

# Assessing the Impacts of FTAs: Issues for the Small, Open and Regionally Integrated Economy

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## Abstract

The computable general equilibrium model has become the workhorse tool for assessing the impacts of bilateral trade liberalization. This paper draws on recent experience within Foreign Affairs and International Trade Canada in modeling the impacts of potential free trade agreements with various partners to highlight (a) the importance of microeconomic closures (and in particular the implicit assumptions concerning the elasticities of supply of capital and labour) that are suitable for the circumstances of the economy in question; (b) the likelihood that regional economic integration will result in significant intra-regional “leakage” of impacts of FTA effects with extra-regional partners; (c) the need to take into account institutional features such as producer price supports when liberalizing border measures; and (d) speculates on the possibility of linking the results from the gravity model literature on the trade impacts of FTAs with CGE model-based results—the former reflecting the “all-in” impacts, the latter the tariff effects alone, and the difference impliedly reflecting the non-tariff aspects of FTAs.

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## Introduction

The workhorse tool for assessing preferential free trade agreements is the computable general equilibrium (CGE) simulation model, based on the Armington assumption that products are differentiated by country or region of origin. The varying values for the elasticities of substitution across products determines the responsiveness of trade flows to changes in the height of border protection. The initial conditions in the model's data base capture the essential roles of comparative advantage in shaping the product composition of a country's trade and of economic geography in determining the regional pattern of trade. The input-output relationships embedded in the social accounting matrix (SAM) for each country or region translate the trade flows into variables of interest to policy makers—economic output and economic welfare at the state/region level.

With this arsenal of data and economic architecture, the CGE model can tell a well-rounded story of the impact of a policy change, such as bilateral trade liberalization, on an economy. The trouble is that, within limits, it can tell almost any story the practitioner wants to tell. The task of narrowing the range of outcomes sufficiently to allow the simulation results to be used as policy advice falls to the modeler, based on information external to the model. Moreover, notwithstanding the impressive amount of detail captured in the model, the complexity of policies that affect production, consumption and trade (especially in agriculture) is not sufficiently well captured to allow reliance on unfiltered results from CGE simulations.

In this paper, I outline two major issues encountered in applying the widely used Global Trade Analysis Project (GTAP) model to simulating the effects of preferential trade agreements between Canada and potential FTA partners and the criteria applied to determine whether particular simulation results are plausible. These are as follows:

- Matching "closure" rules (the choice of variables to be determined exogenously) to the nature of the economy—in particular, what closure rules are appropriate for a small,

open, price-taking economy like Canada versus a large, price-setting economy like the United States?

- Taking account of the implications of regional integration for price responses in commodity markets in response to bilateral liberalization with out-of-region partners.

I also highlight two additional issues that need to be addressed to generate sensible results:

- Taking account of institutional features of agricultural policies and trade such as endogenous subsidies that impact on consumer and producer prices differentially and WTO rulings.
- Taking account of the non-tariff elements of FTAs by integrating the gravity-model based findings of actual FTA impacts.

### **Closure Rules and the Supply Side Response in CGE Simulations**

In performing simulations, the modeller must make some choices as regards which variables in the model are to be exogenous (i.e., fixed at pre-determined values specified by the modeller) and which are to be endogenous (i.e., the values for which are solved by the model). Alternative choices represent alternative "closures" of the model.

Under the GTAP model's default microeconomic closure, the factor endowments (i.e., the total supply of labour, both skilled and unskilled, as well as of capital and land) are fixed; factor prices (i.e., wages and return to capital and land) adjust to restore full employment of the factors of production in the post-shock equilibrium. Under alternative microeconomic closures that are sometimes used, the return to capital or to labour<sup>1</sup> can

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<sup>1</sup> For an example of the use of the labour market closure rule under which the wage rate is fixed, see Francois and Baughman (2005).

be fixed and the supply of capital and/or labour then adjusts to restore equilibrium<sup>2</sup>.

