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Toward a North American Customs Union
Rules of Origin Liberalization Matters More than a
Common External Tariff for Canada

by

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Abstract

This paper shows that when moving from the North American Free Trade Agreement (NAFTA) to a Customs Union (CU), the general equilibrium impacts on Canadian GDP and welfare, of removing Rules of Origin (ROO), are potentially larger than the small effects resulting from the adoption of a common external tariff (CET). Therefore, proposals for a CU should not be dismissed solely on the basis that the establishment of a CET would marginally affect Canada while the negotiation process with the U.S. would be long and difficult -- rules of origin liberalization matters more than a common external tariff for Canada.

Keywords: *NAFTA; Customs Union; Rules of Origin; Common External Tariff; Computable General Equilibrium*
JEL classification: *C68; D58; F13; F15*

Résumé

Le passage d'une zone de libre-échange Nord Américaine à une union douanière pourrait générer des impacts, en équilibre général, potentiellement substantiels sur le PIB réel Canadien et le bien-être, grâce à l'élimination des règles d'origine préférentielles de l'ALÉNA. Ces impacts domineraient nettement les effets de l'adoption d'un tarif extérieur commun. Donc, les propositions visant une union douanière ne devraient pas être rejetées systématiquement sur base du fait que le processus de négociation avec les États-Unis serait long et difficile alors que les gains seraient modestes -- Les règles d'origine comptent plus que l'établissement d'un tarif extérieur commun pour le Canada.

Mots clés: *ALÉNA; Union douanière; Règles d'origine; Tarif extérieur commun; Équilibre général calculable*
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1. Introduction

From the late 1940s into the late 1970s, the trend toward multilateral trade liberalization dominated regional preferential agreements (customs unions or regional free trade zones) with the notable exception of the European Union (under a series of names). Since the 1980s, however, attitudes have changed, resulting in a proliferation of regional trade agreements, estimated at more than 130 in effect around the globe.

The GATT Article XXIV sets out the trade rules governing regional preferential trade arrangements, which basically allows free trade zones and customs unions. In economic literature, a customs union (CU) is the second level of regional integration following a free-trade area (FTA) and involves (as in a FTA) the eventual elimination of all tariffs between member countries, but unlike a FTA, also establishes a common external trade policy, in particular by adjusting all tariffs external to the customs union to a common level. In an FTA, however, the members maintain their individual most favored nation (MFN) tariffs that they impose on countries outside the agreement.

As a result, a CU requires members to negotiate a common trade policy and a common external tariff (CET) with respect to non-member countries, while a FTA requires negotiating measures to avoid trade deflection. Trade deflection occurs when a non-member agent transits goods through the FTA member-country with the lower-external tariff and then transships duty-free (or with preferential treatment) to the final destination. To curb trade deflection, rules of origin (ROO) are negotiated which stipulate which goods have "origin" in the partner country and thus are eligible for duty-free or preferential treatment when crossing's partner's borders, and which goods are not as they are simply being transshipped through, or undergoing only minor transformation in a member country.

In Canada, more than fifteen years of increased market integration through the (1989) Canada-US Free trade agreement (CUSFTA) and the (1994) North American Free Trade Agreement (NAFTA) has led Canada's economy to be more closely integrated with the USA than

at any time in history. Notwithstanding Canada's strong official commitment to multilateralism and to the WTO and the strongly held view by some that Canada's economic dependence upon the United States is a serious weakness and that trade diversification should be a high priority of Canadian policy, many suggestions exist to broaden and deepen NAFTA, including harmonization of border measures, common external tariff, customs union, harmonization of regulatory procedures, free movement of labor, and elimination of NAFTA rules of origin [*e.g.*, Harris (2003), Goldfarb (2003)]. The most ambitious proposal calls for a strategic bargain coupling areas of interest to the United States (such as border security, immigration, defense-related policies and access to continental energy resources) in exchange for a deeper trade integration, possibly in the context of a customs union or a common market, and negotiations to curb U.S. trade remedy laws [Dobson (2002)].

The 10-year anniversary of NAFTA gave the occasion to take stock of the *ex post* impact of the CUSFTA and NAFTA, and Harris (2006) provides a review of the generally positive evidence given in a large number of empirical studies. However, studies examining the *ex-ante* effects on GDP and welfare of the proposals to broaden and deepen NAFTA are still relatively rare. What are the economic impacts of moving from NAFTA to a North American CU? Even this single question has not been answered in a satisfying way.

Krueger (1995) argues that CUs are "preferable" to FTA *because* the distortionary impact of preferential ROO is absent from such an arrangement.[1] However, virtually no studies gauge the impact of liberalizing ROO when analyzing the effects of moving from a FTA to a CU. For example, most computable general equilibrium (CGE) studies assessing the welfare impact of moving from a FTA to a CU, typically proxy the integration as the adoption of a CET towards the rest of the world. However, a CU is also an arrangement that allows for the elimination of FTAs preferential ROO. By getting rid of the differential in the external tariff with respect to non-members, the CET eliminates *de facto* trade deflection and thus removes the economic rationale for ROO. Thus, preferential ROO are typically absent from a CU arrangement and movements of

goods within a CU are not based on their "originating status" but on the principle of "free circulation".[2]

Brown, Deardorff and Stern (2001) gauge the impact of a North American CU but typically limit their experiment to the adoption of a common external tariff. Although Ghosh and Rao (2005) stress the relevance of estimating the welfare cost of ROO, their impact is not captured adequately in their CGE analysis because they do not model ROO explicitly nor do they calibrate their model to reflect the presence of ROO distortions in the benchmark data set.[3] Indeed, unless CGE modelers re-calibrate their models appropriately, there is no "room" for the ROO distortion (that is only implicitly present in the initial benchmark database) and thus there is no way to remove it. Finally, Papadaki *et al.* (2005) calibrate tariff equivalent of unobservable trade cost between Canada and the U.S., and then remove them in the counterfactual analysis of their static CGE model. This experiment captures the impact of a "deeper tighter NAFTA" but inevitably leads to further trade diversion effects with respect to the rest of the world, which corroborates the fears of some observers that a deeper integration with the U.S. is likely to be at the expense of Canada's economic relationship with other countries.[4]

The implications of removing NAFTA rules of origin (ROO) are not well understood. For instance, although removing ROO is typically viewed as a deeper form of integration with the U.S., it can potentially increase Canada's trade with countries outside NAFTA – this sounds like a policy measure that could reconcile both proponents and opponents of increased regionalism! ROO are particularly difficult to model, which may explain why they have been somewhat overlooked in the empirical literature and, more specifically, in computable general equilibrium modeling analyses. Georges (2007) provides a step towards filling that gap and, in particular, demonstrates how to design the removal of NAFTA ROO in a CGE model and to analyze its general equilibrium impact in a multi-country, multi-sector dynamic CGE model that builds on the work of Mercenier (1995) and that is calibrated to GTAP-5 database [Dimaranan and McDougall (2002)].

