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Understanding Rules of Origin:
A Critical Review of the Literature

by

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Abstract

Rules of origin (ROO) are used in preferential trade agreements to determine which goods are eligible for a reduced tariff rate. These rules are often identified as restrictive and cumbersome for businesses that export goods. As a result, NAFTA member countries are considering proposals to liberalize NAFTA ROO. The purpose of this paper is to review the theoretical and empirical literature on ROO to give a clearer understanding of the issues involved. This paper delivers two main conclusions.

First, while the theoretical research on ROO has made progress, sound empirical work remains rare because ROO have proven difficult to measure and model explicitly. This obstacle is unfortunate because theoretical work suggests, depending on the restrictiveness of ROO, the welfare effects of ROO are ambiguous. Empirical analysis, therefore, is the only tool capable of addressing policy experiments.

Second, among the various empirical methodologies identified in the literature, Computable General Equilibrium (CGE) modeling seems to be the most fruitful approach. Existing CGE applications, however, fail to adequately incorporate ROO. As a result, I conclude that a research project that models both the essence of ROO in the benchmark, and their removal in the counterfactual, would add some fresh insight to the policy debate over the liberalization of NAFTA ROO.

Résumé

Les règles d'origine (RO) sont utilisées dans le cadre des accords commerciaux préférentiels pour déterminer les marchandises admissibles à un taux tarifaire réduit. Ces règles sont souvent qualifiées de restrictives et de compliquées pour les entreprises exportatrices. C'est pourquoi les pays de l'ALENA examinent des propositions visant à libéraliser les RO de l'ALENA. La présente étude passe en revue les travaux théoriques et empiriques sur les RO de l'ALENA afin de mieux expliquer les enjeux. Elle débouche sur deux grandes conclusions.

Premièrement, même si les travaux théoriques sur les RO de l'ALENA ont fait des progrès, les études rigoureuses de ce genre demeurent peu nombreuses parce que les RO de l'ALENA se révèlent difficiles à mesurer et à modéliser de façon explicite. Cela est malheureux puisque, selon les études théoriques, dépendamment de la sévérité des RO, les effets sur le bien-être sont ambigus. L'analyse empirique constitue donc le seul outil capable d'examiner les implications de différents scénarios de politiques.

Deuxièmement, parmi les différentes méthodes empiriques abordées dans la littérature, l'approche d'équilibre général calculable semble être le plus utile. Par contre, ses applications existantes n'intègrent pas adéquatement les RO de l'ALENA. L'auteur conclu donc qu'un projet de recherche modélisant à la fois l'essence des RO dans le système de référence et leur élimination dans le système contrefactuel donnerait une nouvelle orientation au débat publique sur la libéralisation des RO de l'ALENA.

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1 Introduction

1.1 What are Rules of Origin?

In any preferential trade agreement (PTA), rules are necessary to determine which goods are attributable to member countries, and thus are eligible to benefit from the agreement. These rules — used to determine if a good originates in a member country of a PTA — are called *rules of origin* (ROO). ROO are applied to all goods that cross the borders of PTA member countries. Goods that satisfy the criteria outlined under the ROO are deemed "originating" in a member country, and are generally subject to reduced tariff rates when crossing borders.

In practice, ROO can be complex, detailed and lengthy legal documents. There are two broad types of ROO. Either a good must be: a) comprised entirely of inputs from member countries of the PTA; *or* b) when a good contains inputs from non-member countries, those inputs must be "substantially transformed" during the production process in a member country. Substantial transformation may stipulate that the product contain a specified percentage of member inputs, that the product undergoes a specific production process, or that the output of the production process be suitably 'different' from the non-member inputs.[1]

ROO have become increasingly important due to the proliferation of trade agreements in the past few decades, and the increase in production taking place across national borders.

1.2 Motivation for Rules of Origin

The primary economic argument supporting the use of ROO is that they prevent *trade deflection*. In many cases, PTA member countries retain existing tariff structures relative to non-members.[2] As a result, non-members might attempt to deflect their shipment through a member with a lower tariff, in transit to the final destination of a member with a higher

[1] For further details on how ROO are implemented, with particular attention paid to the North American Free Trade Agreement (NAFTA) context, please refer to the Appendix.

[2] An arrangement where member countries adopt a common external tariff on non-member imports, abolish trade restrictions between members, and agree to share the revenue of the union's tariffs is referred to as a customs union.

tariff.

As a simple hypothetical example, refer to figure 1. Consider a Japanese firm wishing to export to the Canadian market. If the firm ships directly to Canada, the Japanese exports will be subject to a 20 percent tariff. However, in the absence of ROO and prohibitive transportation costs, the Japanese firm could first ship their good to the US and pay the five percent tariff. Once in the US, under a Canada-US free trade agreement, the good could then move duty-free to Canada. This would result in lost tariff revenue for the high tariff government, and inefficiencies due to the extra shipment (though, the low tariff government would benefit). If ROO existed, but were lax, the Japanese firm could perform some trivial assembly in the US, have the transformed good deemed 'American', then ship it on to Canada duty-free.