*Choice of closure impacts on the size of model responses*

The choice of closure influences the results significantly. For example, in an analysis of the economic impacts of a US-Korea FTA, reported net economic welfare gains for Korea are 2.7 times larger, and for the US that are 2.4 times larger, with the flexible capital closure compared to standard closure Gilbert (2001).

*Choice of closure also determines the composition of impacts*

Equally importantly for policy analysis, the choice of closure rules dramatically alters the composition of economic impacts. For example, changing the closure rule in a simulation of a Canada-Korea FTA changes the sign on allocative efficiency and terms of trade effects as well as greatly altering the absolute values (for Canada, the GDP impact varies by a factor of 4 between the most and least restrictive closure rules; for Korea the corresponding factor is 28<sup>3</sup>). Needless to say, the sectoral rami-

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<sup>2</sup> The second aspect of closure is macroeconomic closure. Two approaches are available. The standard GTAP closure allows the current account to adjust to the trade shock, with passive accommodation by international investment flows. The change in the current account implies a change in domestic investment. In the GTAP model, the change in investment is reflected in the profile of final demand which in turn affects the profile of production and trade but does not feed through into the productive capacity of industries/regions. The alternative macroeconomic closure is to fix the current account, implicitly assuming no international capital mobility. For a comparison of the impact of using these alternative macroeconomic closures in the context of modelling the US-Korea Free Trade Agreement, see Gilbert (2001). The fixed current account simulations reduce substantially the economic welfare gains for Korea (to 3/5 the level of the simulation with flexible current account) and marginally (by 5%) for the United States. Since the fixed capital account closure is an unrealistic assumption for small, open economies like Canada, the implications of this option are not explored here.

<sup>3</sup> For an application of this approach, see Ciuriak and Chen (2008).

fications of liberalization and the impact on other trading partners are similarly affected.

*Examining the assumptions implicit in closure rules*

Quantitatively and qualitatively, therefore, the messages from a GTAP simulation depend not on the model but on assumptions made by the modeller on how to use it. These assumptions need airing<sup>4</sup> and careful consideration.

The standard or default GTAP closure (labour and capital supply fixed; rates of return to capital and wage rates adjust) is sometimes characterized as reflecting a medium-term time horizon; by contrast, the closure rule in which the rate of return to capital is fixed and capital supply adjusts is sometimes described as reflecting longer-run “steady-state” growth conditions. However, neither of these characterizations is actually persuasive.

For example, the model's structure assumes that capital and labour are fully mobile across sectors within an economy—regardless of which closure rule is chosen. If one interprets the fixed factor supply closure as reflecting a short- to medium-term time frame in which total labour supply is “sticky” and capital has been committed to particular uses, then there is a time inconsistency with the fact that this closure still assumes a sufficiently long time frame to permit full depreciation of fixed capital investments in declining industries or firms and new investment in expanding industries or firms and even generational change in the labour market (e.g., to allow full redeployment of labour from farming to industry). In other words, there is far too much flexibility in cross-sectoral industrial adjustment for this closure to be consistent the medium-term time frame characterization of the factor supply market assumed at the aggregate economy level.

A second inconsistency arises from the fact that both the long-run “steady state” and the short- to medium-run fixed factor supply closures assume general equilibrium and thus full utilization of resources. While the full resource utilization as-

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<sup>4</sup> This point is made in Winston (2007).

sumption is reasonable in the long run, it is problematic for the short- to medium run, the period in which the economy is adjusting to the policy shock being modelled. To assume full employment of resources in this time frame is tantamount to assuming negligible frictional costs to structural adjustment, which is contrary to intuition<sup>5</sup> and the empirical evidence<sup>6</sup>.

Similarly, the "steady-state" closure rule, which involves full adjustment of capital supply to a change in the rate of return, but no adjustment at all of labour supply to changes in wage rates and thus in the marginal value of leisure, hardly accords with the observed long-run rise in labour force participation as the returns to labour market participation have risen in the developed countries.