The emphasis in this paper is on providing some results, pertaining to Canada, of the NAFTA ROO modeling exercise presented in Georges (2007) and to extent these results to a CU. In particular, the paper gauges the impacts of a CU and shows that the effects on GDP and welfare of ROO liberalization are substantially larger than the small effects associated with a CET. Therefore, proposals for a CU should not be dismissed solely on the basis of the -- quite common -- view that the establishment of a CET would only marginally affect Canada while the negotiation process with the U.S. would be long and difficult.

The plan of the paper is as follows. Section 2 briefly discusses the efficiency cost of ROO and illustrates scenarios examined in the rest of the paper. Section 3 presents simulation results while Section 4 concludes.

2. The efficiency cost of ROO

Members of a FTA generally retain their individual trade and external tariff policies with respect to non-member states while eliminating or lowering tariffs on goods from other member countries *if* these goods satisfy a condition – a ROO. ROO are used to determine which goods are attributable to member countries and thus eligible for duty-free (or preferential) treatment when crossing partners' borders, and which goods are not as they are simply being transshipped through, or undergoing only minor transformations in a member country. Substantial transformation is the basic criterion that determines the origin of a good. This is a complex criterion, although the essence of the rule is simple in that a minimum percentage of local value added must originate from the exporting member country or a maximum percentage of value must originate from non-members countries [see for example, Kunimoto and Sawchuk (2005)].

Preferential ROO can be costly. Governments incur administrative costs, while importers, exporters, and producers bear compliance costs (paper work and proving origin) in order to obtain the preferential treatment. Furthermore, and this is the main focus in Georges (2007), there is a distortionary cost when ROO induce firms to change their production methods or input mixes in order to fulfill ROO requirements and obtain the tariff preference. Indeed,

according to the definition of "substantial transformation", a ROO is an implicit subsidy on capital, labor, and intermediate goods produced within the FTA zone and an implicit tax on the intermediate goods produced by the rest of the world [Krishna and Kruger (1995), Georges (2007)]. This translates into an increase of the cost of production in comparison to what it would be without the ROO [Francois (2005), Krishna (2005), Georges (2007)].

Although there is very little information on the exact magnitude of this efficiency cost, there are at least two theories in the literature on ROO that closely link this cost with tariff preferences [*i.e.*, the differences between MFN tariff and preferential (NAFTA) tariff]. These two theories are the "revealed-preference" approach and the "participation constraint" approach. In the following, I briefly explain the latter approach.[5]

According to this approach [Cadot *et al.* (2002) and Anson *et al.* (2005)], the terms of a free trade agreement are set to leave partners close to or on their participation constraint (*i.e.*, close to being indifferent between signing and not signing) so that there is substitutability between tariff rate and ROO restrictiveness as instruments of intra-bloc protection (deeper tariff preference implies more restrictive ROO). This approach leads to proxy the cost of the ROO (let us call it $\theta_{j,sd}$, where j and sd refer to the country and the sector under consideration) with the tariff preference. This proxy is an upper bound to the cost of ROO, but the approach implies that it is not far off the true estimate because partners are assumed to be "close to", if not "on" their participation constraint. This (appropriately weighted) estimate is reported in Table 1.[6] This is the proxy used for the efficiency cost of ROO in all simulations presented in the rest of the paper.

The participation constraint framework permits to consider two distinct sub-scenarios -- a symmetric ("USA in") and a asymmetric ("USA out") scenario -- depending on whether NAFTA is the result of an agreement between partners of equal or unequal bargaining power (negotiation power of the USA is either equal or larger than negotiation powers of Canada and Mexico). The "USA in" scenario is the one that emerges from purely equal negotiation powers. All three countries are assumed to be able to push their partners on their participation constraints so that the

proxy for $\theta_{j,sd}$ in Table 1.b is assumed to hold for Canada, Mexico *and* the USA. In the asymmetric scenario ("USA out"), the USA is able to push Canada and Mexico closely to or on their participation constraint so that a proxy for $\theta_{j,sd}$ equal to the tariff preference (Table 1.b) is relevant for these two countries, but Canada and Mexico cannot push the USA on its participation constraint so that $\theta_{usa,sd}$ is set equal to 0.

NAFTA ROO, under the asymmetric scenario, are rules that largely reflect the interests and the lobbying of U.S. intermediary good producers. To be granted tariff preference Canadian and Mexican final good producers must purchase intermediate goods within NAFTA, say in the USA if Mexico and Canada does not produce them. If they do so, U.S. producers of intermediate goods enjoy captive markets and they emerge as the winners. Thus they can be expected to lobby in favor of restrictive ROO *and* deep tariff preference in their downstream sectors (just enough to trigger the change in input mix in Canadian and Mexican production processes). Therefore Mexican and Canadian firms are close to their participation constraint, and trade negotiators of Mexico and Canada must have signed NAFTA for reasons other than current market access. Basically, Mexico was engaged in substantial reforms in need of political anchoring and Canadians feared to be marginalized if they were left out of the negotiations between Mexico and the USA.[7] Canada's position relative to CUSFTA and NAFTA was also to seek to avoid the side effects of *future* U.S. protectionism. Indeed, much of the public and business attention was focused on trade disputes which had taken place with the United States during the early and mid 1980s and that any reduction in the risk of an increased U.S. protectionism would be of great value [Harris (2006)]. Therefore, Canadian trade negotiators may have accepted to be pushed on their current participation constraint and to "lock in" this position for the future.

Table 1.a Tariff Preference

	Canada	USA	Mexico
agri	8.67	0.00	5.09
reso	0.43	0.88	0.39
food	3.16	5.46	3.06
text	12.95	19.49	12.98
manu	2.92	6.26	2.97
tech	1.95	5.08	1.91
auto	2.37	6.23	2.52
serv	0	0	0

Table 1.b Weighted Tariff Preference

	Canada	USA in	USA out	Mexico
agri	1.06	0.00	0	0.34
reso	0.14	0.02	0	0.11
food	0.34	0.06	0	0.10
text	2.27	0.66	0	3.24
manu	0.85	0.21	0	0.34
tech	0.98	0.40	0	1.41
auto	1.54	0.50	0	1.21
serv	0	0	0	0

Note on abbreviations: agriculture (agri); resource sector (reso); food processing (food); textiles and clothing (text); manufactures excluding machinery and equipment (manu); machinery and equipment (tech); automotives (auto); services (serv). Preferential and MFN tariffs were computed from GTAP-5. In Table 1.a, the preference for each NAFTA country is calculated as a trade-weighted average of the preferences given by the other two NAFTA partners. In Table 1.b, the tariff preference is also weighted by the share of sectoral production that is exported to the NAFTA member (that provides the preference).

The U.S. final good producers, however, receive substantial tariff concessions from their partners without being significantly constrained by ROO -- the participation constraint does not hold for the U.S. firms for at least two reasons. First, the asymmetric scenario assumes that the much smaller Mexican and Canadian intermediary sectors do not have the negotiation power to lobby for ROO. Second, if the large U.S. intermediary good industry has developed under the protection of U.S. MFN tariff, then most of the intermediaries used in the production of the U.S. final goods are of U.S. origin so that the production process *already* meets the ROO criterion.[8] Under these assumptions, the introduction of NAFTA ROO did not increase U.S. firms' unit costs of production ($\theta_{usa,sd}$ is set equal to zero in Table 1.b) so that eliminating ROO (when moving to a customs union) would not induce U.S. firms to change their input mix and thus would not lower their unit costs of production, *ceteris paribus*.