ROO are devised to prevent products that are simply being transhipped through, or undergoing only minor operations in the trade area, from enjoying the benefits of the trade agreement.

At a more pragmatic level, ROO can protect domestic (intermediate goods producing) industries and make PTAs more politically viable. In an environment where direct trade barriers have fallen through successive rounds of trade negotiations, ROO offer an indirect means of protection that is not readily apparent. ROO are typically negotiated on an industry-by-industry basis, as opposed to economy-wide; as such, there is considerable scope for lobbying by industries seeking import protection.

Destler (2004) argues that as popular opinion turned against protectionism, firms and labor unions wisely abandoned a strategy of opposing PTAs and instead looked for ways to gain advantage *within* these agreements. Contracting nations, or more specifically the special interests therein, attempt to maximize the benefits of membership of the FTA at the expense of non-members. The politics of FTAs can generally be described as follows: the benefits to winners, who are deeply involved in the negotiations, are large and concentrated. The losses to the injured parties, who are removed from the process, are small and sufficiently diverse so that coordination to oppose, or retaliate to the policies is not viable. Furthermore, rent protection is feasible because the specifics of FTAs tend to be detailed

and technical, which allows for the inclusion of opaque industry-specific concessions.[3]

1.3 Concerns About Rules of Origin

There are two primary concerns about ROO, based on the two types of costs associated with ROO. First, ROO impose additional administrative costs for firms that comply and the governments who enforce that compliance. Second, ROO distort input choices and production processes in ways that increase firms' production costs. Instead of employing cheaper factors of production from a non-member, a firm may opt for more expensive member inputs so their goods may be originating and thus subject to a lower tariff. With higher production costs, consumer prices rise and demand/output is reduced.

Figure 2 illustrates this point. The use of non-member, and member inputs are shown on the vertical and horizontal axes, respectively. The slope of a ray from the origin represents the relative proportion of non-member-versus-member inputs. Before the PTA the firm minimizes costs, C, by using inputs $(nm1, m1)$ at point A. When the PTA is negotiated, it may require a greater percentage of member inputs to meet the ROO, represented by the line labeled ROO. Given the restrictive nature of ROO, the firm must use a greater proportion of member goods to be deemed originating. The firm now substitutes toward member factors of production employing the input choice $(nm2, m2)$ at point B. Total costs of production increase from C to $CROO$. The more difficult it is to substitute member factors, the greater the curvature of the isoquant, and the larger the cost increase.[4] Furthermore, costs increase more as ROO become more restrictive (assuming the firm continues to apply for origin) as the ray from the origin swings down. When the additional costs of compliance $(CROO - C)$ exceeds the benefit of compliance (the tariff reduction), then firms' optimal input choice is

[3]Consider the case of the automobile industry in NAFTA. As Destler (2004) recounts, US automakers wanted high/restrictive ROO to protect themselves from Japanese and European competitors who might locate in Canada or Mexico and ship duty-free to the US. However, General Motors had a joint venture with a foreign company (Izuzu) in Canada, and as such GM preferred a lower ROO regional content requirement (60 percent) than Ford and Chrysler (70 percent). In the end, the US negotiators split the difference and bargained for 65 percent. As the Canadian and Mexican preference was to be more accommodative to Japanese and European firms who might locate in their countries, they sought a rule of around 50 percent. The hotly contested agreement finally settled at 62.5 percent, where it remains today, reflecting the political clout of the Big Three automakers in the US.

[4]There is also an effect on the scale of production that is determined by the returns to scale properties of the production technology.

once again the no-distortion point A. However, since the good is not originating, the good is subject to the higher tariff.

Not only can input choices be distorted, but investment decisions and firm location may be effected as well. Consider the case of NAFTA where the US market is much larger than that of the other two members (Canada and Mexico). If ROO are sufficiently costly, there may be incentive for firms that primarily export to the American market to relocate their firm to the US. Production would then be mainly for the domestic market, and the cost of ROO on those products would be avoided.

Given this discussion, ROO are often identified as restrictive and cumbersome. The purpose of this paper is to review the literature on ROO to give a clearer understanding of the issues involved. This paper delivers two main conclusions:

1. While the theoretical research on ROO has made progress, sound empirical work remains rare because ROO have proven difficult to measure and model explicitly. This obstacle is unfortunate because theoretical work suggests, depending on the restrictiveness of ROO, the welfare effects of ROO are ambiguous. Empirical analysis, therefore, is the only tool capable of addressing policy experiments.

2. Among the various empirical methodologies identified in the literature, Computable General Equilibrium (CGE) modeling seems to be the most fruitful approach. Existing CGE applications, however, fail to adequately incorporate ROO. As a result, I conclude that a research project that models both the essence of ROO in the benchmark, and their removal in the counterfactual, would add some fresh insight to the policy debate over the liberalization of NAFTA ROO.

The remainder of the paper proceeds as follows: Section 2 separates the theoretical papers in the ROO literature into two branches — the purely economic and the political economy paradigms. Section 3 distinguishes three empirical methodologies to estimate the impact of ROO including: estimating gravity equations; the revealed preference approach; and computable general equilibrium modeling. Section 4 concludes.

