A Simple and Flexible Dynamic Approach to Foreign Direct Investment Growth: The Canada-United States Relationship in the Context of Free Trade.*

Peter J. Buckley
Leeds University Business School
University of Leeds
Leeds, UK, LS2 9JT
pjb@lubs.leeds.ac.uk

Jeremy Clegg
Leeds University Business School
University of Leeds
Leeds, UK, LS2 9JT.
ljc@lubs.leeds.ac.uk

Nicolas Forsans
Leeds University Business School
University of Leeds
Leeds, UK, LS2 9JT.
nf@lubs.leeds.ac.uk

Kevin T. Reilly
Leeds University Business School
University of Leeds
Leeds, UK, LS2 9JT.
ktr@lubs.leeds.ac.uk

June 2004

This Draft: June 2005

* *Thanks to workshop participants at the 2004 Academy of International Business Annual Meeting, A. Brumwell and L. Eden for comments on previous drafts; however, the authors retain sole responsibility for any errors that remain. Previous versions of this paper were entitled: "A Simple and Flexible Dynamic Approach to Foreign Direct Investment Growth: Did Canada Benefit From the Free Trade Agreements with the United States?"*

ABSTRACT

A Simple and Flexible Dynamic Approach to Foreign Direct Investment Growth: The Canada-United States Relationship in the Context of Free Trade.

This paper asks a simple question: Did Wilfred Laurier's dream of free trade with the United States, when it came to fruition in 1989, also impact on foreign direct investment (FDI) into Canada by US multinationals? This paper argues that the customary static econometric approach found in the FDI literature, along with the assumption that policy changes influence only the intercept term, are inadequate to address the question. Instead we introduce an innovative dynamic framework to support the testing of hypotheses on behavioural changes in the variables using a structural break framework. A key conclusion is that prior to signing the free trade agreement US FDI responded only to current growth in the Canadian economy, in a unitary fashion, and current exchange rate shifts. This can be described as a static relationship. The implementation of the free trade agreements between Canada and the USA increased the responsiveness of US FDI to growth in the Canadian economy by a factor greater than two. Furthermore, dynamics are found in the form of a lagged effect for changes in the growth in the Canadian economy and interest rate differentials. These conclusions challenge the dominant view, including that in official policy circles, that the free trade agreement had no impact on US firms' FDI decisions in Canada.

(I) Introduction

In the post-war period the world economy has seen the rise and expansion of regional trading blocs and regional economic integration. The prime example has been the evolution of the European Union since the early 1950s; also significant has been the creation of the Asia-Pacific Economic Co-operation Area in 1989, and the development of the North American free trade area, dating also from 1989. This paper will focus on the Canada-United States relationship. While the intentions of the partners to a free trade agreement are clear in the case of trade, the effect on foreign direct investment (FDI) is ambiguous. The question this paper addresses is that of how the North American free trade agreements have affected US foreign investment behaviour in Canada.

The creation of a free trade area creates two classes of foreign investor: those inside and those outside the area. The existing literature suggests that firms outside the area will be motivated by import substitution, while those inside the area are likely to pursue the rationalization of production (see Buckley, Clegg, Forsans and Reilly, 2003). We have narrowed the scope of this paper to examine only the central relationship between the free trade agreement partners, so leaving the study of outsiders' behaviour to future research. Further, we restrict ourselves to US FDI into Canada, for the years 1955 to 2000, for two reasons. First, in order to identify clearly any impact on FDI from the creation of a free trade area requires that a stable policy environment had previously been maintained for a significant period of time. By way of contrast, the constantly changing rules and membership that has characterised the European Union would make it difficult to identify the effect of any particular policy shift. Canada and the USA have signed two free trade agreements since 1987: the Canada-US Free Trade Agreement (CUSFTA), implemented on January 1, 1989, and the North American Free Trade Agreement (NAFTA) implemented on January 1, 1994). However, it is the first agreement that is the critical one for setting the new policy

environment in terms of rules on investment. As Globerman and Shapiro (1999: 517-518) point out, while the NAFTA did introduce changes to the investment rules, especially in the area of transparency, the major shift in Canada's policy occurred in 1989 with the first agreement. This stability and 12 years of post-change data opens up the possibility of observing significant effects.

Second, the Canada-US relationship is one of the most important in the world in terms of both trade and investment and of the level of economic integration. Between 1960 and 2000 the USA exported an average of 18 percent of its total to Canada. Moreover, the variance of this trade over the period was quite low, with the highest proportion observed being 20.9 percent in 1976, with the lowest 15.7 at percent in 1991.[1] This trading relationship is the largest between any two countries in the world (Department of Foreign Affairs, 2003). From 1966 to 2000 United States foreign direct investment (FDI) into Canada fell from 30 percent of total US FDI abroad to just 10 percent. However, this was a period of geographical diversification for US multinationals so that, even in 2000, only the United Kingdom received a higher proportion of US FDI than Canada.[2] Further, this decline must be seen in the context of the sectoral distribution of FDI. In 1998 Canada hosted more investment by American multinational firms in the manufacturing and wholesale-trade sectors than any other country, including the United Kingdom (Hanson, Mataloni and Slaughter, 2001: 47).

This loss of share of US FDI has encouraged both commentators (e.g., Hufbauer and Schoot, 2004: 3) and the Canadian Government itself (Department of Foreign Affairs, 2004: 29) to believe that, in all likelihood, the signing of the two free trade agreements between the two countries had little or no effect on US FDI into Canada. The possibility that the free trade

---

[1] These trade figures are for the export of goods and services and income receipts. They were obtained by the authors from the United States Department of Commerce Bureau, of Economic Analysis (BEA), web site.

[2] These data are for U.S. Direct Investment Abroad and were obtained by the authors from the United States Department of Commerce, BEA, web site.

agreements might have exerted an ambiguous impact on FDI is opened up by the likelihood of the rationalisation of FDI post FTA. The United Nations Transnational Corporations and Management Division (1993) noted that, in the context of the European Union, the effect of regional economic integration can be positive or negative on FDI, for any or all of the members of a trading bloc. The rationalisation of production arising from the elimination of tariffs within a free trade can result either in a member state gaining or losing FDI from its partner(s) in the agreement.[3] A free trade agreement represents a significant change in the policy environment in which firms are operating, and should be expected to affect their foreign investment behaviour. This discussion suggests that that key question is not whether the creation of regional trading blocs affect FDI but how, i.e., is the effect positive or negative? The academic literature to date comes down in favour of evidence that the two free trade agreements between Canada and the USA have had a positive effect on FDI in Canada (e.g., Globerman and Shapiro, 1999). The aim of this paper is to contribute to the level of scientific understanding on the role of free trade agreements as a form of regional integration in influencing the foreign investment behaviour of multinational firms.

Research on the determinants of FDI has focused on two different measures of the firm's foreign involvement: the stock (or level) of FDI and the flow (or growth) of FDI. As is now well recognised (Globerman and Shapiro 1999), there are severe statistical problems in modelling the level of FDI. Generally the series is not stationary, and inferences from an econometric model in this context are misleading at best. In this paper we examine the growth rate of the stock of FDI, thus removing the econometric problems inherent in analysing the stock of FDI. This approximates to studying the flow of US FDI into Canada between 1955 and 2000.

---

[3] See Buckley, Clegg, Forsans and Reilly (2001) for a discussion of this and other points.

In our empirical implementation we also introduce two innovations in the modelling of foreign investment to the existing literature. Our first innovation is to allow for a simple dynamic structure to the growth in FDI. The previous literature, in both the levels and flows estimations, uses a static framework allowing only current values of the independent variables to determine current values of the dependent variable. This approach fails to recognise the possibility of lags in the investment process, particularly between the decision to invest and implementation of this decision. Any model of FDI should recognise that the growth we observe today may be a function of the value of determinants in an earlier period. The simplest way of allowing for this structure to the foreign investment decision is to utilise a distributed lag setup in the econometric model, which we implement in this paper.

It is customary for a policy innovation to be modelled as an intercept shift in the estimating equation (e.g., Buckley, Clegg, Forsans and Reilly 2003; Clegg and Scott-Green 1999; Globerman and Shapiro 1999). This assumes that the policy has no effect on the standard behavioural parameters that appear in these equations, such as those for economic growth and the exchange rate. Yet, as Lucas (1976) has pointed out in the forecasting context, we should always view the behavioural parameters of an econometric model as conditional on the existing policy environment. It follows that changes in the policy environment can result in changes in the behavioural parameters. Therefore our econometric model should allow for the possibility that the introduction of free trade between the USA and Canada might change the parameters of the FDI equation. In this paper we introduce a methodology, structural break analysis, to allow for such changes in the parameters explaining the growth in FDI.

The next section reviews the existing literature on the determinants of FDI, with a focus on the flows or growth literature, while introducing our empirical innovations. In particular, it focuses on the results obtained in the literature from three of the variables that we will use in this study: growth in gross domestic product, changes in the real exchange rate,

and changes in the relative interest rate. We examine the time-series pattern of US FDI into Canada between 1955 and 2000. We show that, at the time of the first free trade agreement, the time series pattern of both the level and growth in US FDI changed significantly. We then demonstrate that while the levels series is nonstationary, the growth series is stationary, so that we can model the latter series within an econometric framework. We conclude this section with a discussion of the two empirical innovations: a distributed lag and a structural break approach.