To sum up, the "symmetric" scenario is based on the assumption that NAFTA ROO have induced U.S., Canadian, and Mexican firms to change their input mix in order to obtain NAFTA preferential tariff, so that removing ROO would also modify the production process of all NAFTA firms. The "asymmetric" scenario assumes that NAFTA ROO have not changed the methods of production (input mix) of U.S. firms (while ROO changed the behaviour of Canadian

and Mexican firms) so that removing ROO would not change the behaviour (input mix) of U.S. firms ("USA out"). The asymmetric scenario is probably more realistic than the symmetric one, although the truth is likely to lie in between these two extreme scenarios (*i.e.*, NAFTA ROO have emerged as a set of rules that reflect an asymmetric bargaining power but with some input from Canada and Mexico). However, a comparison between both scenarios permits to gauge the impact of the U.S. negotiation power. (In this context, it is not surprising, as we will see in Section 3, that removing ROO from an asymmetric (instead of a symmetric) scenario is more favorable to Canada and Mexico as it eliminates ROO that reflect the interests of the dominant country.)

Estimating $\theta_{j,sd}$ is a key issue in order to capture the effects of NAFTA's ROO.[9]

However, the objective in this paper is to go one step further and to gauge the impact of removing ROO as part of a more general counterfactual experiment of moving to a CU. The relevance of a general equilibrium framework to address the impact of removing ROO should be clear when we recall that a ROO acts as an implicit subsidy to NAFTA firms for the use of labor, capital and intermediary good purchased within NAFTA, but as an implicit tax for the use of intermediary goods purchased outside NAFTA.[10] Therefore, it is essential to take into account interactions between agents and repercussions on all markets in the economy following the elimination of ROO, and the knowledge of $\theta_{j,sd}$ is only an initial step in understanding the general equilibrium impacts of removing ROO. This analysis is pursued in Section 3.

3. Simulation Results

Simulation results are reported as percentage change from the benchmark equilibrium [described in Georges (2007)]. The GTAP 5 database (2002 release) has been used to calibrate the model.

3.1 Some key simulation results for Canada

Gauging the impact of moving from NAFTA to a customs union (CU) requires estimating the *joint* effect of adopting a common external tariff (CET) *and* eliminating the ROO, which can

(roughly) be decomposed into two effects: (1) the *pure* effect derived from the adoption of a

CET, and (2) the *pure* effect derived from the elimination of ROO.[11]

Therefore, we do three counterfactual policy experiments.   First, we gauge the pure

impact of removing NAFTA ROO in the current NAFTA regime (*i.e.*, without adopting a CET).

A ROO is an implicit subsidy on capital, labour, and NAFTA intermediary goods, but an implicit

penalty on intermediary goods from the rest of the world. Therefore, the main impact of

removing ROO is the elimination of the implicit subsidies and penalties. This shock reallocates

efficiently the demand for factors of production in each sector of NAFTA countries, lowering

NAFTA firms' demand for capital, labour, and NAFTA intermediary goods, but increasing the

demand for non-NAFTA intermediary goods. The efficient reallocation of factors of production

within NAFTA will also lower the unit cost of production in every sector of NAFTA countries.

In the second experiment, we gauge the pure impact of adopting a CET (without

liberalizing ROO). In this experiment, the CET chosen by all three NAFTA countries is assumed

to be the current U.S. MFN tariff with respect to non-NAFTA countries. Given the actual

convergence of Canadian and U.S. MFN tariffs, it is unlikely that the proposed CET would

significantly impact the Canadian economy. The sizeable differential in the Mexican-US MFN

tariffs, however, implies that Mexico would benefit from the CET. Finally, in the third

counterfactual policy, we gauge the full impact of moving to a CU (*i.e.*, adopting a CET *and*

removing NAFTA ROO).

 Figures 1 and 2 report the impact of these three counterfactual policy experiments on the

steady-state Canadian GDP and the inter-temporal measure of welfare (present value of real

consumption path) for, respectively, the symmetric (USA in) and the asymmetric (USA out)

scenarios proposed in Section 2.[12] Canadian real GDP increases because resources are used more

efficiently. For example, Figure 2 (asymmetric scenario) shows that the pure impact of removing

NAFTA ROO would be a 0.70% permanent increase in GDP. Quite coincidentally, this

magnitude is equal to Canada's commitment to achieving the U.N. official development

assistance target to less developed countries (a target so "ambitious" that it is, according to previous finance minister Goodale, beyond the means of the Canadian fiscal framework). The pure impact of adopting a North American CET with respect to the rest of the world would be a 0.14% increase in GDP, and the full impact of a customs union would be a 0.92% increase in GDP. Observe that the full impact of a customs union include second order or "cross effects" (0.92%-0.70%-0.14%): the removal of NAFTA ROO *per se* modifies trade patterns between NAFTA and non-NAFTA countries. Therefore, second-order effects measure the impact that the adoption of a CET might also have on this *new* pattern of trade *due to* the ROO removal, with repercussions on all variables in the model. As these cross effects are relatively small we will not discussed them further.

Figures 1 and 2 provide three basic insights. First, the impacts on GDP and welfare of liberalising ROO appear to largely dominate the small impacts of adopting a CET. This is expected given the convergence of Canadian and U.S. MFN tariffs. Thus, studies that assume away ROO when gauging the economic impact of a CU must be far off the true estimate and Figures 1 and 2 provide a magnitude of the typical mis-estimation in the existing literature. Second, the symmetric case is less favourable to Canada than the asymmetric scenario. For example, real GDP increases by 0.66% in the symmetric scenario and by 0.92% in the asymmetric case, while welfare changes by -0.04% and 0.33% respectively. Third, there is even a possibility for a small decrease in welfare resulting from the adoption of a CU if the symmetric case is relevant.