2 Theoretical Literature

The theoretical literature on ROO uses either the purely economic, or the political economy approach. The former approach uses the optimization problem of the firm in the presence of an additional ROO constraint as the point of departure. The latter approach treats ROO as the outcome of a political lobbying and/or voting process. Overall, the theoretical work on ROO has made substantial progress and provides a solid foundation for the necessary application of empirical methods to assess various trade policy experiments. The remainder of this section will focus mainly on the purely economic papers, only a brief discussion of those using the political economy paradigm is provided.

2.1 Economic Theory Papers

2.1.1 Viner (1950)

Early research related to the ROO issues can be traced back to Viner's (1950) modern theory of the Customs Union (CU).[5] Prior to Viner's insights, the general logic on CU was as follows: Unfettered free trade maximizes welfare; creating a CU moves in the direction of freer trade, thus a CU must necessarily improve welfare.

Viner demonstrated, however, that a CU was not necessarily welfare-enhancing due to the offsetting effects he termed *trade creation* and *trade diversion*. Trade creation occurs when production shifts from a high cost domestic source to a lower cost partner due to reduced tariffs on intra-union trade. In the process, domestic resources are freed up and can be put to more efficient uses. Trade diversion occurs if a country purchases goods from a union member at the expense of a cheaper non-member. This effect would occur if importing from the latter and then paying the tariff was not the cheaper option. Since trade creation is welfare enhancing, while trade diversion is welfare reducing, the overall welfare impact of the creation of a CU is therefore ambiguous at a theoretical level.

[5] Recall that a major requirement of a CU is the removal of trade barriers between members, which would likely entail the removal of ROO.

2.1.2 Grossman (1981)

More directly-related academic literature on ROO appears to have begun in the early 1980's with Grossman's (1981) analysis a specific type of ROO in the form of domestic content restrictions.[6] Grossman notes (as we will see throughout the remainder of this paper) that the economic impacts of ROO depend on the specific nature of the ROO input requirement, the market structure for the domestic intermediate producer(s), and the substitution possibilities for production by the final goods producer(s).

Grossman's analysis, like much of the work that followed, is essentially partial equilibrium in nature. A small open economy taking as exogenous the world price for the intermediate goods is studied. The Lagrangian is specified and solved, and comparative statics are performed by differentiating the first order necessary conditions.

Grossman incorporates the ROO constraints algebraically into the firm's optimization problem (in a slightly awkward fashion) through an explicit tariff dummy variable on imported intermediate goods. Two cases of ROO are considered: a physical requirement, and a value-added requirement. Analyzing each case in turn:

Case 1: ROO in the form of a physical requirement in a free trade agreement (FTA). The firm's objective is to maximize profits subject to the physical regional value content restriction, given by k.

$$\max PF(L, M + M^*) - P_M M - P_{M^*}(1 + \tilde{t_M})M^* - wL$$

subject to: $\tilde{t_M} = 0$ if $\frac{M^*}{M+M^*} < 1 - k$ (*i.e.* the ROO constraint is satisfied);

$t_M = t_M$ otherwise (*i.e.* the ROO constraint is not satisfied).

where P is the output/final good price; $F(\cdot)$ is the production technology; L is labour; M and M^* are the member and non-member intermediate goods, respectively; P_M and P_{M^*} are their respective factor prices; w is the wage; and finally $\tilde{t_M}$ is an indicator variable which takes on the value 0 if the ROO constraint is satisfied, and the most favored nation (MFN) tariff otherwise.

Case 2: ROO in the form of a value-added requirement in a FTA. The firm wishes to maximize profits subject to a valued added constraint of the following form:

[6] Please see the Appendix which refers to these as regional value content restrictions (RVC).

$$\max PF(L, M + M^*) - P_M M - P_{M^*}(1 + \tilde{t_M})M^* - wL$$

subject to: $\tilde{t_M} = 0$ if $\frac{P_{M^*}M^*}{PF(L,M+M^*)} < 1 - j$;

$\tilde{t_M} = t_M$ otherwise.

where j is proportion of domestic-to-total gross value added, measured at domestic prices.

The first order necessary conditions for these problems demonstrate that ROO are equivalent to a subsidy on the use of member inputs and a tariff on the use of non-member inputs.[7]

Grossman's analysis shows that, relative to a free trade benchmark which does not impose a ROO constraint, implementing relatively weak ROO will initially increase the production of member intermediate goods. However, as the restrictiveness of ROO increases, the production of member intermediates may fall eventually, though still remain above its level in the benchmark case. This result occurs because of two offsetting effects on derived demand from member intermediate goods: Final goods producers substitute member for non-member intermediates to satisfy the ROO, but they also substitute labour for both intermediates in response to the increased cost of the composite intermediate. Eventually as ROO become very restrictive the demand for member's intermediate goods may fall and eventually reaches the level that would exist in the absence of ROO. This occurs as firms optimally choose either to use more (domestic) labour instead of member intermediates to meet the ROO, or to not meet the ROO constraint altogether and simply pay the MFN tariff rate.