In the third section we present the results of our estimation and our over-arching conclusion that the introduction of free trade between Canada and the USA resulted in a significant change in the parameterization of the US Canadian FDI growth relationship. In particular we document that, prior to 1989, this relationship is best viewed as a static one, in which US investors' decisions are responses only to current growth in the Canadian economy and to current exchange rate movements. A reasonable interpretation of this pre-free trade result is that, for the most part during this period (1955-1988), the motive of US FDI in Canada was to service the existing Canadian market. The parameter estimates on growth in the economy suggests a unitary relationship and our failure to fins any role for interest rate differential variable supports this interpretation. In the post free-trade period (1989-2000) the relationship becomes dynamic in that lagged growth and the interest rate spread become significant determinants along with current growth, changes in the exchange rate and, for the first time, the current interest rate differential. These post-free trade results are evidence that greater product market and financial integration arose between the two economies as a result of the agreement in 1989.

Our concluding section will summarize our results.

(II) Inward Foreign Direct Investment Flows and Free Trade: The US-Canada Relationship

In the period 1955-2000 the most important shift in trade and investment policy came with the implementation of the first free trade agreement between the two countries on January 1, 1989. This was expanded to include Mexico in 1994.[4] The goals of both treaties are relatively limited: the free flow of goods and services and the minimisation of the barriers that affect the flow of investment across the borders. In particular, as Article 1102, Clause 1, of the North American Free Trade Agreement states:

> *Each Party shall accord to investors of another Party treatment no less favorable than that it accords, in like circumstances, to its own investors with respect to the establishment, acquisition, expansion, management, conduct, operation and sale or other disposition of investments.*

This is the national treatment clause of the agreement, which requires that US multinational firms must be treated just as Canadian firms in terms of Canadian government investment policy. The major exceptions allowed for in the agreement concern the areas of financial services and culture and media. While the North American treaty in 1994 expanded the geographic area covered by the agreement to include Mexico, the fundamental policy environment between the USA and Canada with respect to trade and investment rules has remained stable since the implementation of the 1989 treaty.[5] Stability is critical in order to identify any effect on FDI arising from the adoption of free trade.

---

[4] Students of Canada's foreign investment policy might question this statement on the grounds that on a number of previous occasions the Canadian government had legislated in this area. In defence it can be argued that the Canada-United States Automotive Products Agreement of 1965 can be seen as a forerunner of the Canada-US Free Trade Agreement that we are modelling here. The 1965 agreement required that the value of automotive products imported into Canada exactly balance that of Canadian exports to the USA, if penalty tariffs were to be avoided. This is probably best viewed as a "managed trade" agreement, the existence of which makes less likely an investment effect associated with the implementation of the automotive free trade zone between the two countries. At the same time, the Canadian Foreign Investment Review Act (FIRA) was in operation between 1974 and 1985 and the National Energy Program between 1980 and 1984. FIRA increased the cost of investment by foreigners through regulation, while the National Energy Program encouraged Canadian and government ownership of energy industry assets. The possibility that foreign investment was suppressed prior to the implementation of free trade in 1989 makes it more likely that a free trade effect will be observed in the data. However, the evidence to date on the effect of these programs (Globerman and Shapiro 1999: 523 & 527) suggests that, at standard significance levels, there had been no impact on foreign investment in Canada.

[5] See Globerman and Shapiro (1999, 516-518) for an excellent discussion of this latter issue.

Our perspective on the Canada-US relationship leads us to ask four questions in this section. First, from an empirical perspective, should we model the investment process from a stock or flow perspective? Second, what explanatory factors should we use to model the determination of FDI? Third, should we view this process as static, as it is traditionally viewed in the empirical literature on FDI, or as dynamic, as an investment process perspective would suggest? Finally, how should we incorporate the policy change introduced by free trade between the USA and Canada?

Figure 1 presents, in 1985 Canadian dollars, the development of US FDI into Canada between 1955 and 2000. For most of this period there is an upward trend in the data; however, in the early 1990s the upward trend appears to increase dramatically. This interpretation is supported by Figure 2, which plots the growth rate of US FDI into Canada for the same period. During the 1950s and early 1960s we observe a period of high growth in US FDI into Canada. This growth, after 1967 and until the early 1990s, appears to be on a downward trend. There are eight years of negative growth in this series, between 1973 and 1989. In the early 1990s high growth reappears, such that growth rates in US FDI into Canada return to levels only previously observed in the 1950s. Table 1 presents this periodic variability in the average growth rate of US FDI into Canada. The average for the whole period is 3.3 percent but this is generated by an average of only 1.3 percent between 1977 and 1987, and of 4.7 percent after 1987. Such a pattern in both the level and growth of US FDI into Canada would be expected if Canada had indeed benefited in this sense from the introduction of free trade between the two countries.

However, there is a problem in making the assertion that figures 1 and 2 document the impact of the free trade agreement on US FDI into Canada. This pattern could be the result of other factors occurring simultaneously with the implementation of the first agreement in 1989. An obvious candidate is the growth of the Canadian economy which could, in part, account

for the changes we observe in the two figures. Between 1980 and 1991 Canadian real GDP grew on average by 2.4 percent; while, after that, the average growth rate rose to 3.1 percent. Thus what we observe could be, in part, US multinationals responding to growth in the Canadian markets for their products. This discussion suggests that we need to use a conditional, or regression, framework to disentangle the different effects.

To implement a conditional analysis requires that the measure of FDI we seek to explain is stationary. The reasonably continuous upward trajectory outlined in Figure 1 suggests that the stock of US FDI in Canada might be subject to a stochastic trend, and thus not be a stationary series. Testing for this under the null hypothesis that there is stochastic trend in real US FDI in Canada we find that the Phillips-Perron test statistic for this series is -1.20, with a MacKinnon approximate p-value of 0.934.[6] This does not enable us to reject the null hypothesis that the series is non-stationary, in agreement with Globerman and Shapiro (1999). As with this earlier study, this means we are not able to use a regression technique to examine the determinants of the stock of US FDI in Canada over this period.[7]

To model foreign investment requires the use of an alternative representation of the FDI series. Previous researchers have addressed this problem by using FDI flows (Clegg and Scott-Green 1999; Globerman and Shapiro 1999) or by normalising the FDI level series using another trended variable, such as GDP (Klein and Rosengren 1994; Hejazi and Safarian 1999). Our choice of alternative representation of the series is to model it in a growth context, and in particular to use:

$$g_t^{K^F} \cong \ln\left(K_t^F\right) - \ln\left(K_{t-1}^F\right). \qquad (1)$$

Where:

---

[6] An alternative to this is the standard Augmented Dickey-Fuller tests and Appendix B documents that this traditional test comes to the same conclusion.

[7] In future work we will be turning to a co-integration approach to model the short and long-run dynamics of the stock of FDI.

K_j^F : stock of United States FDI in Canada, j=t or t-1;

$g_t^{K^F}$: approximate growth rate in the stock in period t.

An advantage of using equation (1) as a representation of US FDI in Canada is that the coefficients within a regression context will have a straightforward interpretation, in contrast to the alternatives used elsewhere in the literature. Further, $g_t^{K^F}$ is a stationary series. Table 2, reports a Phillips-Perron test statistic for the series of -3.141 with a MacKinnon approximate p-value of 0.024. This allows us to reject the null hypothesis that the series is non-stationary, enabling us to use the growth rate of US FDI into Canada within a regression framework.

There are two approaches that can be taken when specifying an underlying FDI equation. The first is to follow Stevens and Lipsey (1992) and model a well-specified neoclassical investment process in which the domestic and foreign decisions are jointly determined. While theoretically appealing, and of interest to us in the long run, this structural approach has data requirements that cannot be met at present.[8] The second approach, which most of the literature uses, is to use a single-equation specification. This approach can be loosely referred to as a reduced-form, or hedonic, approach to the foreign investment decision. While lacking theoretical purity in terms of predictions on coefficients, it represents a reasonable starting point in the examination of the empirical issues that are the focus of this paper. It also enables the evaluation of our findings in the context of the existing literature.