Given the above considerations, it is best to see the closure rules for what they are: assumptions about the long-run supply of labour and/or capital. Seen this way, the conventional closures make arbitrary and extreme assumptions about these elasticities: labour and capital supply are assumed to be either perfectly elastic or perfectly inelastic in the long run. The reality is likely to be somewhere between. Moreover, I will argue that the reality is likely to be different for different types of economies. The "choice" of closure thus is not really a choice but an empirical question for the modeller to answer.

The GTAP model can be simulated to approximate intermediate values of the elasticity of supply of capital and/or labour. The modeller's assumptions for these parameters, based on empirical evidence drawn from outside the model, determine how the gains from an FTA are obtained. For example, for labour, the more in-

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<sup>5</sup> For example, sectoral re-allocation of labour in a regionally heterogeneous country such as Canada requires inter-regional mobility of labour, which definitely is not frictionless.

<sup>6</sup> The short- to medium-term impact of the Canada-US FTA on Canadian industry was essentially to shut down the least productive establishments in the sectors that had previously benefited from the highest level of tariff protection. The result was a decline in employment in import-competing industries coupled with a steep rise in labour productivity; the employment-to-population ratio recovered in the longer-term but in the interim there was under-utilization of labour. See Trefler (2004).

lastic is labour supply, the greater the extent to which gains are achieved in the form of wage increases; conversely, the more elastic is labour supply, the greater the extent to which gains are achieved in the form of additional jobs. Similarly, as noted earlier, for the economy as a whole, the gains reflect either improved prices (and thus improved terms of trade) or increased output—or some combination of the two—depending on the assumptions about supply-side elasticities established in the chosen closure.

Given the sensitivity of the results to the specific assumption made, it is useful in practice to examine the results of simulations for several alternative closure rules:

- (a) labour and capital supply fixed (the standard or default closure);
- (b) labour supply flexible, capital supply fixed;
- (c) labour supply fixed, capital supply flexible; and
- (d) both labour and capital supply flexible.

These alternatives map out the "ballpark" for the impacts of a given policy simulation; the modeller's reference scenario, employing the assumptions for capital and labour supply deemed most appropriate for each economy is then set in context<sup>7</sup>.

It goes almost without saying that the choice of assumptions for any particular economy should be grounded in the empirical evidence for that economy. A few generalizations are, however, possible.

As regards the long-run supply of capital, for a small open economy like Canada that has relatively untrammelled access to capital in a highly integrated North American and global capital market, it is unlikely that a rise in the rate of return to capital in Canada relative to the US would not be met with higher investment, even if this were not financed through increased domestic savings. The most plausible assumption for capital supply is that it is highly elastic; the steady state closure rule for capital might be considered a reasonable approximation.

Conversely, for a large, price-setting economy like the US, a sustained increase in the rate of return relative to elsewhere in the

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<sup>7</sup> For an application of this approach, see Ciuriak and Chen (2008).

world is plausible. At the same time, the additional capital would have to be forthcoming in good measure from domestic sources, implying less elastic supply than in a small open economy. Accordingly, the assumption of inelastic supply is appropriate to the US case, and is commonly used. That being said, given that the US share of global economic activity is declining on trend, and it continues to attract vast capital inflows, the standard GTAP closure rule of zero elasticity of capital supply is becoming ever less plausible.

In between, there are many smaller economies that are open to capital inflows in varying degrees. It is reasonable to expect that rates of return could differ across economies and that a policy shock could lead to higher returns, coupled with some expansion of supply.

As regards the long-run supply of labour, the economic literature supports a positive but relatively low supply elasticity. Some recent empirical evidence suggests that the labour supply elasticity in industrialized countries could be as high as unity<sup>8</sup>; traditionally, the accepted value has been less than half that value. Labour supply is of course subject to a negative income effect, making the net impact of a rise in wage rates and a rise in incomes an empirical question, at least in the higher-income countries<sup>9</sup>.