The effect of ROO on economy-wide output is ambiguous,[8] depending on the market structure for intermediates and final goods. Domestic intermediate production increases, but final goods production will fall, due to the increased input costs. In a prophetic statement, Grossman says: "the degree of protection (from ROO policies) is variable, and difficult to predict." He was also one of the first authors to highlight ROO as a disguised mean of protection for intermediate stages of production, which is more politically viable than increased tariffs. Grossman's solid analysis provides the foundation for the subsequent papers

[7]This result will be shown explicitly in a paper that follows (Krishna and Krueger, 1995), using a clearer constraint specification.

[8]Subsequent work, still to be discussed, analyzes welfare implications.

in this area.

With the exception of this paper, there was very little attention paid to ROO in the intervening decade. This all changed as the issue of preferential and free trade agreements was resuscitated with the negotiations of the Canada-US Free Trade Agreement and subsequently, NAFTA. In fact, the contentious negotiation of NAFTA likely spawned the political economy approach discussed in section 2.2.

2.1.3 Krueger (1993)

Most of the literature in the late 1980's and early 1990's regarded FTAs and CU as equivalent, and thus analyzed them in a similar fashion. The only difference between the two was whether or not there were common external tariffs, but the analysis itself was thought to be unchanged. Krueger (1993) pointed out the critical distinction between the two is rules of origin. She illustrates that ROO can be used in FTAs to protect domestic industries and affect firm location decisions in a way that cannot occur in a CU. She argues that the Americans used ROO in NAFTA to give advantage to their firms, particularly in the automotive and textile sectors.

2.1.4 Krishna and Krueger (1995)

A few years later, Krishna and Krueger (1995) investigate the effects of the specific implementation of ROO and alternative market structure assumptions. The authors model ROO as a regional value content constraint (RVC) on a cost, and price basis, under both perfect and imperfect competition. The results differ in all four environments. Furthermore, the effects are not necessarily monotonic. Echoing Grossman, beginning with no ROO constraint, as ROO become increasingly restrictive, there is a relevant range for the ROO constraint to bind. Below this range, where ROO are lax, firms are already satisfying the constraint so there is no effect on input choices. Above this range, where ROO are very restrictive, firms find it too costly to apply for origin and producers simply pay MFN tariff rates. In both cases input choices are unaffected, outside a critical range of ROO restrictiveness.

The setup is similar to Grossman (1981), but the more general cost-minimization problem is solved, instead of the profit-maximization problem. This procedure only requires the

firm to be a price-taker in the input market. As a result one can allowing for imperfect competition in output markets, and also focus on the cost distortion induced by ROO (by simply examining the value function). The setup is once again partial equilibrium, so the reader is faced with the rather tenuous assumption that the US is a small country, unable to affect world prices. The discussion pertaining to perfect competition is presented for the sake of brevity.

Case 1, Cost-based ROO: Consider ROO as a cost-based constraint. The firm's problem is to minimize its total cost subject to the ROO constraint that α, a minimum percentage of NAFTA inputs are employed. The second constraint is a unit production normalization, so that we can interpret the value function as the minimum cost of producing one unit of output. The firm's problem is:

$$\min P_M M + P_{M^*} M^* + wL$$

$$s.t.: \quad \frac{P_M M + wL}{P_M M + P_{M^*} M^* + wL} \geq \alpha, \text{ and } \quad F(L, M, M^*) \geq 1$$

The Lagrangian and first order necessary conditions for this problem are:

$$\mathcal{L} = \min P_M M + P_{M^*} M^* + wL - \phi[P_M M + wL - \alpha(P_M M + P_{M^*} M^* + wL)]$$

$$-\mu[F(L, M, M^*) - 1]$$

$$\frac{\partial \mathcal{L}}{\partial L} : w(1 - \phi(1 - \alpha)) = \mu F_L(\cdot)$$

$$\frac{\partial \mathcal{L}}{\partial M} : P_M(1 - \phi(1 - \alpha)) = \mu F_M(\cdot)$$

$$\frac{\partial \mathcal{L}}{\partial M^*} : P_{M^*}(1 + \phi\alpha)) = \mu F_{M^*}(\cdot)$$

$$\frac{\partial \mathcal{L}}{\partial \phi} : P_M M + wL = \alpha(P_M M + P_{M^*} M^* + wL)$$

$$\frac{\partial \mathcal{L}}{\partial \mu} : F(\cdot) = 1$$

The authors make two observations. First, as Grossman noted, the value-added ROO constraint acts like a subsidy on the use of NAFTA inputs, and a tax on the use of non-NAFTA inputs. Second, the ROO constraint does not affect or distort the *ratio* of the marginal products of NAFTA inputs.