The empirical model is founded on the perspective of the representative firm facing a choice of methods in foreign market servicing: direct exports, production licensed to a locally-owned firm, or production by an affiliate of the foreign firm (Buckley and Casson, 1976, 1981; Dunning, 1977, 1993). As the size of the local market share attributable to the foreign firm grows in absolute value terms, the cost of local affiliate production (FDI)

declines relative to the cost of exporting and licensing (Buckley and Casson, 1981). This local production is better able to avoid or reduce the naturally occurring transport costs, artificially-imposed trade barriers such as tariffs and non-tariff barriers, and the transactions costs of operating in the local market. In a simple world, a reduction in such barriers, e.g., via transport innovation, a change in trade policy, or improvement in local intellectual property protection, will tend to reduce the business case for local production via FDI and strengthen that for exports or non-affiliate licensing. Nevertheless, as the firm's sales in the local market grow, a point will arrive beyond which FDI minimises total cost of serving the local market. At this point a standard investment demand function is appropriate, and local market size becomes a key driver of FDI. This suggests that we should follow the existing literature and model FDI as conditional on Gross Domestic Product (GDP), which is a reasonable proxy for local market size. Since we are modelling the growth of FDI, we will model the market size effect by the natural log of real GDP (S_t) and in particular the difference in logs $(\Delta S_t = S_t - S_{t-1})$. Translating this approach into a regression framework within a growth context yields the following simplified representation of this equation:

$$g_t^{K^F} = \beta_0 + \beta_1 \Delta S_t + u_t. \qquad (2)$$

The Buckley and Casson (1981) argument suggests that we will observe a positive value for β_1. To test this requires that our measure of market size, ΔS_t ,is a stationary variable. In Table 2 the Phillips-Perron Unit root statistic for this measure is –6.175, indicating that we can reject the null hypothesis that the series is non-stationary.

Findings on the market size hypothesis in the literature are mixed (e.g., Aristotelous and Fountas, 1996; Culem, 1988; Lunn, 1983), However, our conclusion is that a positive effect is present when modelling the FDI relationship. When estimating an equation for

---

[8] In particular, as Stevens and Lipsey (1992: 45) point out the researcher requires consistent domestic and

Canadian FDI inflows, Globerman and Shapiro (1999) find a significant positive effect for change in real GDP. Using industry level data for Japan, Farrell, Gaston and Strum (2003) also find a positive coefficient on a real GDP variable when not controlling for fixed effects. In contrast, the results for FDI into the EU suggest the effect is not present in the relationship. Clegg and Scott-Green (1999) find predominantly insignificant effects (for US FDI) or significant negative impacts for Japanese FDI. Similar conclusions were drawn by previous EU studies (Pearce, Islam and Sauvant, 1993; Aristotelous and Fountas, 1996). However, these European studies include potentially nonstationary regressors (e.g., level of GDP) and so cannot be treated as strong evidence against the market growth hypothesis.

The standard expectation in the literature is that an appreciation in the host country currency relative to the home currency will lead to a decrease in FDI inflows (Cushman, 1985). However, Stevens (1977) developed three alternative models of FDI behaviour to show that a US dollar devaluation (with the USA in this case as home country) could assume either a positive or negative sign. The theoretical impact of the exchange rate on FDI is also complicated by the fact that there are likely to be several simultaneous influences having opposite effects, even for a single firm. As a consequence, it is difficult to make a solid prediction without making an assumption about the dominant character of FDI in question, in particular horizontal local market seeking versus vertically integrated efficiency seeking investment. Only market-seeking (import substituting) FDI would unambiguously associate a host exchange rate appreciation negatively with FDI inflows during initial market entry into the host country. The logic is that a host appreciation both renders imports cheaper in terms of host currency and host assets more expensive in terms of foreign currency, thereby reducing the profitability of FDI (Logue and Willet 1977; Kohlhagen 1977). As the exchange rate is often proxied in empirical testing (as in our study) by the number of units of host country

---

foreign investment series, which are not generally available.

currency that can be bought with one US dollar, this would suggest an expected positive sign in the case of market seeking FDI. To date, the weight of empirical work has concentrated on the USA as the host country (Bailey and Tavlas 1991; Caves 1990; Cushman 1985; Ray 1989). Overall this evidence suggests an inverse relationship between the exchange value of the host currency and FDI inflows (Stevens, 1993), and therefore that the dominant FDI motive is market seeking, however this is mainly based on US (as host) studies. To model the exchange rate effect we include the change in the real Canadian-US exchange rate (ΔE_t) in equation (5):

$$g_t^{K^F} = \beta_0 + \beta_1 \Delta S_t + \beta_2 \Delta E_t + u_t \qquad (3)$$

Our discussion suggests that the sign prediction on β_2 is indeterminate, but in order to test for any exchange rate impact, as with our market size variable, requires that the change in the real exchange rate is a legitimate regressor. The Phillips-Perron Unit root statistic for this variable is –5.603 (Table 2) and so we can reject the null hypothesis that it is a non-stationary series, permitting us to include it in the regression.

As noted above, the relative interest rate is also included as a control variable. When financial markets are to some extent segmented, the international spread in the cost of borrowing should theoretically impact upon the financial component of FDI, so capturing the portfolio-type refinancing of FDI. If the host country cost of borrowing rises relative to that in the home, then foreign affiliates will tend to reduce their local borrowing and increase their borrowing from the parent firm, thereby increasing the FDI stock and outflow (Boatwright and Renton, 1975). This behaviour falls within the corporate treasury function of MNEs, and is a mimicking within the internal capital market of the multinational firm of the response by portfolio investment to exploit short-lived international differentials in the external capital market (Gilman, 1981). However, most of the impact on FDI of interest rate spread changes occurs within relatively short periods, certainly less than a year, and are temporary, affecting

only the *timing* of FDI flows rather than the eventual *amounts* of real investment expenditure (Boatwright and Renton, 1975). With only annual (e.g., as compared with quarterly) data available, much of the important variation in this variable is lost. General insignificance is therefore not surprising, e.g., as found by Culem (1988) and Clegg and Scott-Green (1999) for US FDI in the EU. The relative interest rate is given by the real Canadian minus the real US medium term interest rates (Δdi_t), valued at year end, where the real rate is the nominal interest rate minus the inflation rate. As Table 2 indicates the change in the difference between real interest rates is a stationary variable. So in spite of the lack of support to date for this hypothesis, it remains theoretically valid as an aggregate control variable for the financial component of FDI flows.

$$g_t^{K^F} = \beta_0 + \beta_1 \Delta S_t + \beta_2 \Delta E_t + \beta_3 \Delta di_t + u_t \tag{4}$$

Turning to our third question, concerning the possible existence of dynamics, given that the underlying process being modelled is an investment decision, the static assumption that underlies equation (4) is an extremely strong one, even in a context limited to annual data. Theory suggests that firms make investment decisions using the information currently available; however, the actual implementation of these decisions (i.e., when investment expenditure is recorded) will lie in the future. The investment we observe today will be a function of both current and past information, and therefore a dynamic and not a static process. The simplest method through which to introduce dynamics into the relationship is to use a distributed lag structure, by including lagged values of the independent variables in the econometric equation:[9]

$$g_t^{K^F} = \beta_0 + \beta_1 \Delta S_t + \beta_2 \Delta E_t + \beta_3 \Delta di_t + \beta_4 \Delta S_{t-1} + \beta_5 \Delta E_{t-1} + \beta_6 \Delta di_{t-1} + u_t. \tag{5}$$

[9] In this paper we leave the dynamics in terms of the dependent variable as unspecified and correct for the implied autocorrelation.

In contrast with equation (4), equation (5) hypothesises that it is not only the current but also the lagged values of our three explanatory variables that affect growth in US FDI into Canada. The advantage of this simple set-up is that hypothesis testing procedures can be employed to determine whether the lags matter or not, and whether we require a dynamic structure to explain the data. If a dynamic structure is required, then the cumulative impact of a factor is given by the sum of the relevant individual period effects. So, for example, for the market size variable the total or cumulative impact is:

$$\beta_S^T = \beta_1 + \beta_4 \tag{6}$$

The advantage of a specification in the form of equation (5) is that it allows us to nest the standard static model (equation(4)) commonly used by researchers in the area.

Finally, we turn to modelling the impact of changes in policy within our estimated equations. Robert Lucas (1976) argued, in a forecasting context, that the parameters of an econometric model are conditional on the existing policy regime. When a policy regime changes, it is necessary to allow for the possibility that the parameters governing the relationship change. However, customarily within the literature on FDI, authors such as Globerman and Shapiro (1999), Clegg and Scott-Green (1999), and Buckley, Clegg, Forsans and Reilly (2001, 2003) have used a dummy variable to capture the effects of policy changes brought about by free trade or regional integration in general. The dummy variable in the context of these studies measures the effect of the policy change only on the intercept. This also applies to Equation (5) as it stands, which assumes that the parameters of specified variables are not affected by the introduction of the free trade agreement between the USA and Canada. We argue in this paper that the free trade agreement, implemented on January 1, 1989, brought about fundamental policy changes likely to affect the behavioural parameters within our model.

The conventional way of representing the effect of policy changes is encapsulated within the optimal timing of FDI model (Buckley and Casson, 1981). Here the use of a dummy variable in an econometric model captures the intercept effect, i.e., changes in levels of FDI follow from changes in the fixed costs of servicing a foreign market. Using a growth approach, we argue that the fixed costs of FDI remain unchanged. What changes, however, are the variable costs of servicing a foreign market through exports, licensing or FDI. This, we argue, affects the coefficients of all the parameters in the model, and is a slope effect, as opposed to an intercept effect.