**Figure 1   GDP and Welfare (steady-state) Impacts of a Customs Union
(% change from benchmark)
Symmetric Scenario ("USA in")**
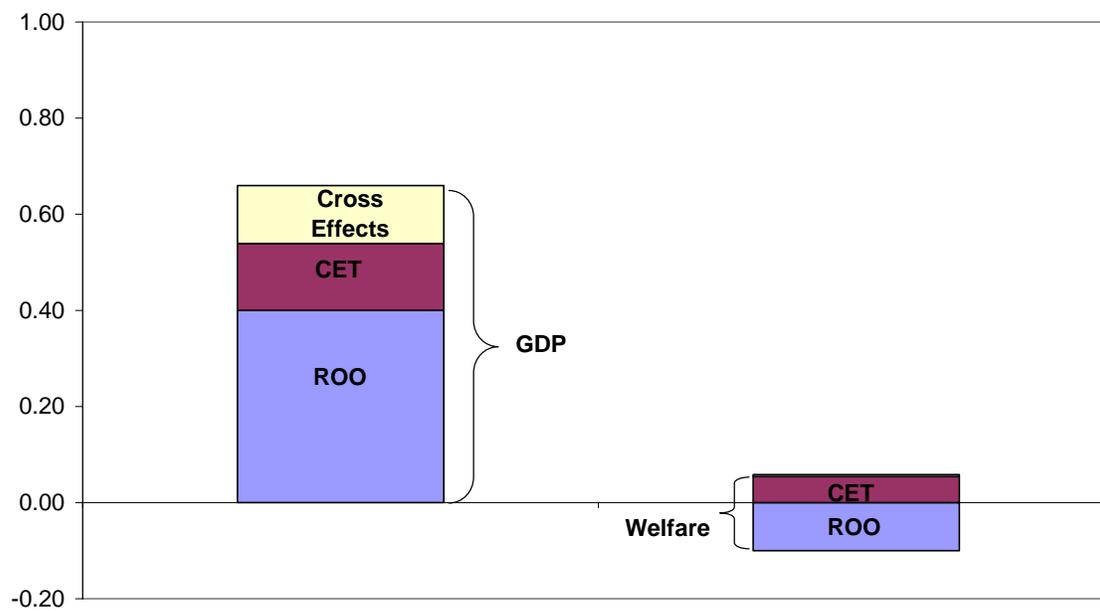
**Figure 2   GDP and Welfare (steady-state) Impacts of a Customs Union
(% change from benchmark)
Asymmetric Scenario ("USA out")**
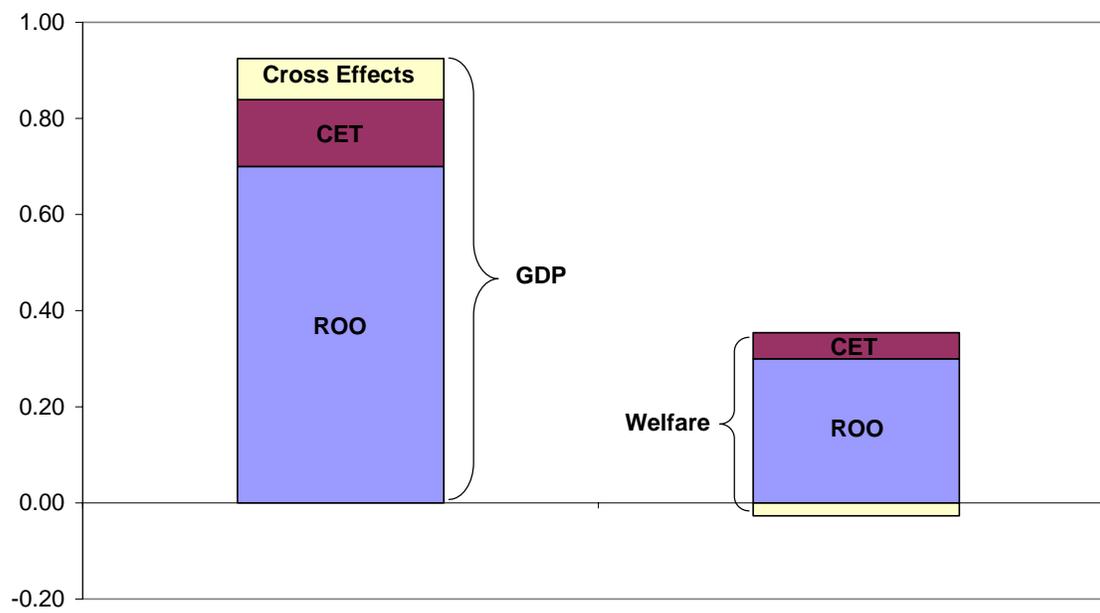
Relative to the second insight, the asymmetric scenario ("USA out") is clearly more favourable to Canada because removing ROO from an asymmetric scenario eliminates a distortion that is assumed to have been initially introduced in response to the lobbying and interests of the U.S. intermediary good producer (as explained in Section 2). This illustrates the relevance of understanding whether NAFTA ROO initially emerged as the result of a negotiation process between partners of equal (symmetric) or unequal (asymmetric) bargaining powers.

Relative to the third insight, as mentioned by Krueger (1993), ROO generate additional trade inefficiencies (on top of the traditional trade diversion of a FTA or a CU), so that eliminating ROO *per se* should eliminate these distortions, which is *potentially* welfare improving. However, it is clear that NAFTA countries will suffer a terms of trade deterioration (defined as the ratio of the world price of NAFTA exports to the world price of NAFTA imports). Indeed, removing ROO lowers the unit cost of production so that the price of NAFTA-produced goods (and thus also the price of NAFTA exports) must fall, whereas the additional demand for non-NAFTA goods (NAFTA imports that will be used as intermediate materials by NAFTA firms) puts an upward pressure on their prices. A terms of trade deterioration implies that for unchanged real import, real export must increase, so that, *ceteris paribus*, real consumption must fall, and with it the intertemporal welfare of the representative household.[13] Hence, the net effect on welfare is ambiguous (less distortion, but, deterioration of terms of trade) and is thus an empirical issue.

In the symmetric scenario ("USA in"), Canadians experience a small welfare loss from the removal of NAFTA ROO due to a large deterioration in the terms of trade (with respect to the rest of the world). This reflects that U.S. firms altogether constitute a significant share of world demand for intermediary goods and hence have the potential to affect world prices by a substantial margin, and hence affect import prices of other countries such as Canada, if U.S. firms switch to non-NAFTA intermediary goods once ROO are removed. This also suggests an

analogy with the theory on optimal tariff. Note however that when a CET is also adopted, this negative effect virtually vanishes (see Figure 1) so that it is not empirically important.

Furthermore, once we consider the asymmetric case ("USA out"), simulation results suggest an unambiguous welfare gain for Canada from the elimination of ROO. In this scenario the deterioration of terms of trade is not as strong because U.S. final good producers do not modify their input mix once ROO are removed, which mitigates any demand-induced price increase of non-NAFTA goods.[14]

3.2 A more detailed analysis

Tables 2 and 3 decompose for, respectively, the symmetric and asymmetric scenarios, and for the three counterfactual experiments, the impact on real GDP into its main components, real export, real import, real consumption and investment.[15] It is clear from these tables that the impacts of a CU are essentially driven by the liberalisation of ROO so that we will mainly focus on the general equilibrium impact of removing ROO.

In the symmetric scenario (Table 2), the *volumes* of export and import of Canada increase. Real export increases by 7.2%, while import increases by 5.9% in steady state. Real net export in Canada drives the small increase in real GDP, whereas real domestic investment falls. In the asymmetric case (Table 3), the increase in real GDP in Canada is also due to an increase in real consumption (+0.3%).