A representative firm compares the unrestricted cost function $C(\cdot)$ (the value function when there is no ROO constraint), and the restricted cost function $R(\cdot)$ (the value function when ROO constraint is binding), in the following manner. Given the assumptions of

constant return to scale in production and perfect competition, the output price will be equal to the unit cost of production. Thus, when exporting to member countries, the firm will sell its output at the tariff-inclusive price $R(\cdot, \alpha)$ if it satisfies the ROO (and the preferential tariff is zero). Otherwise, it will sell at $C(\cdot)(1+t_{MFN})$ where t_{MFN} is the tariff rate imposed by the importing country on that non-originating good. Thus, the firm applies for origin if and only if: $R(\cdot, \alpha) < C(\cdot)(1 + t_{MFN})$, otherwise it does not. Since $R(\cdot, \alpha)$ is increasing in α, the restrictiveness of the ROO, by increasing α we can derive a relevant middle range over which ROO bind.

Case 2, Price-based ROO: For a representative American firm, the price-based ROO problem is specified as follows:

$$\min P_M M + P_{M^*} M^* + wL$$

$$s.t. : \frac{P^{US} - P_{M^*} M^*}{P^{US}} \geq \alpha, \text{ and } \; F(L, M, M^*) \geq 1$$

Again, the associated Lagrangian and FOCs are:

$$\mathcal{L} = \min P_M M + P_{M^*} M^* + wL - \lambda[P^{US} - P_{M^*} M^* - \alpha P^{US}] - \mu[F(L, M, M^*) - 1]$$

$$\frac{\partial \mathcal{L}}{\partial L} : w = \mu F_L(\cdot)$$

$$\frac{\partial \mathcal{L}}{\partial M} : P_M = \mu F_M(\cdot)$$

$$\frac{\partial \mathcal{L}}{\partial M^*} : P_{M^*}(1 + \lambda) = \mu F_{M^*}(\cdot)$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} : P^{US} - P_{M^*} M^* = \alpha P^{US}$$

$$\frac{\partial \mathcal{L}}{\partial \mu} = F(\cdot) = 1$$

The key distinction between the two ROO specifications (cost versus price) is that by increasing its price, the firm makes it easier to meet the constraint (the percentage increase in the numerator is larger than the percentage increase in the denominator, so the ratio increases).[9] Therefore, with imperfect competition in output markets the firm can take into account the affect its pricing decision has on relaxing the ROO constraint.

The authors state and prove the following propositions:

Proposition 1: In the long run, with constant returns to scale, price and cost-based ROO

[9] As a simple example, with initial values of $P^{US} = 10$, and $P_{M^*} M^* = 5$, consider a price increase to $P^{US} = 11$. Initially, the firm had $\frac{1}{2}$ member content, whereas in the latter case, the firm has $6/11 > \frac{1}{2}$ member content, simply by raising its price, not through any changes in input composition.

are equivalent.[10]

Proposition 2: In the short run, with capacity constraints, exporters will prefer price based ROO to cost based ROO, since they are afforded some leniency through price increases.

To summarize, Krishna and Krueger (1995) show the details of ROO matter, *i.e.* cost and price definitions are NOT always equivalent, market structure matters, and finally, the effects of ROO are not necessarily monotonic.

2.1.5 Krishna and Ju (1998), updated (2005)

Krishna and Ju (1998) highlight the interaction between final goods producers and the demand for the intermediate inputs used to produce them. Recall Viner (1950) noted the trade creation and trade diversion effects. Krishna and Ju add to these two new effects: the *derived demand* and *input price* effects.

In the creation of a FTA, there is the aforementioned trade creation effect, which displaces domestic final goods production to some other member. As a result, there is trickle-down, derived-demand impact, as there is now less demand for domestic inputs due to less domestic final goods production. The second effect results from the lower tariffs on member's intermediate goods which produces an input price effect that increases final goods production.

Krishna and Ju (2005) build on the previous finding of a 'relevant range' for the ROO constraint to be binding and give the theory a little more substance. Rather than assume a representative firm, the authors allow for ex-ante identical firms to endogenously choose ROO compliance in such a way as to equalize the profits from complying or not. Thus in equilibrium, once ROO are strict enough to bind for a firm, we will get ex-post heterogeneous behavior as some firms choose to abide by ROO and apply for origin, and other firms decide not to. This is termed the 'heterogeneous regime'. As ROO become more restrictive, the proportion of firms meeting ROO adjusts, so that the profit from the two options are equalized. Previous papers had only a homogeneous regime where either all, or no firms, abide by the ROO.

[10]This can immediately be seen by substituting P^{US} for $P_M M + P_{M^*} M^* + wL$ in the price-based ROO constraint.

2.1.6 Rodriguez (2001)

Rodriguez (2001) undertakes a novel approach using a continuum of production stages, with value added at each stage to the good-in-process. This methodology allows for the use of calculus techniques to examine the impacts of ROO on multi-stage production processes. The model is partial equilibrium in nature and assumes perfect competition. The results show that restrictive ROO lead to the diversion of production to the FTA's intermediate good producer at the expense of the other FTA final goods producer, and the raw material producing non-member. This result occurs because ROO are applied at the time of export from the intermediate good producer to the final good producer. As a result, there is incentive for more of the substantial transformation to occur at the second stage of production. The diversion of production towards the FTA intermediate goods producer increases as ROO become more restrictive. Unfortunately, we do not get the more realistic non-monotonicity of Krishna and Krueger, because compliance is imposed, and not endogenously determined. As well, the model implies that restrictive ROO will result in increased investment in the FTA.