To capture this reasoning we treat the implementation of the 1989 Canada-US free trade agreement as a structural break in the parameters of the relationship. For example, before the free trade agreement, the effect of current growth in Canada's GDP is β_1, but after this agreement comes into force the coefficient is now β_1^* because of the fundamental change in policy. Therefore, the free trade effect on the parameter can be defined as:

$$\beta_1^{FT} \equiv \beta_1^* - \beta_1 \tag{7}$$

Viewing the process in this structural break framework allows us to estimate β_1 and β_1^{FT} using a dummy variable:

$$D_t^{FT} = \begin{cases} 1 \text{ if } t \geq 1989; \\ 0 \text{ if } t < 1989. \end{cases} \tag{8}$$

The parameter on any variable interacting with the dummy variable defined in equation (8) yields an estimate of the change in the parameter that results from the introduction of free trade between the USA and Canada: β_1^{FT}. Its companion variable, not interacted with D_t^{FT}, yields an estimate of the pre-free trade effect (β_1) of the variable on the growth in US FDI into Canada. Using equation (7) we can then derive an estimate of the post-free trade effect (β_1^*) that the variable exerts on the growth of US FDI into Canada. Expanding equation (5) to

allow all parameters to be affected by the introduction of the free trade agreement between Canada and the USA, yields the hypothesised FDI growth equation:

$$\begin{aligned} g_t^{K^F} &= \beta_0 + \beta_1 \Delta S_t + \beta_1^{FT}\left(D_t^{FT} \times \Delta S_t\right) + \beta_2 \Delta E_t + \beta_2^{FT}\left(D_t^{FT} \times \Delta E_t\right) \\ &+ \beta_3 \Delta di_t + \beta_3^{FT}\left(D_t^{FT} \times \Delta di_t\right) + \beta_4 \Delta S_{t-1} + \beta_4^{FT}\left(D_t^{FT} \times \Delta S_{t-1}\right) \\ &+ \beta_5 \Delta E_{t-1} + \beta_5^{FT}\left(D_t^{FT} \times \Delta E_{t-1}\right) + \beta_6 \Delta di_{t-1} + \beta_6^{FT}\left(D_t^{FT} \times \Delta di_{t-1}\right) + u_t. \end{aligned} \tag{9}$$

Specifying the relationship using equation (9) allows us to test directly if the provisions of the free trade agreement between the USA and Canada did affect the decision by US multinationals to invest in Canada. This is achieved via a standard significance test on the parameter of the dummy variable-interaction variable. The combination of the distributed lag and structural break innovations affords a flexible methodology. This gives priority to the data to tell us what is and is not important in determining the growth of inward US FDI into Canada in terms of both dynamic and free trade effects.

Unlike many researchers in the area (e.g., Globerman and Shapiro 1999; Clegg and Scott-Green 1999), we will refrain from adding any further variables to our FDI equation. Especially prominent amongst the variables that we are excluding are controls for corporate taxation and wage costs, and this is for two reasons. First, although in each case a theoretical argument can be made for the inclusion of these variables there exists no evidence, in either the North American or European context, that at the aggregate level these extra variables have a significant effect on FDI flows. This implies that our results are unlikely to be subject to omitted variable bias. The second reason is that to over-parameterise the equation, as many researchers do, significant effects are being lost due to the increase in the standard errors arising from either partial collinearity between independent variables, or the effect of a dearth of degrees of freedom. For these reasons we feel justified in pursuing a strategy of limiting the independent variables in our FDI equation. So in recognition of the limited degrees of

freedom available, there are strong efficiency reasons for following the late Zvi Griliches' (1974) advice to minimise the number of parameters estimated.

(III) Results

Table 3 presents the results of five specifications of our model of US FDI growth into Canada. Column (1) are the results for the literature's standard static specification, equation (4); the results of a dynamic model (equation (5)) that assumes no free trade effects are presented in column (2); a static model that allows for free trade effects in column (3); a full dynamic specification with free trade effects in column (4), our estimate of equation (9); and concludes in column (5) with our preferred specification of the relationship. The second part of Table 3 we present various specification tests that allow us to distinguish between the five specifications in this table.

The results in Column (1) report that current Canadian GDP growth and the change in the exchange rate have positive and statistically significant parameters. The change in the real interest rate spread parameter has a negative sign, although it is statistically insignificant. The results from this specification are consistent with studies discussed in the previous section and the Ramsey Reset test indicates there are no specification problems. This suggests we could stop at this point; however, this specification test has extremely low power which makes us sceptical of its ability to guide us in choosing the "correct" specification. The low power problem with this statistic is clear, on the basis that none of the five specifications in Table 3 report a Ramsey Reset test statistic indicating a specification problem even though all are significantly different from each other. In this context we will use our simple theoretical arguments developed in the previous section in combination with traditional t and F-tests on the parameters to distinguish between the specifications reported in Table 3.

The next specification we consider is to allow for dynamic effects in the no-free-trade-effect context, and these results are reported in Column (2). The results are inferior to the

standard static specification. All lagged terms are individually and jointly [*see Dynamic Test (I)*] statistically insignificant. Further, the coefficients on the current values of the three variables yield the same conclusion as the pure static model reported in Column (1). The effect of introducing the lagged terms is to increase the relative size of the standard errors on all three current variables and thus, via a degrees-of-freedom effect, we have merely reduced the precision of our estimates without changing the conclusions. This suggests that introducing dynamics does not of itself improve the explanation of the growth in US FDI into Canada.

Column (3) of Table 3 returns to the static specification but now allows all the parameters, except the constant, to change after the introduction of free trade between Canada and the United States.[10] Our test of the joint significance of the three free trade dummy interaction parameters [*see Free Trade Test*] allows us to reject the null hypothesis that they are jointly insignificant. The estimate of the post-free trade effect of growth in the Canadian economy is large, and indicates that the introduction of free trade between the two countries increased the responsiveness of US multinationals to growth by a factor of two. However, this positive conclusion should be tempered since, on individual basis, the post-free trade coefficients for the changes in the exchange rate and interest rate differential are statistically insignificant. Further, the results for the three pre-free trade effect coefficients are no different than obtained in our previous results. This suggests that we have found a free trade effect on economic growth with this specification, but that is all that we have found.

Combining our two empirical innovations, the results with a full set of dynamic and free trade effects are reported in Column (4), so generating a number of interesting conclusions. First, both our dynamic [*Dynamic Test I*] and free trade tests [*Free Trade Test*]

---

[10] We have considered specifications that include an intercept shift effect for the free trade agreement and in all cases this parameter is insignificant without changing our conclusions. See Appendix C that is available on request.

indicate that we can reject the null hypothesis that all the lags or post-free trade parameters are zero. We now have evidence that the introduction of the distributive lag and structural break specification helps to explain the data better. Second, the post-free trade parameter on lagged growth in real Canadian GDP is large and individually significant. Finally, we now observe a marginally significant effect for the post-free trade parameter on the lagged change in interest rate spread.

However, Column (4) reports a number of insignificant parameters, which suggest the specification is over-parameterised. In particular, all the lagged terms estimating the dynamic parameters prior to the introduction of free trade are individually and jointly insignificant [*see Dynamic Test (II)*]. This suggests to us that part of the over-parameterization problem is related to imposing a dynamic structure in this earlier period and suggests that a static structure to the relationship is an adequate representation of the data before the implementation of the Free Trade Agreement. Further, looking at each of the three factors we are modelling, we see other regularities that will simplify the specification. The free trade parameter on current economic growth is insignificant which suggests that free trade had no effect. Further, neither of the post-free trade parameters for the change in the exchange rate is individually significant.[11] Finally, turning to the interest rate spread it is evident that, pre-free trade, both the current and lagged terms are zero from a statistical point of view.[12]

The results from our preferred model are reported in Column (5) of Table 3 and all the parameters, except the intercept, are statistically significant. Our tests for the presence of dynamic factors [*Dynamic Test (I)*] and parameter shifts as a result of the free trade agreement in 1989 [*Free Trade Test*] both reject the hypothesis that these effects are not present in the

---

[11] Further, testing the hypothesis that the pre-free trade lagged term and the two post-free trade changes in exchange rate variables are jointly insignificant can be accepted with a probability value of 0.67.

[12] Jointly the restriction that these seven parameters we have identified are zero in this discussion is accepted is documented in the *Omnibus Test* reported in Table 3.

data. We should emphasise that the support for the empirical structure proposed in this paper should not be construed as an argument that the relationship under study is either (or both) completely dynamic, or that the free trade agreement altered all parameters. However, our findings suggest that the free-trade agreement changed fundamentally the FDI relationship between Canada and the USA.

Our results prior to the free trade agreement are consistent with the US FDI growth relationship being static, whereby only current growth in Canadian GDP and changes in the real exchange rate are influential in the FDI decisions of US multinationals. Prior to 1989 US firms' investment in Canada was driven by growth in the Canadian market for their products as captured by the current market size variable, which exhibits unit elasticity.[13] This implies that US multinationals were responding at a unitary proportional rate to the current state of the Canadian economy when making their Canadian investment decisions. This may be interpreted as suggesting that increases in FDI were primarily of an expansionary nature, rather than representing the establishment of new projects. There is limited evidence of market seeking behaviour by US firms from an inspection of the impact of the exchange rate. However, this is very much a second order effect. Converting the relevant coefficient into elasticity terms results in an effect of only 0.002. Overall the results suggest a reactive mode of decision making by US multinational firms in the pre-free trade period.