To the extent that the modeller is not building in a productivity boost to capture the effect demonstrated using heterogeneous firm models that trade liberalization leads to exit of the least productive firms, driving up average productivity, then allowing a stronger labour supply response would serve as a reasonable proxy for these non-represented productivity effects.

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<sup>8</sup> For a recent discussion of the elasticity of supply of labour see Ham and Reilly (2006). This study finds statistically significant inter-temporal labour supply elasticities of 0.9 with the Panel Study of Income Dynamics (PSID) data set and 1.0 with the Consumer Expenditure Survey (CES) data set.

<sup>9</sup> In lower-income countries where there is a large supply of unskilled labour in the rural sector, it would be plausible to have substantially higher elasticities of labour supply, without regard to any dampening effect from rising incomes.

### *Reality Checks*

Building in some degree of supply response into the model injects a "dynamic" element into the simulation. However, this dynamic effect is not explicitly established; it emerges implicitly from the model's structure. This raises the question: how plausible are the measured endowment effects? Several criteria can be used as benchmarks against which a given simulation's results can be compared:

- (a) The extent of trade deepening can be compared to the GDP gain: Empirical estimates of the relationship between expanded trade and economic activity suggests a strong impetus to GDP growth but overall smaller gains in GDP than in trade. A specific quantitative "rule of thumb" has been suggested: "Research ... using a variety of alternative techniques, suggests that annual GDP gains to each partner would amount to 20 percent of the expanded [bilateral] trade... These gains reflect the adoption of improved production methods in response to competitive pressures, the exit of less efficient firms, scale and network economics, reduced mark-up margins, more intensive use of imported inputs, and greater variety in the menu of available goods and services."<sup>10</sup> The precise interpretation of this rule of thumb is that for every percentage point increase in the trade share of GDP—(exports + imports)/GDP—there is a 0.2 percentage point increase in GDP.
- (b) The extent of trade diversion can be examined—especially as regards exports. Theory suggests that, in the presence of sunk costs of market entry, there ought to be some degree of "compression" of exports—firms export to fewer countries than they otherwise would because of the sunk costs associated with establishing a market presence in each new market. It follows that, if firms are induced to establish a presence in an FTA partner country, exports to third countries might be lower than otherwise would have been the

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<sup>10</sup> DeRosa and Gilbert. 2006. At p. 238.

case. The empirical literature does not offer a consensus opinion on the extent of trade diversion caused by FTAs. The "conventional wisdom" has been that the trade creation effect has dominated the trade diversion effect. Direct attempts to measure whether FTAs reduce the amount of trade with third parties using gravity models have generally failed to show significant negative effects, although different studies have reached opposite conclusions on this point<sup>11</sup>. Given that the literature does not decisively support extensive trade diversion, simulations which generate very large extents of trade diversion with regard to exports suggest too little in the way of "dynamism".

- (c) The division of impacts for an economy between allocative efficiency (which equals the increase in GDP measured at pre-shock prices) and terms of trade needs to be examined. Simulations that show small, open economies obtaining the bulk of their gains from an FTA in the form of terms of trade gains probably have too little dynamism. For example, Trefler (2004) finds that the Canada-US FTA on Canada resulted in little if anything in the way of terms of trade gains.