Because of the increased investment, production is reallocated among FTA members, and trade is diverted from non-members. There is migration of production to the midstream (intermediate) producer, and both the other FTA member and the non-member lose. This illustrates a general finding in the literature, that the effects on intermediate and final goods producers may be opposed.

2.1.7 Krishna (2003)

The final economic theory paper is Krishna's (2003) survey paper. The author summarizes the results of the ROO literature into three laws:

1. ROO can insulate an industry.
2. The precise form of ROO matters (including capital cost, price vs. cost method).
3. Extremely restrictive ROO can backfire, increasing rather than decreasing imports, if firms simply disregard ROO, import inputs, and pay the MFN tariff rates.

Assuming perfect competition, there are three usual partial equilibrium effects:

1. In the long run, ROO affect investment.
2. ROO may raise or lower welfare, depending on their restrictiveness (more stringent rules will likely lower welfare).
3. In the short run, with capacity constraints, the form of ROO matters.

Krishna notes that the theoretical work has been confined to partial equilibrium models, and the results of imperfect competition are not clear. There is very little research to date on the general equilibrium effects.

2.2 Political Economy Models

As mentioned earlier, the other strand of the theory literature is that of the political economy. Grossman and Helpman (1995) employ the political economy framework in the following manner: First lobby groups offer policy-contingent campaign contributions to politicians, who then make decisions that serve their own political objectives. The politicians do so choosing policies to maximize the weighted sum of total campaign contributions and aggregate welfare. Industry exclusions (*i.e.* either permanently high ROO, or long phase-in periods) of sensitive sectors might make an otherwise impossible FTA politically viable. These exclusions can be "sold" to import competing domestic companies in exchange for their campaign contributions.

Duttagupta and Panagariya (2001) extend the Grossman-Helpman model to show more formally that ROO may improve or worsen the overall welfare of a FTA. ROO can generally be devised to make the FTA more politically viable. Essentially, ROO that protect domestic import-competing industries and intermediate exporting-industries improve the political viability of an FTA. Two examples are discussed. First, a FTA that lowered welfare of the union and was rejected without ROO is accepted after introducing ROO. Second, a FTA that raised welfare of the union but was rejected without ROO is accepted after introducing ROO. The required ROO, however, may be so distortionary that the FTA lowers the union's joint welfare relative to the status quo.

3 Empirical Research

The empirical work on ROO can be categorized into three approaches: i) the creation of indexes and estimation of gravity equations; ii) an indirect, revealed preference approach, and iii) computable general equilibrium (or CGE) modeling. These approaches are not mutually exclusive.

The first of these approaches (gravity equations) however, can be distinguished by its apparent motivation — the issue of 'market access'. These authors do not attempt to estimate the costs of ROO *per se*. Rather, they attempt to show that the impact of restrictive ROO have reduced the potential benefits of PTAs for small or less developed members. The second approach (revealed preference) is more concerned with the quantitative estimation of the costs of ROO. Thus, this branch of the empirical literature delivers some relevant, indirect approximations. The third methodology (CGE modeling) is the most ambitious. It attempts to numerically estimate the impacts for the economy as a whole and at a sectoral level, as part of an internally consistent economic system.

3.1 Creating Indexes and Estimating Gravity Equations

The issue of 'market access' largely motivates the first strand of the empirical literature. The term market access usually refers to the increase in trade flows (or lack thereof) for smaller, less developed countries after the signing of a PTA. Most of this work has been done by authors associated with the Inter-American Development Bank.

The expansion of this work was largely facilitated by a ROO restrictiveness index created by Estevadeordal (2000). The index uses the substantial transformation (the change in tariff classification — CTC) ROO criterion found in trade agreements.[11] Two basic assumptions underlie the index. First, a substantial transformation at a higher level of aggregation, for example the chapter (two-digit) level is more onerous than a change at a lower level of aggregation, for example at the heading (four-digit) level. Second, the requirement of two criteria of substantial transformation (*e.g.* a change in tariff classification *and* a regional value content requirement) is stricter than if only one criterion is required.

[11] For more details on the various substantial transformation criteria, please refer to the Appendix.

A typical approach from this strand of the literature would include Estevadeordal's ROO restrictiveness index as an explanatory variable in a gravity equation. A gravity equation attempts to explain bilateral trade flows based on the countries' national incomes, the distance between them, and a gamut of dummy variables representing whether or not the countries are part of a PTA, share a common language, *etc.* Gravity equations have been subject to attack for their lack of theoretical foundations. Nonetheless, they have been quite successful as reduced-form equations used to predict trade flows.

Generally, the PTA dummy in the gravity equation is positive, while the ROO restrictiveness index is negative; both are statistically significant. This can be interpreted as ROO restricting trade, or restricting 'market access' for the country in question. A few examples from the literature follow below.

Francois (2003) uses the gravity equation approach with an application to auto sector. His results provide some evidence that EU and NAFTA ROO have implied a shift in trade away from final goods and towards intermediate goods from FTA partners.