From 1989 onwards only changes in the real exchange rate retain the same impact on the FDI growth decision as prior to the free trade agreement. Growth in the Canadian economy now takes on a dynamic structure in which both current and lagged changes now exert significant effects on US FDI. While the impact of current growth in the Canadian economy is unchanged by the introduction of free trade between the two economies the

[13] You cannot reject the null hypothesis that the coefficient on the change in Canadian GDP growth is different from one. Appendix C Table C2 reports a full set of elasticity results for both periods (pre- and post-free trade) and is available on request.

addition of the lagged effect results in a total effect on the part of Canadian GDP that is significantly larger than the unit elastic response (2.91) reported earlier. Further, US multinationals post free trade altered their FDI behaviour in, for the first time, reacting to the dynamic (current and lagged) interest rate spread between the two economies. This is a concrete finding for a hypothesis which rarely finds support in the empirical literature on foreign direct investment flows. It is evident that US multinationals' investment decision making in Canada after 1989 is much more complex, though remaining reasonable, than that exhibited prior to the free trade agreement.

The increase in the coefficient on Canadian GDP growth can be understood as a direct outcome of the provisions under the free trade agreements to remove barriers to trade and investment. Under regional economic integration two (or more) economies segmented by barriers to the flow of goods, services and assets, become a single economy. In these circumstances existing and potential foreign investors come to regard the foreign market as an integral part of the domestic economy. It is important here to appreciate that economic integration is only realised through changes in the responsiveness of firms to market conditions in partner countries. Under autarky the impact of market growth on inward FDI would be zero. Under regional integration, the relationship between market growth in the partner countries and inward FDI becomes stronger. In the steady state a position should be reached in which the coefficient on market growth explaining inward FDI from a partner country should approximate that for domestic investment. The result in Table 3 therefore testifies to the positive behavioural impact of the removal of trade and investment barriers, via the profitability of FDI, on the investment strategies of US firms in Canada.

The impact of the relative interest rate variable is significant in both the current and the lagged period following the implementation of free trade. This significance is almost unprecedented in studies of the financial determinants of FDI using annual data. However, the

sign in the current period is negative, which runs counter to expectations, while the sign in the lagged period is positive. The net effect on FDI across the two periods is zero, which is the overall effect generally observed in similar studies. Our explanation for the negative relationship being located in the lagged period is that, as we are using annual rather than quarterly (or better) data, our variable is not picking up the short term international movement of funds on intra-company account (the hypothesis for which it was originally designed). Rather, it is the effect of longer term loans from the parent being employed in the foreign affiliate, which are recorded as FDI expenditures only after an investment lag. Loans from the parent are increased when the interest rate spread widens. The negative sign in the current period can then be understood as the aggregate behaviour of foreign affiliates in repaying these loans (so reducing the financial component of FDI). The significant change in responsiveness to the interest rate spread can be explained as a behavioural change to economic integration. Following the elimination of barriers in the real sector, the only significant segmentation that remains is that between the capital markets. The greater organisational integration within US multinational enterprises expected with integration would naturally extend to financial strategy.[14]

(IV) Conclusions

We began this paper by asking whether US firms' foreign investment decisions with regard to Canada changed with the introduction of a free trade zone between the two countries in 1989. To answer this simple question effectively required us to introduce two empirical innovations to the FDI literature. The first innovation is to model the FDI decision in a dynamic framework, rather than the literature's traditional static framework, and is accomplished by using a distributed lag specification of the estimating equation. The second empirical innovation is to generalise the existing methodology for analysing the effect of policy changes

[14] In future work, we will test this directly on the financial components data.

on FDI by using a structural break framework, in preference to modelling it simply as an intercept shift, while allowing all parameters in the estimating equation to change. An important advantage of these innovations is that the standard framework used by previous researchers is just a special case of the model estimated in this paper. This will be of interest to researchers beyond the specific case of US FDI into Canada pursued here.

With the implementation of these two innovations, we answer the question at the centre of the paper by analysing the behaviour of US FDI into Canada in a growth context which, unlike the levels series, is stationary for the period 1955 to 2000. We obtain three key conclusions: first, the introduction of the free trade agreements between Canada and the USA increased the responsiveness of USI investors to growth in the Canadian economy by a factor of two. Second, limited dynamics are found in the form of lagged effects in the interest rate spread although, interestingly this factor only entered into US MNEs' decision making after the first free trade agreement was signed. Finally, the effect of the change in the exchange rate is static and constant over the whole 1955 to 2000 period, and was unaffected by the introduction of free trade between the United States and Canada.

Our results indicate that the introduction of free trade between the USA and Canada did fundamentally alter the decision making process of US multinational firms investing in Canada. Prior to the agreement in 1989 US multinationals' decisions were driven by market size and exchange rate factors in a static way. Following the agreement it is clear, by virtue of the estimated market size and interest rate effects, that these firms have changed their investment strategy with respect to the Canadian market in a manner consistent with effective product market integration, and their corporate integration as evidenced by the appearance of a significant response to financial market factors. This furnishes scientific evidence that US multinationals' FDI decisions in Canada changed fundamentally with the introduction of free

trade, which challenges the view of a number of commentators, including that of the Canadian government.

References

Aristotelous, Kyriacos & Stilianos Fountas, 1996, An empirical analysis of inward foreign direct investment flows in the EU with emphasis on the market enlargement hypothesis. *Journal of Common Market Studies*, 34(4): 571-83.

Bailey, Martin J. and George S Tavlas, 1991, Exchange rate variability and direct investment. In *The Annals of the American Academy of Political and Social Science: Foreign Investment in the United States*, Michael Ulan, editor, number 516, July: 106-17.

Barrell, Ray and Nigel Pain, 1999, Trade restraints and Japanese direct investment flows. European Economic Review, 43: 29-45.

Boatwright, B.D. and Renton, G.A., 1975, An analysis of United Kingdom inflows and outflows of direct foreign investment. *Review of Economics and Statistics*, 57(4): 478-86.

Buckley, Peter J.& Mark C. Casson,., 1976, *The future of the multinational enterprise*. London: Macmillan.

Buckley, Peter J.& Mark C. Casson, 1981, The optimal timing of a foreign direct investment. *Economic Journal*, 92(361): 75-87.

Buckley, Peter J.; Jeremy Clegg, Nicolas Forsans and Kevin T. Reilly, 2001, "Increasing the Size of the "Country": Regional Economic Integration and Foreign Direct Investment in a Globalised World Economy" *Management International Review*, 41(3): 251-274.

Buckley, Peter J.; Jeremy Clegg; Nicolas Forsans and Kevin T. Reilly, 2003, "Evolution of FDI in the United States in the Context of Trade Liberalisation and Regionalisation" *Journal of Business Research*, 56(10): 853-857.

Caves, Richard E., 1990, Exchange rate movements and foreign direct investment in the United States. In *The Internationalization of US Markets*, David B. Audretsch and Michael P. Claudon, editors, New York: New York University Press: 199-229.

Clegg, Jeremy and Susan Scott-Green, 1999, "The Determinants of New FDI Capital Flows into the EC: A Statistical Comparison of the USA and Japan" *Journal of Common Market Studies*, 37(4): 597-616.

Culem, Claudy G, 1988, The locational determinants of direct investments among industrialised countries. *European Economic Review*, 32(4): 885-904.

Cushman, David O, 1985, Real exchange rate risk, expectations, and the level of direct investment. *Review of Economics and Statistics,* 67: 297-308.

Department of Foreign Affairs, 2003, *NAFTA @ 10 A Preliminary Report*, Ottawa, Canada: Minister of Public Works and Government Services Canada.

Department of Foreign Affairs, 2004, *Fifth Annual Report on Canada's State of Trade*, Ottawa, Canada: Minister of Public Works and Government Services Canada.

Dunning, John H., 1977, Trade, location of economic activity and the multinational enterprise: A search for an eclectic approach. In *The International Allocation of Economic Activity*, Bertil Ohlin, Per-Ove. Hesselborn and Per Magnus Wijkman, editors. London: Macmillan: 395-418.

Dunning, John H., 1993, *Multinational enterprises and the global economy*. Wokingham, Berks: Addison-Wesley.

Dunning, John H., 1997, The European internal market programme and inbound foreign direct investment - Part II'. *Journal of Common Market Studies,* 35(2): 189-223.

Farrell, Roger, Noel Gaston and Jan-Egbert Strum, 2003, "Determinants of Japan's Foreign Direct Investment: An Industry and Country Panel Study, 1984-1998" *Journal of the Japanese and International Economics*, forthcoming.