Table 2 Symmetric scenario (USA in)*

	Export	Import	Consumption	Investment	Real GDP
CET only	2.2	2.1	0.1	-0.1	0.1
ROO only	7.2	5.9	-0.1	-1.0	0.4
CU	10.2	8.5	-0.1	-1.1	0.7

rounded to 1 decimal

Table 3 Asymmetric scenario (USA out)*

	Export	Import	Consumption	Investment	Real GDP
CET only	2.2	2.1	0.1	-0.1	0.1
ROO only	10.6	9.8	0.3	-0.7	0.7
CU	13.8	12.7	0.3	-0.7	0.9

rounded to 1 decimal

Consumption

The level of real consumption, and with it the level of consumption spending, is determined through an inter-temporal budget constraint.[16] For Canada, real consumption increases in the asymmetric scenario by 0.3 % due to an expanded inter-temporal budget. Why does the budget increase? The removal of ROO tends, all else being the same, to lower Canadian factor prices and thus revenues because Canadian firms prefer to substitute domestic labour, capital, and NAFTA intermediaries for cheaper non-NAFTA intermediaries (which also embodies non-NAFTA capital and labour). However, if the removal of ROO makes Canadian firms more efficient, resulting in an increased demand for their cheaper goods, then, with full employment this also implies higher domestic *primary* factor prices and therefore higher revenues. When the second effect dominates the first (which may concomitantly happen with lower unit cost of production given the use of intermediary inputs), this leads to an expanded budget and a real consumption increase in Canada.

It is nevertheless possible that real consumption falls if ROO liberalisation leads to a strong deterioration of terms of trade as in the symmetric scenario. Although the price of NAFTA goods falls due to the removal of ROO, the price of goods produced outside NAFTA increases. Indeed, the removal of ROO leads to a higher demand for intermediary goods of non-NAFTA origin, which triggers a higher demand for factors of production that produce these goods so that wages and rental prices of capital increase in non-NAFTA countries, pushing up the unit cost of production and therefore the price of all goods. Furthermore, this increase in price tends to partly offset the initial motivation for NAFTA firms to purchase cheap non-NAFTA intermediaries so that, after all, the efficiency of NAFTA firms does not improve as much as expected. As for NAFTA consumers, they face NAFTA goods that are only marginally cheaper, but more expensive non-NAFTA goods. This deterioration of the terms of trade is much more important when U.S. firms do change their methods of production (as in the symmetric scenario), which

may fully offset the positive income (budget) effect and lead to a fall in real consumption (Table 2).

Investment

With the removal of ROO, NAFTA firms desire to substitute out of capital, labour, and NAFTA intermediary goods into non-NAFTA intermediary goods. In the model, the representative household is the owner of the domestic stock of physical capital so that they can respond to a lower demand by NAFTA firms for the service of capital by progressively reducing the stock of capital in the economy. To do this, the household must have an investment rate that is below the rate of depreciation of the capital stock during the transition phase to a lower (steady state) stock of capital. For example in Table 2 (3), investment in Canada eventually falls to –1.0% (-0.7%) of what it was in the initial benchmark.

Trade flows

One way to present the new trade flows is by comparing benchmark and counterfactual country-*shares* of Canada's imports and exports. Table 4 illustrates the benchmark country-shares. For example, more than 70% of all exports from Canada went to the USA, while more than 60% of their total imports came from the USA.

Tables 5.a1 and 5.b1 show, for both the symmetric and the asymmetric scenario, the percentage points difference between the benchmark shares and the counterfactual shares corresponding to the three experiments (CET only, ROO only, and CU) (so that counterfactual shares can be computed by adding numbers in Tables 4 and 5). For example, in the ROO removal experiment, and in the "USA-in" ("USA-out") scenario, the U.S. share of Canadian imports falls by 10.2 (13.9) percentage points from 63.3% to 53.1% (49.4%) while the non-NAFTA share increases by the same proportion and overall real imports increase by about 5.9% in Table 2 (9.8% in Table 3).

The second way to present the counterfactual trade flows is by focusing on the percent change in *levels* of Canadian export or import as given in Tables 5.a2 and 5.b2. In these tables

we also include the percent changes in Canadian "export" to Canada or Canadian "import" from Canada. This information simply reflects the percent change in the level of Canadian production sold to (and bought from) the domestic market.

The outstanding feature of ROO liberalisation is that trade is fundamentally reorganised between Canada and its NAFTA and non-NAFTA trade partners, which, in general, largely dominates any trade effects due to the adoption of a CET. Additional trade flows between Canada and non-NAFTA countries are done at the expense of "intra-NAFTA" trade. This indeed illustrates the fact mentioned above that ROO have created additional trade distortions above and beyond the trade diversion due to NAFTA. Removing ROO creates an opportunity for Canada to import further goods, and in particular further intermediary goods from non-NAFTA countries, whereas non-NAFTA countries can also benefit from cheaper final NAFTA (and so, Canadian) goods (given the lower unit cost of production in NAFTA due to the removal of ROO).

This clearly appears in the symmetric case. Table 5.a1 shows that the U.S. plus Mexican share of total Canadian export falls (-2.8 percentage points) while the non-NAFTA share increases (+2.8 percentage points). This change in trade patterns is even more significant on the U.S. plus Mexican share of total Canadian import (-10.4 percentage points) versus non-NAFTA share (+10.4 percentage points). The trade pattern changes also translate in percent change in *levels* (Table 5.a2) with the exception of Canadian export to the U.S. which increases by 3.3% (even with a 2.7 percentage point loss of the U.S. share of Canadian export) because total Canadian export increases by 7.2% (Table 2) when ROO are removed.

Table 4 Benchmark country-shares in total Canadian exports and imports (%)

	CAN	
	EXP	IMP
CAN	--	--
USA	72.1	63.3
MEX	0.5	1.7
MER	0.5	0.6
LAT	1.2	1.2
EUR	10.6	15.7
ROW	14.6	17.4
TOTAL	100	100

Tables 5.a1 and 5.a2: Counterfactuals shares and levels -- Symmetric scenario (USA in)

Table 5.a1 Change in shares

	CET only		ROO only		CU	
	EXP	IMP	EXP	IMP	EXP	IMP
CAN	--	--	--	--	--	--
USA	0.0	-2.6	-2.7	-10.2	-2.5	-12.9
MEX	0.0	0.1	-0.1	-0.2	-0.1	-0.1
MER	0.0	0.0	0.1	0.2	0.1	0.1
LAT	0.0	-0.1	0.1	0.5	0.1	0.4
EUR	0.1	1.8	1.4	4.8	1.4	6.3
ROW	0.0	0.9	1.1	5.0	1.0	6.2
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

Table 5.a2 % Change in levels

	CET only		ROO only		CU	
	EXP	IMP	EXP	IMP	EXP	IMP
CAN	-0.61	-0.61	-1.51	-1.51	-2.07	-2.07
USA	2.25	-2.14	3.28	-11.21	6.29	-13.61
MEX	-2.73	6.11	-5.06	-6.89	-8.62	2.58
MER	1.93	-2.99	15.50	38.33	18.04	32.30
LAT	1.95	-6.01	18.90	49.37	21.80	39.34
EUR	2.73	13.46	21.24	37.95	24.70	51.67
ROW	1.92	7.51	15.54	36.22	18.01	47.46

Tables 5.b1 and 5.b2: Counterfactual shares and levels -- Asymmetric scenario (USA out)