### **The implications of regional integration for price responses in commodity markets**

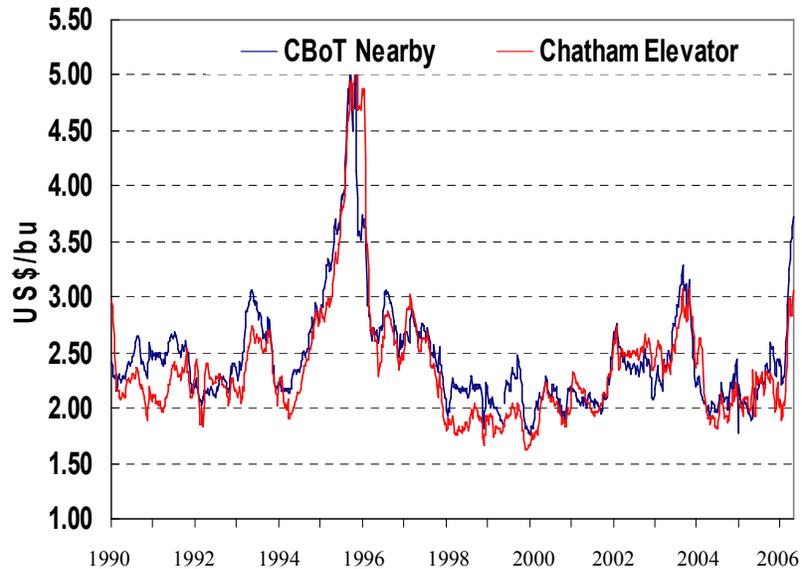
The empirical record suggests that because of regional integration of the markets, Canadian agricultural prices moving in tandem with US prices as quoted on US exchanges, after account is taken for the exchange rate (see chart below for corn)<sup>12</sup>.

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<sup>11</sup> A 2003 study for the Australian Productivity Commission contradicted this conventional wisdom, finding that most FTAs reported to the WTO were trade diverting. Adams, Dee, Gali, and McGuire (2003). However, DeRosa (2007) reviewing this same evidence using updated trade data reached the opposite conclusion, namely that most FTAs were net trade creating.

<sup>12</sup> Based on the data in Agriculture and Agrifood Canada's Food and Agriculture Research Model (FARM), which uses annual prices, a regression of Canadian prices on US prices yields a coefficient of almost one in front of the US price expressed in Canadian dollar terms with an r-square of 0.99.

## Weekly Corn Prices in Canada and the United States



Source: Agriculture and Agri-Foods Canada

However, when dealing with minimally differentiated commodities such as beef, pork or grains, the Armington assumption, when applied with GTAP 6.0 elasticities, results in significant price increases in Canadian commodity sectors relative to US commodity sectors when very high tariff barriers are removed. In the opinion of agricultural trade experts, such sustained price wedges cannot emerge; if so, that means the supply responses generated by the GTAP model can also not occur.

Working through the problem logically, the extension to Canadian producers of preferential, tariff-free access to a large highly protected agricultural product market in a third country expands demand for Canadian product. This causes prices for Canadian output to rise. In turn, this gives rise to two effects: on the one hand, Canadian producers expand supply; on the other hand, US exports to Canada become more competitive and expand. Given the relatively large size of the US agricultural sector compared to Canada's, the latter effect has more

mented price impacts in the US market. The bottom line is that US producers share in the expansion of production to satisfy the demand from Canada's FTA partner. Moreover, the overall price increase in the combined North American market needed to satisfy the expanded demand is lower than the price increase needed to satisfy this demand from Canadian produce only, which in turn implies the competitive impact of lower-priced imports from Canada in the FTA partner country is also deepened.

One way to estimate the quantitative implications of this effect is to first run an initial simulation to identify commodity sectors in which large relative price and output gains are calculated for Canadian producers. In a second simulation, those same sectors are simultaneously opened up to US producers as well. In effect, this assumes that US and Canadian commodities are perfect substitutes, abrogating the Armington assumption for these products. The model-calculated expansion of exports from the US to the Canadian FTA partner are then to be interpreted in triangular trade terms: these exports actually go to Canada while an identical amount of additional Canadian exports are diverted from the domestic market to the FTA partner<sup>13</sup>.