Augier et al. (2004) use an augmented gravity model to estimate the impact of cumulating PTAs in EU.[12] Overlapping PTAs may induce distortions as ROO differ across agreements. Cumulation addresses this issue. The empirical results suggest that where there is no cumulation of ROO, bilateral trade is 40–50 percent lower. The effect may be larger for intermediate goods than for final goods, but the evidence for this conjecture is not compelling.

Estevadeordal and Suominen (2004) extend Estevadeordal's original (2000) work, by constructing restrictiveness, and additionally, facilitation indexes for ROO.[13] Panel data results show PTAs have a positive effect on trade, as does the ROO facilitation index, while the ROO restrictiveness index has a negative effect (all significant at the one percent level). The authors show that the effects of ROO have decreased over time, possibly suggesting that exporters have learned to comply. The authors find some evidence of trade diversion, as ROO on final goods encourage trade in member inputs at the expense of potentially

[12] Cumulation is discussed in Section A3.3 of the Appendix- it essentially amounts to reconciling gaps where there is overlap between PTAs.

[13] Facilitation refers to sections A3.1 through A3.3 (de minimis, absorption and cumulation provisions) of the Appendix.

cheaper ROW inputs.

Cadot et al. (2003) point out a possible endogeneity bias in the gravity equations. The problem lies in trying to assess the effects of ROO on trade flows without recognizing that ROO are themselves lobbied for based on trade flows.[14] For example, a large tariff preference (high MFN rates relative to NAFTA rates) makes strict ROO more acceptable for potential members looking to join to gain access to new, larger markets.

To summarize, this branch of the empirical literature uses as an explanatory variable a somewhat subjective index, in a reduced-form equation that lacks theoretical underpinnings.

3.2 Revealed Preference Approach

The revealed preference approach attempts to attach numbers to the costs associated with ROO. For example, some early estimates of the costs of ROO are attributed to Koskinen (1983) and Herin (1986) for the paper-based system of the European FTA. Koskinen estimates administrative compliance costs for Finnish exporters at 1.4 percent to 5.7 percent of the value of exports. Herin estimates administrative costs pertaining to ROO at 3 percent to 5 percent. Herin's pioneering approach is important because it introduces the revealed preference methodology.

The revealed preference approach uses firm's actual ROO compliance choices to indirectly infer what ROO costs are consistent with such behavior. Industry-level compliance is measured by utilization rates (the percentage of total trade that occurs between PTA partners on a preferential basis). If all firms applied for and received originating status for their goods, the utilization rate would be 100 percent. Conversely, if no firms applied for origin, the utilization rate would be zero percent.

In industries where utilization rates are 100 percent, the tariff preference (*i.e.* the benefit of applying for origin equals the MFN tariff minus the PTA tariff) is 'revealed preferred' to the overall compliance costs of ROO. The tariff preference can provide an estimate of the upper bound for the (ad-valorem equivalent) of ROO compliance costs. Conversely, where utilization rates are zero, the tariff preference can provide an estimate of the lower bound (

[14] Empirically, the endogeneity problem is addressed by simultaneously estimating the first order necessary conditions from the Grossman Helpman (1995) model and a gravity equation.

ROO costs must be at least as large as the tariff preference, or else some firms would apply for origin). When utilization rates are between zero percent and 100 percent, assuming all firms have symmetric compliance costs, this is interpreted as revealed indifference, so the tariff preference is 'revealed equal' to the compliance costs.

Two important caveats to the reveal preference results are the following:

1) A more plausible interpretation would allow for ROO compliance costs to differ across firms. In this case, consider two firms in the same industry, facing the same tariff preference. That one firm applies for origin (say the 'large' firm) while the other (say the 'small' firm) does not, simply suggests lower ROO costs for the former relative to the latter.

In fact, in using the revealed preference approach, Cadot et al. (2002) acknowledge that, "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."

2) Care should be taken to exclude industries for which tariff preferences are zero (*i.e.* MFN and PTA rates are equal). Clearly in these instances there is little or no incentive to apply for origin, and utilization rates cannot be used to glean any meaningful information regarding ROO costs.

With these caveats in mind, here are some results. Anson et al. (2003) estimate Mexican total ROO compliance costs to be five percent (an average for all sectors) of the value of exports. Of this five percent, 40 percent of that, *i.e.* two percent, is attributed to administrative costs. The authors also report that in 2000, the Mexican use of NAFTA on its exports to the US was 64 percent. This number jumps to 83 percent if we correctly exclude categories where MFN rates are zero.

In a Canadian study, Goldfarb (2003) applies the revealed preference methodology to Canadian utilization rates. The author estimates that ROO costs "cannot be higher than 10.2 percent, or lower than 0.5 percent of the value of Canadian exports". Such an imprecise result is of little practical use, but at least we can establish that a great deal of heterogeneity exists across sectors in Canada. Overall 55 percent of Canadian exports to the US enter under NAFTA in 2000 (slightly less than for Mexico). However, one-third of all US MFN

tariff rates are zero (Goldfarb includes these goods in the calculations), so there is no incentive for those goods to enter under NAFTA.