Table 5.b1 Change in shares

	CET only		ROO only		CU	
	EXP	IMP	EXP	IMP	EXP	IMP
CAN	--	--	--	--	--	--
USA	0.0	-2.6	0.5	-13.9	0.6	-16.5
MEX	0.0	0.1	-0.1	-0.3	-0.1	-0.2
MER	0.0	0.0	0.0	0.2	0.0	0.2
LAT	0.0	-0.1	0.0	0.6	0.0	0.5
EUR	0.1	1.8	0.0	6.3	0.0	7.7
ROW	0.0	0.9	-0.4	7.0	-0.5	8.3
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

Table 5.b2 % Change in levels

	CET only		ROO only		CU	
	EXP	IMP	EXP	IMP	EXP	IMP
CAN	-0.61	-0.61	-1.48	-1.48	-2.08	-2.08
USA	2.25	-2.14	11.40	-14.23	14.73	-16.63
MEX	-2.73	6.11	-3.83	-7.38	-7.62	2.34
MER	1.93	-2.99	8.47	51.41	11.06	44.35
LAT	1.95	-6.01	9.61	66.62	12.51	55.11
EUR	2.73	13.46	10.50	53.64	13.91	67.61
ROW	1.92	7.51	7.49	54.20	9.97	66.81

Tables 5.a1 and 5.a2 also show that ROO liberalisation drives most of the trade impact of a CU. However, the CET and ROO impacts on Canadian import from Mexico tend to offset each other both in terms of changes in shares and levels. This is because Mexico still has a relatively high tariff with respect to non-NAFTA countries. Therefore, establishing a CET to the level of

the current US MFN tariffs with respect to non-NAFTA countries substantially lowers domestic prices in Mexico, which induces Canadian to increase their purchase of Mexican goods, partially offsetting the direction of trade implied by the removal of ROO.

In the asymmetric scenario (Tables 5.b1 and 5.b2), U.S. firms do not modify their methods of production after ROO liberalisation; They do not increase their purchase of intermediary goods from non-NAFTA sources. This also implies that U.S. firms do not produce at lower unit costs of production. Canadian firms, however, change their methods of production so that they can lower unit cost of production, which results in an increased efficiency with respect to U.S. firms. Therefore, in the asymmetric case, U.S. consumers and firms increase their purchase of Canadian goods, which translates into additional exports to the U.S. This increased relative efficiency also induces agents from non-NAFTA countries to purchase more Canadian goods so that the final impact on U.S. versus non-NAFTA shares of total Canadian export is ambiguous. Our simulation results show that the U.S. share of Canadian export increases by 0.5 percentage points (the share of non-NAFTA countries falls by 0.4 percentage point) while the level of Canadian export to the U.S. increased by 11.4% and overall Canadian export increases by 10.6% (Table 3).

Finally, after liberalising ROO, the U.S. plus Mexican share of total Canadian imports falls by 14.2 percentage points in the asymmetric case whereas the change was "only" 10.4 percentage points in the symmetric case. This is again due to a more subdued terms of trade deterioration in the asymmetric scenario (as U.S. final good producers do not modify their input mix once ROO are removed), which mitigates any demand-induced price increase on non-NAFTA goods. For example, the equilibrium price of intermediary goods from non-NAFTA countries does not raise as much when Canadian (and Mexican) firms are the only ones to switch to non-NAFTA intermediary goods. Therefore, Canadian final good producers can expect to benefit more fully (in terms of efficiency) from ROO removal relative to the symmetric case.

This translates into a stronger increase in Canada's imports from non-NAFTA countries (relative to the symmetric case presented in Tables 5.a1 and 5.a2).

Sectoral impacts

Table 6 illustrates, for each counterfactual experiment, the impact on Canadian sectoral outputs. The impact of adopting a CET (the U.S. MFN tariff with respect to non-NAFTA countries) has straightforward implication for Canadian sectors. This negatively affects agriculture (-1.8%), food (-7.7%), and textile and clothing (-3.5%), all three sectors receiving under the benchmark NAFTA case a higher tariff protection in Canada than in the U.S. with respect to third countries.

Table 6 Impact on sectoral output (in percent, steady state)

Table 6.a: Symmetric scenario ("USA in")   *Table 6.b: Asymmetric scenario ("USA out")*

	CET only	ROO only	CU
agri	-1.84	5.30	4.90
reso	1.18	-11.69	-10.54
food	-7.77	1.43	-5.72
text	-3.54	-2.91	-3.58
manu	0.58	0.51	0.92
tech	1.26	2.19	3.25
auto	2.65	7.06	12.14
serv	0.06	0.12	0.15

	CET only	ROO only	CU
agri	-1.84	3.03	2.60
reso	1.18	-8.06	-6.82
food	-7.77	0.83	-6.68
text	-3.54	-2.06	-2.69
manu	0.58	1.30	1.70
tech	1.26	5.30	6.37
auto	2.65	14.93	20.54
serv	0.06	-0.17	-0.14

Analysing the sectoral impact of liberalising ROO is a much more difficult task, however. ROO in our modelling approach generate an implicit penalty on intermediary goods from non-NAFTA countries but an implicit subsidy for NAFTA intermediary goods. This eventually increases the unit cost of production and therefore the price of (final) NAFTA goods. Therefore, liberalising NAFTA ROO will eliminate the implicit subsidy on Canadian intermediary goods and lower the prices of Canadian final goods. Given the input-output principles on which CGE analysis is based, all eight sectors in our analysis are both *final* goods and *intermediaries* used in the production of other sectors. Canadian sectors of production will be negatively affected by the removal of ROO when their production is used as intermediaries while positively affected when their production is for final uses.

The most striking results are the decrease in the resource sector (-8%) and the upsurge of the automobile sector (+15%) and the machinery and equipment (+5%) in Table 6.b. All sectors of the economy use resources intensively as an intermediary good. Therefore, as suggested above, the removal of ROO induces strong substitution towards non-NAFTA resources, which has a strong negative impact on the Canadian resource sector.

Both the Canadian automobile sector and the machinery and equipment (high tech) sector would be large winners from the liberalization of ROO and the establishment of a CU. It is interesting to note the differential impact of removing ROO in these two sectors if NAFTA ROO are initially assumed to have emerged from a symmetric ("USA in") or an asymmetric ("USA out") negotiation process. Although these tables do not report the impact on the U.S. sectors, our simulations show that the production of the U.S. automobile sector stays basically unchanged when ROO are liberalized in the symmetric scenario but would fall by 2.3% in the asymmetric scenario while this would benefit the Canadian (and Mexican) automobile sectors as they would be in position to buy cheaper auto-parts from the rest of the world and become more efficient. This shows the relevance of understanding how "asymmetrical" the negotiation process of NAFTA ROO has been. Clearly if the auto-part sector in the U.S. was able to impose NAFTA ROO that helped them to capture the North American market, then liberalizing ROO must be detrimental to them while favorable to Canadian (and Mexican) assemblers.