Does this work? While we are not yet ready to put numbers out into the public domain, the results of this approach are encouraging in that the responses are qualitatively in line with expectations and quantitatively the triangular trade flows are similar to those in the bilateral liberalization case, while the price response in Canada and the US fall into line with expectations. However, for GTAP sectors that aggregate a number of varied products and for which the composition of trade is different for Canadian versus US producers and hence the weighted tariff facing US exporters differs from that facing Canadian producers, the results are less satisfactory and more careful work is required to build in this effect.

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<sup>13</sup> An alternative is to boost the elasticities of substitution for these commodities. However, this has repercussions throughout the model and may introduce more distortions than it cures.

The important take-away point is that, to the extent that North American commodity market integration limits the price increase that Canadian producers can obtain, the model-calculated terms of trade impacts are over-stated. This has significant implications for the Canadian FTA partner since the downward price pressures from liberalization are actually greater. And for third countries, the reduction of terms of trade gains for Canada reduces terms-of-trade-induced welfare losses for net importers of those commodities and affects outcomes for rival net exporters as well.

### **Institutional Features of Agricultural Trade**

Trade in agricultural products requires special attention because of the complexity of the institutional setting, including the effects of producer support systems and the rules governing subsidized exports which are still permitted under the WTO Agreement on Agriculture, but which are subject to reduction commitments.

It goes without saying that exports of products that are considered to be subsidized and therefore subject to reduction commitments cannot be expanded if the estimated level of border protection is eliminated. This is the situation, for example, with Canada's exports of dairy products, which face high measured border protection in the GTAP protection data, but which could not benefit from elimination of this protection because of WTO rulings<sup>14</sup>.

We are attempting to deal with endogenous subsidies such as payments to farmers that are triggered when market prices fall below a certain threshold. Since such producer price supports are not likely to be part of a bilateral trade deal, their retention can have important implications for output in the liberalizing country. For example, Japan has a 38.5% tariff on beef and maintains a producer subsidy program in the form of direct deficiency payments, which kick in when prices fall below a target level. When modelled using the OECD's AGLINK model, which expressly

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<sup>14</sup> For a review of the case history, see WTO (2001) at p. 11, para 3.2.

takes these policies into account<sup>15</sup>, tariff liberalization in Japan results in the consumer price falling substantially. GTAP calculates a roughly similar price drop. However, where the AGLINK model shows relatively modest production impacts in Japan, the GTAP model calculated production impact is substantially greater, since it does not take into account the way in which the deficiency payments impact on producer behaviour.

### **Taking account of the non-tariff elements of FTAs**

While CGE-model-based estimates of FTA impacts are restricted to elimination of tariffs and other quantifiable measures of protection, modern FTAs address a wide range of other areas of cooperation and facilitation<sup>16</sup>. Action in these areas can reduce costs which drive a wedge between firms' domestic costs of production and the all-in cost of bringing product to destination markets.

As well, the economic literature suggests that the price effects from tariff reductions do not fully capture the impact of an economic cooperation agreement on business behaviour.

Finally, it has been suggested that conventional CGE models underestimate the trade impacts in the differentiated goods

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<sup>15</sup> AGLINK is a dynamic partial equilibrium supply-demand model of world agriculture developed by the OECD Secretariat in close co-operation with Member countries and the FAO. It explicitly models annual supply, demand and prices for the principal agricultural commodities produced, consumed and traded by Member countries. The model was expressly designed to capture the potential influence of agricultural policies on agricultural markets over a medium term horizon.

<sup>16</sup> For example, in the negotiations between Canada and Korea, issues that are being addressed include trade in goods, rules of origin, customs procedures, trade facilitation, non-tariff measures, cross-border trade in services, financial services, temporary entry, investment, government procurement, competition, intellectual property, e-commerce, dispute settlement and institutional provisions. In addition, Canada is pursuing environmental and labour cooperation agreements in parallel with the free trade negotiations. See Foreign Affairs and International Trade Canada, *Canada-Korea – Free Trade Agreement Negotiations*, <http://www.international.gc.ca/tna-nac/rb/korea-en.asp>.

sector because they capture only trade expansion at the intensive, and not the extensive, margin. It follows that empirically-based estimates of FTA trade effects, such as those obtained using gravity models, should show greater trade gains, especially in the differentiated products sectors, than CGE model simulations would suggest. This section explores these issues.