Gilman, Martin G., 1981, The financing of foreign direct investment, a study of the determinants of capital flows in multinational enterprises, Frances Pinter: London

Globerman, Steven and Daniel M Shapiro, 1999, "The Impact of Government Policies on Foreign Direct Investment: The Canadian Experience" *Journal of International Business Studies*, 30(3): 513-532.

Griliches, Zvi, 1974, "Comments on Sims" in Michael D. Intriligator and David A. Kendrick (Eds.) *Frontiers of Quantitative Economics*, Vol. 2, Amsterdam: North Holland: 334-336.

Hanson, Gordon H., Raymond J. Mataloni and Matthew J. Slaughter, 2001, Expansion Strategies of U.S. Multinational Firms, *Bureau of Economic Analysis Working Paper*, Washington, DC: U.S Department of Commerce, May, number 2001-01.

Hejazi, Walid and Edward A. Safarian, 1999, "Trade, Foreign Direct Investment and R&D Spillovers" *Journal of International Business Studies*, 30(3): 491-511.

Hufbauer, Gary C. and Jeffrey J. Schott, 2004, *The Prospects for Deeper North American Economic Integration: A U.S. Perspective*, Montreal, Canada: C.D. Howe Institute Commentary, The Border Papers, January.

Klein, Michael W. and Eric Rosengren, 1994, "The Real Exchange Rate and Foreign Direct Investment in the United States: Relative Wealth vs. Relative Wage Effects" *Journal of International Economics*, 36(3-4): 373-389.

Kohlhagen, Steven W., 1977, The effects of exchange-rate adjustments on international investment: Comment. In *The Effects of Exchange Rate Adjustments*, Peter B. Clark, Dennis E. Logue and Richard James Sweeney, editors, Washington, DC: US Government Printing Office: 194-7.

Logue, Dennis E. and Thomas D. Willet, 1977, The effects of exchange-rate adjustments on international investment. In *The Effects of Exchange Rate Adjustments*, Peter B. Clark, Dennis E. Logue and Richard James Sweeney, editors, Washington, DC: US Government Printing Office: 137- 50.

Lucas, Robert E. Jr., 1976, "Econometric Policy Evaluation: A Critique" in Karl Brunner and Allan H. Meltzer (Eds.) *The Phillips Curve and Labor Markets*, Vol. 1 of Carnegie-Rochester Conference Series on Public Policy, Amsterdam: North-Holland: 19-46.

Lunn, J. (1983) Determinants of US direct investment in the EEC: Revisited again. *European Economic Review*, **21**(3), 391-3.

Pearce, Robert D., Azizul Islam, and Karl P. Sauvant, 1992, *The determinants of foreign direct investment: A survey of the evidence*. United Nations Centre on Transnational Corporations, New York: United Nations.

Ray, Edward John, 1989, The determinants of foreign direct investment in the United States: 1979-1985. In *Trade Policies for International Competitiveness*, Robert C. Feenstra, editor, Chicago: University of Chicago Press: 53-83.

Stevens, Guy V.G., 1977, The effects of exchange-rate adjustments on international investment: Comment. In *The Effects of Exchange Rate Adjustments*, Peter B. Clark, Dennis E. Logue and Richard James Sweeney, editors, Washington, DC: US Government Printing Office: 183-88.

Stevens, Guy V.G., 1993, Exchange rates and foreign direct investment: A note. *International Finance Discussion Papers*, Washington, DC: Board of Governors of the Federal Reserve System, April, number 444.

Stevens, Guy V.G. and Robert E. Lipsey, 1992, "Interactions between domestic and foreign investment" Journal of International Money and Finance, 11: 40-62.

United Nations Transnational Corporations and Management Division, 1993, *From the Common Market to EC 92: Regional Economic Integration in the European Community and Transnational Corporations*. Department of Economic and Social Development. New York: United Nations.

Figure 1: Stock of US Foreign Direct Investment in Canada, 1955-2000

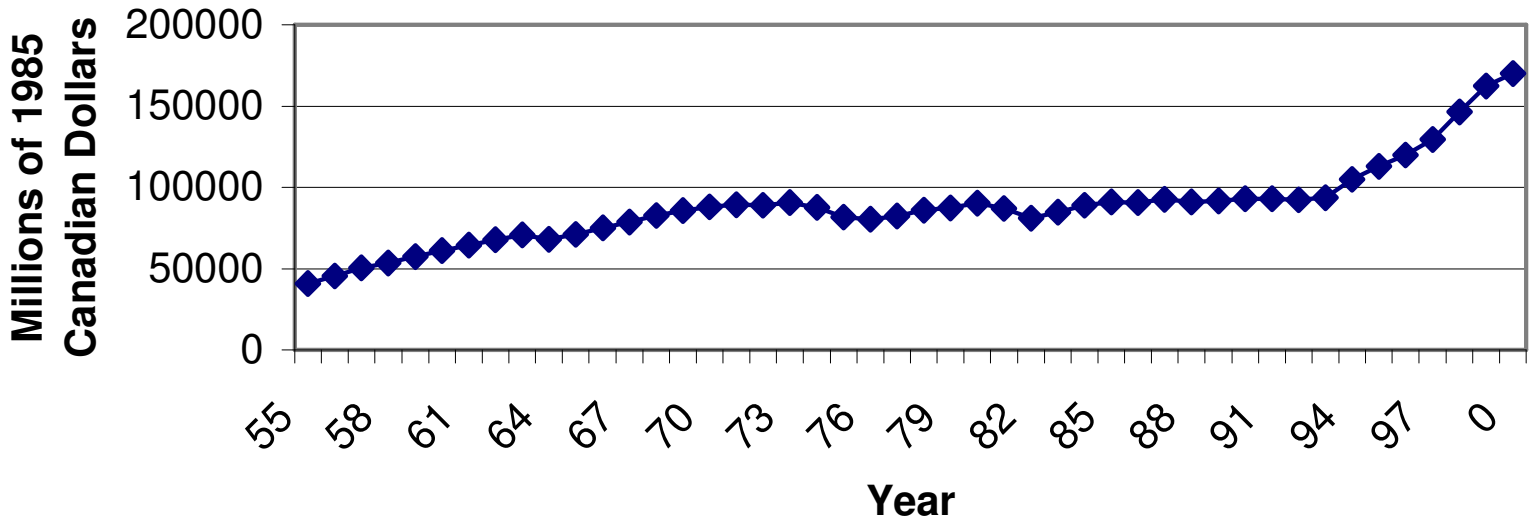

Figure 2:
Growth Rate of US FDI in Canada, 1955-2000

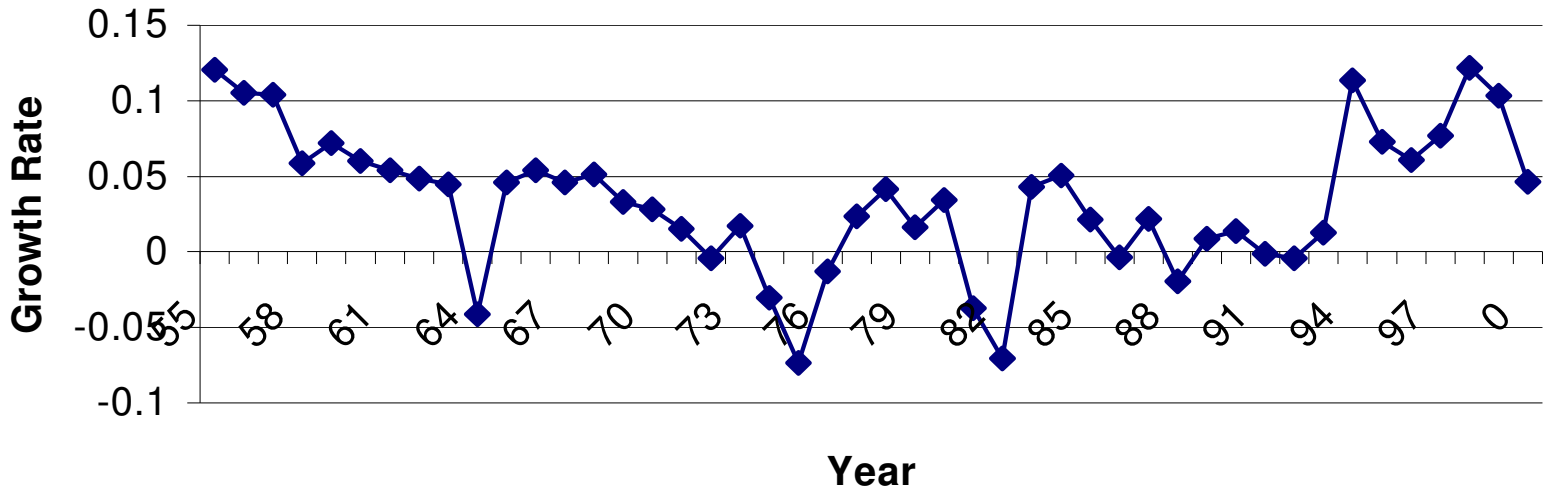

Table 1
Growth Rate of United States Foreign Direct Investment into Canada

Period	Mean	Standard Deviation
1955-1964	0.0627	0.0451
1965-1976	0.0142	0.0385
1977-1987	0.0128	0.0369
1988-2000	0.0467	0.0484
1955-2000	0.0336	0.0463

Table 2
Descriptive Statistics

Variable	Mean	Standard Deviation	Phillips-Perron Unit Root Statistic[a]
Real US FDI into Canada (Millions Canadian $)	87939.36	25917.67	-1.200 (0.934)
Growth in Real US FDI into Canada	0.034	0.046	-3.141 (0.024)
Growth in Real Canadian GDP[b]	0.039	0.024	-6.175 (0.000)
Change in Canada-US Exchange Rate	0.008	0.059	-5.603 (0.000)
Change in Difference Real Canadian-US Medium Term Interest Rate	-0.044	1.580	-8.561 (0.000)

Notes to Table 2:

a: Newey-West Standard errors are used and in parenthesis are the MacKinnon Approximate P-Values.

b: Unit root test includes a time trend in the underlying regressions.