4. Conclusion

Gauging the welfare gain of moving from a FTA to a CU requires estimating the joint impact of adopting a common external tariff (CET) and eliminating ROO. Most studies have emphasized the adoption of a CET while neglecting the ROO dimension of the experiment. This paper provides results from a general equilibrium analysis of three counterfactual policy experiments -- adopting a CET, liberalizing ROO and moving to a CU.

Throughout the paper we distinguish between two scenarios to illustrate the relevance of understanding whether NAFTA ROO initially emerged as the result of a negotiation process

between partners of equal (symmetric) or unequal (asymmetric) bargaining powers. The "truth" is likely to lie in between these two extreme scenarios (*i.e.*, NAFTA ROO have emerged as a set of rules that reflect an asymmetric bargaining power but with some input from Canada and Mexico). Liberalising ROO from an asymmetric (instead of a symmetric) scenario is shown to be more favourable to Canada as it potentially eliminates ROO that reflect the lobbying and interests of the U.S. intermediary good sector.

The paper shows that, when moving from NAFTA to a Customs Union, the impacts on GDP and welfare of removing ROO are potentially larger than the small effects associated with adopting a CET. Although a CU negotiation process with the U.S. might be long and difficult, it might result in a net overall benefit, not through the adoption of a CET, but due to the elimination of NAFTA ROO – Rules of origin liberalization matters more than a common external tariff for Canada.

In particular, the paper illustrates that a CU that also eliminates NAFTA ROO may permanently increase Canada's real GDP by 0.9%, of which 0.7% points are due to ROO liberalisation -- a magnitude corresponding to the continually-postponed Canada's commitment to the U.N. target for development assistance to less developed countries. Furthermore, the paper shows that such an arrangement should not exacerbate the fears of some observers that this might be done at the expense of Canada's trade relationships with other countries. Indeed, shares of non-NAFTA countries of Canadian import and export could actually *increase* while the U.S. share of Canadian import would likely fall and the U.S. share of Canadian export might either fall (symmetric scenario) or remained basically unchanged (asymmetric scenario). If Canada is in search of a policy measure that might reconcile proponents and opponents of increased regionalism, then this might be the one -- a customs union with the U.S. that also liberalizes NAFTA rules of origin.

References

Anson, J., Cadot, O., Estevadeordal, A., de Melo, J., Suwa-Eisenmann, A., and Tumurchudur, B. (2005) "Rules of Origin in North-South Preferential Trading Arrangements with an Application to NAFTA", *Review of International Economics*, 13(3), 501-517.

Appiah, A. (1999), "*Applied General Equilibrium Model of North American Integration with Rules of Origin*", Unpublished Ph.D. Thesis, Simon Fraser University.

Blanchard, O., and Fischer, S. (1989), "*Lectures on Macroeconomics*", The MIT Press, Cambridge, Massachusetts.

Brown, D., Deardorff, A., and Stern, R. (2001), "Impact on NAFTA Members of Multilateral and Regional Trading Arrangements and Tariff Harmonization", in Harris, R., editor, *North American Linkages: Opportunities and Challenges for Canada*, University of Calgary Press.

Cadot, O., de Melo, J., Estevadeordal, A., Suwa-Eisenmann, A., and Tumurchudur, B. (2002), "Assessing the Effect of NAFTA's Rules of Origin", World Bank Working Paper.

Dimaranan, B., and McDougall R. (2002), (Editors), *Global Trade, Assistance, and Production: The GTAP 5 Data Base*, Center for Global Trade Analysis, Purdue University, West Lafayette, Indiana.

Dobson, W. (2002), "Shaping the Future of the North American Economic Space", C.D. Howe Institute Commentary No. 162.

Francois, J. (2005), "Preferential Trade Arrangements and the Pattern of Production and Trade When Inputs are Differentiated", Tinbergen Institute Discussion Paper No. 2005-072/2.

Georges, P. (2007), "NAFTA Rules of Origin Liberalization: A Dynamic CGE Analysis", Forthcoming, *Review of International Economics*.

Goldfarb, D. (2003), "The Road to a Canada-U.S. Customs Union: Step-by-Step or in a Single Bound?", C.D. Howe Institute Commentary, No. 184.

Ghosh, M., and Rao, S. (2005), "A Canada-U.S. Customs Union: Potential Economic Impacts in NAFTA Countries", *Journal of Policy Modeling*, 27: 805-827.

Harris, R. (2003), "*North American Linkage: Opportunities and Challenges for Canada*", Calgary University Press.

Harris, R. (2006), "The Economic Impact of the Canada-U.S. FTA and NAFTA Agreements for Canada: A Review of the Evidence", in *NAFTA@10*, J. Curtis and Sydor, A. (eds.), Foreign Affairs and International Trade-Canada, Ottawa.

Hart, M. (1994), *Doing the Right Thing: Regional Integration and the Multilateral Trade Regime*. Centre for Trade Policy and Law, Ottawa.

Helliwell, J. (2002), "*Globalisation and Well-Being*", UBC Press, Vancouver, British Columbia.

Herin, J. (1986), "Rules of Origin and Differences between Tariff Levels in EFTA and in the EC", EFTA Occasional Paper No. 13, Geneva.

Krueger, A. (1993), "Free Trade Agreements as Protectionist Devices: Rules of Origin", NBER Working Paper No. 4352.

Krueger, A. (1995), "Free Trade Agreements versus Customs Unions", NBER working Paper No. 5084.

Krishna, K. (2005), "Understanding Rules of Origin", NBER Working Paper 11150.

Krishna, K., and Krueger, A. (1995), "Implementing Free Trade Areas: Rules of Origin and Hidden Protection", NBER Working Paper, No. 4983.

Kunimoto, B., and Sawchuk, G. (2005), "NAFTA Rules of Origin", Policy Research Initiative, Discussion Paper.

Mercenier, J. (1995), "Nonuniqueness of Solutions in Applied General Equilibrium Models with Scale Economies and Imperfect Competition", *Economic Theory* 6, 161-177.

Papadaki, E., Mérette, M., Lan, Y., and Hernandez, J. (2004), "Towards Deeper Canada-US Integration : A Computable General Equilibrium Investigation", International Trade Canada, mimeo.

Wonnacott, R. (1991), "The Economics of Overlapping Free Trade Areas and the Mexican Challenge", Canadian-American Committee sponsored by the C.D. Howe Institute (Toronto), and the National Planning Association (Washington, D.C.).

Endnotes

[1] Her proof relies on the argument that an FTA does not generate more trade creation (which is welfare improving) than does a CU, but generates more trade diversion (which is welfare decreasing) where trade diversion is taken "at large" that is, including the impact of ROO distortion. Moreover, she claims that the political economy of FTA is likely to be less conducive to (future) multilateral trade liberalization than is a CU because ROO favor FTA producers relative to more efficient world producers so that the firms producing for the partner country's market will constitute an additional opposition to any moves to globally freer trade. Appiah (1999) provides empirical support to this view and examines the gains of moving from a Pre-FTA regime to either a FTA or a CU. Appiah's simulation results suggest that a North American CU is always "superior" to a North American FTA *if* the common external tariff is not the maximum or "protectionist" CET. He examines three scenarios for the CET: set to the minimum, average, and maximum of the three countries external tariff, chosen separately by industry. The difference in aggregate gains of moving to a CU instead of moving to NAFTA can be as much as 1.1% of real income for Canada, 1.2% for the United States and 1.5% for Mexico.