### *Complementarity between trade and investment and services*

The rising importance of intra-firm trade in global trade and an associated positive correlation between trade and investment have been well-documented in the economic literature<sup>17</sup>.

To some extent, increased two-way investment due to investment liberalization or facilitation can be expected to increase bilateral trade flows. However, causal links can run both from increased trade to increased investment (e.g., firms establish a corporate presence in destination markets for distribution and after-sales service support) and from increased investment to increased trade (e.g., firms import inputs from their home base to be assembled in the investee country). Moreover, the relationship between investment and trade can vary from sector to sector and from country to country, depending on the motive for the foreign investment<sup>18</sup>. Accordingly, it can be difficult to establish the quantitative impact of increased investment flows on two-way trade.

Similar complementarities between goods trade and services trade also appear to exist, with similar issues concerning the direction of causality.

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<sup>17</sup> It has been widely debated whether trade and investment are complements or substitutes. Overall, as the OECD (2005) reports, “greater trade correlates with greater investment flows.” at p.8. For an empirical investigation into this linkage see Goldberg and Klein (1999).

<sup>18</sup> Empirical estimates by Graham and Wada (2000) suggest an elasticity of 0.6 for the “pull” of US direct investment abroad on its exports; Hejazi and Safarian (1999) report a small coefficient for Canada. The citations for both studies are drawn from Hufbauer and Baldwin (2006).

In the context of growing trade in intermediate goods and services and the associated emergence of global value chains<sup>19</sup>, measures to facilitate investment and/or liberalize services trade in an economic partnership agreement would be expected to have an impact on two-way goods trade over and beyond the effect induced by lower tariffs.

### *Business behaviour effects of trade agreements*

The impact of tariff changes on trade flows as measured in conventional economic models reflects the response of trade flows to changes in prices, with no differentiation for a price change that reflects a marginal reduction in a tariff versus full tariff elimination in the context of a political commitment embodied in an economic agreement to promote the bilateral economic relationship in various ways.

A number of reasons have been suggested in the economic literature as to why a stronger trade response might be expected in the latter case, namely full tariff elimination in the context of a broader economic cooperation agreement.

- The “announcement effect”: the conclusion of an agreement acts like a “wake-up” call to the private sector, drawing attention to the new possibilities offered by the agreement.
- A somewhat different articulation of this is the “animal spirits” effect: business enthusiasm is raised by the agreement, which leads to trade-creating actions.
- The “lock-in effect”: firms have greater certainty about market access by the capping of non-tariff barriers to trade in goods and services, investment, the movement of business persons etc. In the presence of sunk costs (that is, expenditure of resources to establish a presence in a new market), a reduction of perceived business risk translates into a greater expected return on the investment required to establish a market presence (Freund, 2000).

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<sup>19</sup> For a recent overview of this phenomenon, see Sturgeon (2007).

- The “compression effect”: in the presence of sunk costs, firms are likely to concentrate their resources on markets with greater potential (Haveman, Nair-Reichert and Thursby, 2003). An economic agreement will thus have the effect of attracting the resources of trading firms to building a deeper bilateral economic relationship.

#### *Capturing trade expansion at the extensive margin*

In the framework of CGE models, the various factors shaping trade patterns, including comparative advantage and economic geography, are reflected implicitly in the initial conditions (i.e., the base year trade data) established in the social accounting matrix. If there is no trade in a particular sector between two countries or regions, the reduction of protection cannot induce trade. In short, CGE models capture trade effects at the "intensive margin" (where there is existing trade) but not at the "extensive margin" (where there is no existing trade).