Table 3
Growth in United States FDI into Canada and the Introduction of Free Trade, 1955-2000

	Dependent Variable: Growth Rate in United States FDI into Canada				
Specification	**No Free Trade Effects**		**Free Trade Effects**		
Independent Variables	**(1) Static**	**(2) Dynamic**	**(3) Static**	**(4) Dynamic**	**(5) Dynamic**
Current Growth Real Canadian GDP	0.679 (0.297) [0.027]	0.637 (0.285) [0.031]	0.657 (0.291) [0.030]	0.833 (0.294) [0.008]	0.866 (0.231) [0.001]
1st Lagged Growth Real Canadian GDP		0.020 (0.260) [0.938]		0.035 (0.309) [0.910]	
Cumulative Multiplier for Real Growth Canadian GDP		0.657 (0.364) [0.078]		0.868 (0.376) [0.028]	
(Free Trade, 1989)x(Current Growth Real Canadian GDP)			1.271 (0.355) [0.001]	-0.095 (0.393) [0.810]	
(Free Trade, 1989)x(1st Lag Growth Real Canadian GDP)				1.492 (0.498) [0.005]	1.439 (0.371) [0.000]
(Free Trade, 1989)x(Cumulative Multiplier for Real Growth Canadian GDP)				1.396 (0.365) [0.001]	
Current Change in Real Canada $/US $ Exchange Rate	0.295 (0.102) [0.006]	0.231 (0.098) [0.023]	0.312 (0.121) [0.014]	0.291 (0.139) [0.043]	0.316 (0.068) [0.000]
1st Lag Change in Real Canada $/US $ Exchange Rate		0.187 (0.114) [0.106]		0.099 (0.136) [0.470]	
Cumulative Multiplier for Change in Real Canada $/US $ Exchange Rate		0.419 (0.139) [0.004]		0.390 (0.152) [0.015]	
(Free Trade, 1989)x(Current Change in Real Canada $/US $ Exchange Rate)			-0.229 (0.165) [0.174]	0.063 (0.186) [0.735]	
(Free Trade, 1989)x(1st Lag Change in Real Canada $/US $ Exchange Rate)				0.049 (0.198) [0.806]	
(Free Trade, 1989)x(Cumulative Multiplier for Change in Real Canada $/US $ Exchange Rate)				0.112 (0.200) [0.578]	

Table 3 Continued on Next Page

Table 3
Growth in United States FDI into Canada and the Introduction of Free Trade, 1955-2000

	Dependent Variable: Growth Rate in United States FDI into Canada				
Specification	**No Free Trade Effects**		**Free Trade Effects**		
Independent Variables	**(1) Static**	**(2) Dynamic**	**(3) Static**	**(4) Dynamic**	**(5) Dynamic**
Current Change in Difference Canada-US Real Returns	-0.006 (0.005) [0.285]	-0.003 (0.004) [0.431]	-0.003 (0.006) [0.607]	-0.002 (0.007) [0.779]	
1st Lag Change in Difference Canada-US Real Returns		-0.003 (0.004) [0.431]		-0.003 (0.004) [0.473]	
Cumulative Multiplier for Change in Difference Canada-US Real Returns		0.006 (0.008) [0.740]		-0.005 (0.009) [0.581]	
(Free Trade, 1989)x(Current Change in Difference Canada-US Real Returns)			-0.000 (0.007) [0.965]	-0.007 (0.009) [0.476]	-0.010 (0.003) [0.000]
(Free Trade, 1989)x(1st Lag Change in Difference Canada-US Real Returns)				0.011 (0.007) [0.098]	0.011 (0.003) [0.002]
(Free Trade, 1989)x(Cumulative Multiplier for Change in Diff. Can-US Real Returns)				0.004 (0.013) [0.352]	0.001 (0.004) [0.805]
Intercept	0.005 (0.014) [0.738]	0.005 (0.014) [0.740]	-0.001 (0.013) [0.951]	-0.013 (0.013) [0.352]	-0.012 (0.013) [0.365]
Specification Tests					
Ramsey Reset Test	1.72 {3,39} [0.178]	1.10 {3,36} [0.360]	0.27 {3,36} [0.848]	1.38 {3,30} [0.276]	1.16 {3,37} [0.339]
Dynamic Test (I): Static Versus Dynamic		0.97 {3,39} [0.418]		6.80 {6,33} [0.000]	8.20 {2,40} [0.001]
Dynamic Test (II): Static Before Free Trade				0.35 {3,33} [0.791]	
Free Trade Test: Exclusion of Free Trade Interaction Terms			6.85 {3,39} [0.001]	6.69 {6,33} [0.000]	10.20 {3,40} [0.000]
Omnibus Restriction Test: Exclusion of Insignificant Parameters.				0.55 {7,33} [0.789]	

() Standard Errors: Static are Robust and Dynamic are Newey-West; [] Two-Sided Probability Values; {} Degrees of Freedom.

Appendices To

A Simple and Flexible Dynamic Approach to Foreign Direct Investment Growth: The Canada-United States Relationship in the Context of Free Trade.

Peter J. Buckley
Leeds University Business School
University of Leeds
Leeds, UK, LS2 9JT
pjb@lubs.leeds.ac.uk

Jeremy Clegg
Leeds University Business School
University of Leeds
Leeds, UK, LS2 9JT.
ljc@lubs.leeds.ac.uk

Nicolas Forsans
Leeds University Business School
University of Leeds
Leeds, UK, LS2 9JT.
nf@lubs.leeds.ac.uk

Kevin T. Reilly
Leeds University Business School
University of Leeds
Leeds, UK, LS2 9JT.
ktr@lubs.leeds.ac.uk

June 2005

Appendix A
Variable Definitions and Data Sources

Table A.1
Variable Definitions

Real United States foreign direct investment in Canada:

Growth rate of stock data for the period - as approximated by difference in logs, 1955-2000 (Source: United States Bureau of Economic Analysis)

Real Canadian Gross Domestic product:

Growth rate as approximated by difference in logs, 1955-2000 (Source: IMF)

Real opportunity cost of FDI:

Approximated by the difference between the real Canadian medium term interest rates (end of year) and US medium term interest rates, 1955-2000 (Source: IMF)

Real exchange rate:

Approximated by [(Canadian$/US$)x(US GDP deflator/Canadian GDP Deflator], 1955-2000 (Source: IMF)

Dummy variable:

Equals 1 in 1989 and after, 0 before 1989

Appendix B
Augmented Dickey-Fuller Unit Root Test Results

Tables B.1 to B.5 present our results for the presents of stochastic trend in the five variables we use in this paper. These tests are the Augmented Dickey-Fuller unit root test and are an alternative unit root test to the one presented in the main body of the paper.[15] While the tests differ the conclusions are the same as that presented in Table 2.

[15] Augmented Dickey-Fuller Critical Values are: Intercept Only: 10%=-2.57; 5%=-2.86; 1%=3.43 or Intercept and Trend: 10%=-3.12; 5%=-3.41; 1%=3.96.