[2] The European Commission clearly states that preferential ROO are not part of a Customs Union arrangement at:
http://europa.eu.int/comm/taxation_customs/customs/customs_duties/rules_origin/index_en.htm. , and "The customs policy of the European Union" at
http://europa.eu.int/comm/publications/booklets/move/19/txt_en.htm#2. However, there are exceptions to the principle of free circulation so that some goods are still subject to a preferential treatment based on origin. As members of the European union have a common external tariff, no trade deflection exists, so that there is hardly any *economic* argument in support for ROO on these "exceptions" and they may be viewed as purely protectionist devices.

[3] Ghosh and Rao give an estimate of a potential North American CU by first gauging the impact of removing NAFTA ROO. Their experiment is based on the anecdotal evidence reported in Krueger (1995) that Canadian producers have *on occasion* chosen to pay the relevant MFN duties rather than ask for preferential treatment and incur the cost of proving origins of their goods. Ghosh and Rao push this observation to the extreme and create an artificial benchmark whereby no preferential trade occurs among NAFTA members (no NAFTA member asks for preferential treatment so that the tariff applied to trade flows among NAFTA members are MFN). They then successively reintroduce preferential treatment in their counterfactual (all trade flows among NAFTA members attracts preferential tariff whether ROO are satisfied or not) and then a common external tariff with respect to non-members. The authors view the move from their artificial MFN benchmark to the preferential step as providing an upper bound estimate for the impact of removing NAFTA ROO. Astute as it might be, it is, however, impossible to disentangle this so-called upper bound estimate into the true contribution of removing ROO and the contribution of an artificial reforming of an already existing preferential trade arrangement (indeed, they must *de facto* recapture some of the trade gains that have already occurred due to over 15 years of combined Canada-U.S. FTA and NAFTA). The only way out of this problem is an explicit modeling of distortionary ROO and a proper calibration procedure, which is proposed in Georges (2007).

[4] For example, Helliwell (2002) claims that: "North America is destined, through the joint forces of demography and catch-up, to be a smaller and smaller share of the world economy. To focus emphasis on the smaller part of the global pie may seem attractive during booming times in the United States economy, but would be a short-sighted strategy".

[5] As for the first approach, the typical argument in the revealed preference approach [Herin (1986), Cadot *et al.* (2002), Goldfarb (2002), Kunimoto and Sawchuk (2005) and Anson *et al.* (2005)] is as follows. We can estimate the *cost* of complying with ROO indirectly via a revealed-preference mechanism, using data on NAFTA utilization rates (*i.e.*, data on the proportion of firms that apply for tariff preferences and, therefore, comply with the ROO). In sectors where NAFTA's utilization rate is 100%, the benefit of tariff preference is revealed larger than compliance costs. Thus, in those sectors, the rate of tariff preference provides an upper bound on the ad-valorem equivalent of compliance costs. In sectors where NAFTA's utilization rate is zero, by the same reasoning, tariff preference provides a lower bound on compliance costs. Finally, in all sectors where utilization rates are strictly between 0 and 100%, if exporters had identical compliance costs they would be revealed indifferent between shipping under NAFTA or MFN, so the tariff preference would be revealed equal to the compliance costs. With heterogeneous compliance

costs, all that can be said is that the tariff preference gives a rough estimate of compliance costs in the sense that at least some firms have higher compliance costs whereas some have lower ones. We can obviously assume that the aggregate utilization rates are between 0% and 100% in the highly aggregated sectors examined in Section 3.

[6] $\theta_{j,sd}$ is a percentage increase in the *average* (unit) cost of production (so that it applies to each unit produced) whereas tariff preference only applies to the production that is exported to NAFTA countries. Therefore, in order to use tariff preference as a proxy for the increase in unit cost of production, it must be weighted by the share of sectoral production that is exported to the NAFTA member (that provides the preference). If a firm sells its entire production domestically, then tariff preference *per se* has no value, so that the firm would not change its input mix and incur an increase in unit cost of production (weight = 0) in order to satisfy a ROO. The weight equals 1 in the other extreme scenario of a NAFTA firm that exports all its production to the two other NAFTA members.

[7] To quote Wonnacott (1991): "As long as the United States and Mexico are going forward with a negotiated agreement, it is worse for Canada to stay away and not participate." However, Estevadeordal and Suominen (2004) show that NAFTA ROO are more restrictive than the ROO that applied under the previous Canada-USA FTA.

[8] The two assumptions underlying the asymmetric scenario (the lobbying for a captive market and the initial tariff protection of the U.S. intermediary sector) also underlie Krueger's (1993) point that ROO can effectively extend the protection that the U.S. intermediary industry receives within the U.S., to Canada and Mexico, so that the ROO can be used by the U.S. to secure its NAFTA intermediary market for the exports of its own intermediate products. It is as if the U.S. tariff on intermediary good applied to the rest of the world (before NAFTA) became a tariff imposed by NAFTA to the rest of the world.

[9] However, estimating $\theta_{j,sd}$ is also, in a sense, "fighting the last war" in that economists and CGE modelers should have addressed this issue when ROO were introduced together with NAFTA. Appiah (1999) seems to be the first study that addressed this issue using CGE analysis.

[10] A general equilibrium framework is even more relevant when ROO (tax/subsidy) are removed from all sectors of NAFTA countries at the same time, as is the case in our analysis.

[11] In addition to these two "pure" effects, there is also a second order or "cross" effect. The removal of NAFTA ROO *per se* modifies trade patterns between NAFTA and non-NAFTA countries, so that the adoption of a CET will also have an impact on this new pattern of trade.

[12] The change in real consumption (described in next subsection) is the factor that explains the inter-temporal measure of welfare. In the model, the measure of the welfare change resulting from the removal of the ROO is computed as the percentage increase in the benchmark real consumption that would make the household indifferent in present value terms to the counterfactual real consumption path.

[13] Alternatively, if the inter-temporal budget constraint suggests that consumption spending should fall after the removal of ROO, and if the aggregate consumption price does not fall proportionally because of the terms of trade effect mentioned above, then, real consumption must indeed decrease. This shows the importance of understanding the impact that ROO might have on both the intertemporal budget constraint of the household and the aggregate consumer price.

[14] Current discussions within NAFTA countries to remove ROO apply to only a few very specific items (*e.g.*, spices, tea, toys), instead of a general across the board removal. Clearly, this very focused sectoral approach, although potentially beneficial to the few firms involved, is not likely to have any of the general equilibrium effects of magnitude described in this paper.

[15] The simulations run for 40 periods, which is sufficient here to reach a steady state. The tables in this paper illustrate only the long term (steady state) when v = 40.

[16] The budget constraint is such that the present discounted value of GDP minus investment and consumption spending plus the initial foreign asset position is zero. [See for example, Blanchard and Fischer (1989).]