Recent work by Fan (2006) which includes firm heterogeneity and fixed exporting costs (following Melitz, 2003), into the CGE framework, suggests that standard CGE simulations substantially underestimate the trade and economic welfare effects of trade opening<sup>20</sup>.

#### *Linking results from gravity models to results from CGE models*

An alternative tool that is widely used to evaluate the potential impact of free trade agreements is the gravity model of international trade. Gravity models estimate the overall size of bilateral trade flows based on a wide variety of factors that might otherwise influence the bilateral trading relationship, including size of the respective economies, their distance from one another, their wealth, and various points of commonality such as

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<sup>20</sup> Illustrative simulations in this paper suggest that taking into account trade creation at the extensive margin more than doubles the estimated trade and economic welfare gains compared to those generated with a standard Armington CGE model.

common language, culture, borders etc. that are linked to the strength of trade interaction. By taking into account whether two countries are members of a regional trade agreement, the gravity model can provide an estimate of the overall impact on trade of such an agreement.

By and large, empirical studies of the impact of FTAs on trade tend to show larger increases in trade than CGE simulations project. For example, one study of a potential US-Switzerland FTA which alludes to announcement and lock-in effects as well as to investment-trade links, reported that gravity model results indicate an expansion of bilateral trade approximately five times as great as the CGE results (Derosa and Gilbert, 2006).

The larger impact on trade identified using gravity models compared to CGE models can be interpreted as reflecting the effects of the non-tariff elements of a trade agreement, including the behavioural response of business, as well as the underestimation implied by failure to capture trade expansion at the extensive margin.

One way to directly integrate the gravity and CGE results would then be as follows.

- First, the impact on bilateral trade flows of a representative set of high-quality FTAs would be estimated using a gravity model. In this regard, Baier and Bergstrand (2005) have recently estimated FTA coefficients that range from 0.46 to 0.68, implying bilateral trade impacts in the range from 58 to 97 percent (using  $e^{0.46} = 1.58$  and  $e^{0.68} = 1.97$ ). Their preferred estimate is 0.62. In other words, an FTA on average increases two member countries' trade about 86 percent.
- Second, for the same subset of countries (or for a similar set of countries), the trade effects of the FTA would be estimated using a CGE model. The difference between the two trade effects would then represent the incremental boost to trade of the dynamic and non-tariff effects of a high-quality economic cooperation agreement as well as any underestimation of differentiated goods trade.

Given the methodology, any such estimate would obviously have to be considered to be subject to a considerable margin of uncertainty. Nonetheless, this approach might serve to provide some quantitative dimension to some of the non-tariff effects of FTAs that have been suggested by economists.

## **Conclusions**

Impressive strides have been made in developing technology to assist trade analysis, the GTAP model and its data base being a prime example. Nonetheless, we are still not in a position where we can simply “push the button” to get robust, meaningful results; the exercise still requires, in almost every study undertaken it would seem, that the analyst “push the envelope” when applying the model.

This paper draws on recent experience within Foreign Affairs and International Trade Canada in modeling the impacts of potential free trade agreements with various partners to highlight the importance of microeconomic closures (and in particular the implicit assumptions concerning the elasticities of supply of capital and labour) that are suitable for the circumstances of the economy in question. Alternative closures affect significantly not only the size of estimated impacts but also their composition. In particular, it is pointed out that, for small, open, price-taking economies, the often-used closure rule of fixed factor endowments heavily skews impacts towards terms of trade, contrary to intuition and empirical evidence. The paper highlights the likelihood that regional economic integration will result in significant intra-regional “leakage” of impacts of FTA effects with extra-regional partners, especially in the case of minimally differentiated commodities. It further highlights the need to take into account institutional features such as producer price supports when liberalizing border measures. Finally, it speculates on the possibility of linking the results from the gravity model literature on the trade impacts of FTAs with CGE model-based results—the former reflecting the “all-in” impacts, the latter the tariff effects alone, and the difference impliedly reflecting the non-tariff aspects of FTAs.

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