Table B.1
Unit-Root Tests for United States (US) Foreign Direct Investment (FDI) into Canada, 1955-2000

	Dependent Variable: Change in US FDI					
Specification	**Without Time Trend**			**With Time Trend**		
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
1st Lag in US FDI	**0.068**	**0.010**	**0.012**	**0.094**	**-0.060**	**-0.056**
	(2.59)	**(0.43)**	**(0.49)**	**(1.71)**	**(1.17)**	**(1.02)**
1st Lag Change in US FDI		0.662	0.731		0.747	0.763
		(5.15)	(4.44)		(5.41)	(4.65)
2nd Lag Change in US FDI			-0.119			-0.035
			(0.68)			(0.19)
Trend				-51.454	128.309	122.652
				(0.53)	(1.55)	(1.38)
Constant	-2958.022	176.758	136.010	-3942.153	3035.105	2869.904
	(1.26)	(0.09)	(0.07)	(1.30)	(1.13)	(1.03)
Akaike Information Criteria	16.764	16.327	16.360	16.801	16.315	16.357
Bayes Information Criteria	16.843	16.446	16.519	16.920	16.474	16.556
Observations	**46**					

() Absolute Value of t-statistic

Table B.2
Unit-Root Tests for Growth in United States (US) Foreign Direct Investment (FDI) into Canada, 1955-2000

	Dependent Variable: Change in Growth of US FDI					
Specification	**Without Time Trend**			**With Time Trend**		
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
1st Lag Growth in US FDI	**-0.381**	**-0.372**	**-0.306**	**-0.381**	**-0.370**	**-0.283**
	(3.30)	**(2.93)**	**(2.26)**	**(3.23)**	**(2.81)**	**(-1.96)**
1st Lag Change in Growth in US FDI		-0.029	-0.105		-0.031	-0.133
		(0.20)	(0.66)		(0.20)	(0.78)
2nd Lag Change in Growth in US FDI			-0.194			-0.218
			(1.30)			(1.37)
Trend (*1/1000)				-0.001	0.198	2.133
				(-0.00)	(0.05)	(0.47)
Constant	0.012	0.012	0.010	0.012	0.011	0.003
	(1.83)	(1.69)	(1.34)	(0.89)	(0.76)	(0.18)
Akaike Information Criteria	-6.583	-6.540	-6.536	-6.539	-6.497	-6.498
Bayes Information Criteria	-6.503	-6.421	-6.377	-6.420	-6.338	-6.299
Observations	**46**					

() Absolute Value of t-statistic

Table B.3
Unit-Root Tests for Growth Rate of Real Canadian (Can) Gross Domestic Product (GDP), 1955-2000

	Dependent Variable: Change in Real Can GDP Growth					
Specification	**Without Time Trend**			**With Time Trend**		
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
1st Lag in Growth in Real Can GDP Growth	**-0.742** **(5.35)**	**-0.765** **(4.29)**	**-0.594** **(2.83)**	**-0.584** **(6.16)**	**-0.977** **(5.29)**	**-0.889** **(3.69)**
1st Lag in the Change in Real Can GDP Growth		0.030 (0.21)	-0.119 (0.68)		0.142 (1.01)	0.072 (0.39)
2nd Lag in the Change in Real Can GDP Growth			-0.207 (1.49)			-0.083 (0.58)
Trend				-0.001 (2.49)	-0.001 (2.67)	-0.001 (2.22)
Constant	0.029 (4.68)	0.030 (3.98)	0.023 (2.69)	0.051 (4.83)	0.058 (4.61)	0.052 (3.38)
Akaike Information Criteria	-7.504	-7.462	-7.470	-7.595	-7.576	-7.540
Bayes Information Criteria	-7.425	-7.343	-7.311	-7.476	-7.47	-7.341
Observations	**46**					

() Absolute Value of t-statistic

Table B.4
Unit-Root Tests for Change in Difference between Real Canadian (Can)-US Returns, 1955-2000

	Dependent Variable: Change in the Change in Real Canadian (Can) Returns					
Specification	**Without Time Trend**			**With Time Trend**		
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
1st Lag Change in Difference between Can-US Returns	**-1.207 (8.31)**	**-1.290 (5.40)**	**-1.463 (4.84)**	**-1.208 (8.23)**	**-1.293 (5.36)**	**-1.477 (4.82)**
1st Lag Change in the Change in Diff between Can-US Returns		0.055 (0.44)	0.228 (0.99)		0.068 (0.45)	0.239 (1.03)
2nd Lag Change in the Change in Diff between Can-US Returns			0.138 (0.94)			0.145 (0.98)
Trend				-0.087 (0.38)	-0.007 (0.39)	-0.009 (0.49)
Constant	-0.063 (0.27)	-0.060 (0.26)	-0.048 (0.20)	0.087 (0.19)	0.096 (0.21)	0.149 (0.32)
Akaike Information Criteria	0.935	0.974	0.997	0.975	1.014	1.034
Bayes Information Criteria	1.015	1.093	1.156	1.094	1.173	1.233
Observations	**46**					

() Absolute Value of t-statistic

Table B.5
Unit-Root Tests for Change in Real United States/Canada (US/Can) Exchange Rate, 1955-2000

	Dependent Variable: Change in the Change in Real Can/US Exchange Rate					
Specification	**Without Time Trend**			**With Time Trend**		
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
1st Lag Change in Real US/Can Exchange Rate	**-0.839 (5.63)**	**-0.840 (4.19)**	**-1.050 (4.56)**	**-0.843 (0.151)**	**-0.853 (4.16)**	**-1.077 (4.57)**
1st Lag Change in the Change in Real US/Can Exchange Rate		0.001 (0.01)	0.201 (0.167)		0.012 (0.07)	0.223 (1.11)
2nd Lag Change in the Change in Real US/Can Exchange Rate			0.292 (1.74)			0.303 (1.78)
Trend(*1/10)				0.003 (0.43)	0.003 (0.43)	0.004 (0.62)
Constant	0.007 (0.78)	0.007 (0.76)	0.007 (0.85)	-0.001 (0.05)	-0.001 (0.05)	-0.004 (0.18)
$\overline{R}^2$	0.406	0.392	0.419	0.395	0.380	0.411
Akaike Information Criteria	-5.626	-5.582	-5.609	-5.587	-5.543	-5.575
Bayes Information Criteria	-5.546	-5.463	-5.450	-5.467	-5.384	-5.376
Observations	**46**					

() Absolute Value of t-statistic

Appendix C: Free-Trade Intercept Results

Table C.1
Growth in United States FDI into Canada and the Introduction of Free Trade, 1955-2000, Intercept Effect

Dependent Variable: Growth Rate in United States FDI into Canada			
Independent Variables	**(1) Static**	**(2) Dynamic**	**(3) Dynamic**
Current Growth Real Canadian GDP	0.793 (0.345) [0.027]	0.794 (0.362) [0.036]	0.868 (0.280) [0.004]
1st Lagged Growth Real Canadian GDP		0.003 (0.323) [0.933]	
(Free Trade, 1989)x(Current Growth Real Canadian GDP)	0.850 (0.469) [0.078]	-0.076 (0.444) [0.865]	
(Free Trade, 1989)x(1st Lag Growth Real Canadian GDP)		1.717 (0.481) [0.001]	1.429 (0.416) [0.001]
Current Change in Real Canada $/US $ Exchange Rate	0.313 (0.124) [0.016]	0.290 (0.139) [0.046]	0.315 (0.080) [0.000]
1st Lag Change in Real Canada $/US $ Exchange Rate		0.097 (0.140) [0.491]	
(Free Trade, 1989)x(Current Change in Real Canada $/US $ Exchange Rate)	-0.250 (0.183) [0.181]	0.114 (0.169) [0.505]	
(Free Trade, 1989)x(1st Lag Change in Real Canada $/US $ Exchange Rate)		0.046 (0.196) [0.816]	
Current Change in Difference Canada-US Real Returns	-0.003 (0.006) [0.620]	-0.002 (0.007) [0.767]	
1st Lag Change in Difference Canada-US Real Returns		-0.003 (0.004) [0.483]	
(Free Trade, 1989)x(Current Change in Difference Canada-US Real Returns)	-0.001 (0.007) [0.898]	-0.008 (0.009) [0.425]	-0.009 (0.003) [0.001]
(Free Trade, 1989)x(1st Lag Change in Difference Canada-US Real Returns)		0.013 (0.006) [0.052]	0.011 (0.003) [0.002]

Table C.1 Continued on Next Page

Table C.1
Growth in United States FDI into Canada and the Introduction of Free Trade, 1955-2000, Intercept Effect

Dependent Variable: Growth Rate in United States FDI into Canada			
Independent Variables	**(1) Static**	**(2) Dynamic**	**(3) Dynamic**
Free Trade, 1989 Dummy Variable	0.019	-0.010	0.000
	(0.019)	(0.023)	(0.019)
	[0.344]	[0.654]	[0.982]
Intercept	-0.008	-0.009	-0.012
	(0.019)	(0.020)	(0.017)
	[0.658]	[0.655]	[0.506]

() Standard Errors: Static are Robust and Dynamic are Newey-West; [] Two-Sided Probability Values.

Table C.2
US Foreign Direct Investment Elasticity Estimates

	Elasticity Estimates	
	Before Free Trade Agreement	**After Free Trade Agreement**
Current Growth Real Canadian GDP	**0.852**	**0.852**
1st Lag Growth Real Canadian GDP	**0.000**	**1.439**
Total Growth Real Canadian GDP	**0.852**	**2.291**
Current Change in Real Canada $/US $ Exchange Rate[a]	**0.002**	**0.002**
Current Change in Difference in Real Can-US Returns[b]	**0.000**	**-0.002**
1st Lag Change in Difference in Real Can-US Returns[b]	**0.000**	**0.002**
Total Change in Difference in Real Canadian-US Returns	**0.000**	**0.000**

Notes to Table C.2:

a: Evaluated using average change in the Real Canada $/ US $ Exchange Rate for the whole period, 0.008.

b: Evaluated using average change in the Difference in Real Medium Canadian-US Returns for the post-free trade agreement period, -0.151.