In work for the Policy Research Initiative, Kunimoto and Sawchuk (2005) cite the revealed preference studies of Cadot et al. (2002) and Carrère and de Melo (2003) for ROO costs to Mexican exporters to the US. Their own study estimates the cost to Canadian exporters to the US for the upper bound estimates for administrative costs (Table 1).

The authors document Canadian and American utilization rates by sector (Table 2). Overall, both countries use NAFTA roughly half of the time. However, if we correctly examine only commodities that face positive MFN tariffs, NAFTA utilization rates are about 80 percent and have been at that level since 1998. Note that there are some large differences in some sectors (*e.g.* vegetables, minerals, transportation equipment, arms and ammunition)

In regression analysis, utilization rates are regressed on tariff preferences (positive and significant), Estevadeordal restrictiveness index (insignificant), and a sector dummy (positive and significant) CTC dummy (insignificant). The results are preliminary and have not used data disaggregated enough.

To summarize the finding of the revealed preference approach, administrative costs of ROO of less than two percent of the value of exports would be consistent with firm's observed behavior under NAFTA (assuming compliance costs were the same for all firms in a given sector). The distortionary costs of ROO may well be larger than the administrative costs.

If instead we acknowledge the more plausible case of heterogeneous compliance costs, NAFTA's ROO self-certification requirement may be more reasonably viewed as a largely sunk cost, specific to each industry (given the industry-specific nature of ROO). Larger firms with suitably advanced accounting systems and more flexible production processes may incur the largely one-time costs of learning the paperwork, and possibly adjusting their production processes or input choices. If the tariff preference is not large, smaller firm may simply ignore ROO and pay the MFN tariff.

Finally, something not alluded to in the literature is the effect of exchange rate fluctuations on the firm's ability to obtain origin. For Canadian or Mexican exporters in particular,

sudden exchange rate movements may render a previously-originating good, non-originating (or overturn the choice of cost versus price method calculations) through the (possibly asymmetric) impacts on prices and costs.

3.3 Computable General Equilibrium (CGE) Modeling

Computable general equilibrium (CGE) models are widely used to study the allocational and distributional effects of economic policies or shocks. In particular, trade economists have often used CGE models to quantitatively estimate the potential economic impacts of the formation of a PTA or FTA. CGE models can be thought of as an extension and quantitative application of the partial equilibrium economic theory papers discussed in Section 2.1 to an environment where wealth effects are allowed to be an important transmission mechanism across markets. Being general equilibrium in nature, CGE models place heavy data requirements on the modeler. Social accounting matrices are required, which trace the flow of money through the income and expenditure sides of the economy, and track the input usage and production of each industry.

This subsection will begin by presenting Appiah (1999) which is the first and most significant research in this area relating to NAFTA. The estimation of a NAFTA transition to a Customs Union was tangentially addressed by Brown et al. (2001). Finally, the last two papers discussed relate to on-going work on this subject being conducted at Industry Canada (Ghosh and Rao, 2004) and the Department of International Trade (Papadaki et al., 2004).

3.3.1 Appiah (1999)

Prior to Appiah's (1999) work, most CGE studies had assumed entirely uninhibited, free trade in a FTA regime. This assumption makes the analysis more tractable, but with the application of ROO in FTAs, this assumption is demonstrably incorrect. By ignoring the costs of ROO emphasized in theoretical work of Section 2 and the empirical work of Section 3, these models over-estimated the gains to a FTA. Appiah's contribution is to explicitly model ROO to empirically estimate their welfare costs.

Appiah's model is comprised of four regions: Canada, the US, Mexico, and the rest of

the world. Primary and service sectors produce using a constant return to scale technology and behave in a perfectly competitive manner. The manufacturing sectors, however, uses an increasing returns to scale technology (facing a fixed cost to production, hence average costs decline as output increases) and behave as imperfect competitors.[15] Appiah uses the Armington assumption (national product differentiation), so that homogeneous products produced on either side of the border are viewed as imperfect substitutes by consumers. Using homothetic utility, consumption decisions are made in a multi-stage process.

The benchmark for the policy experiment is pre-NAFTA (the data are from 1988). Appiah computes counterfactuals of NAFTA without ROO, and counterfactuals of NAFTA with ROO (with the distortionary effects only, ignoring administrative costs). ROO are introduced through two constraints. A regional value content (RVC) constraint,[16] and a "simulated" *ad hoc* CTC constraint that is modeled as an increase in the value added per unit of foreign input costs over the benchmark.[17] Importantly, Appiah assumes 100 percent ROO compliance in the NAFTA regime.

Welfare gains are measured using equivalent variation (*e.g.* moving to NAFTA is equivalent in welfare to a change in pre-NAFTA income of x percent, where a positive number implies a welfare gain to integration). Changes in welfare are attributable to six separate effects: a substitution; terms of trade; scale efficiency; variety; trade diversion (more NAFTA imports, less imports from ROW); and GE income effects. The welfare costs of increasing ROO restrictiveness increase at an increasing rate (because Appiah assumes 100 percent compliance, there can be no range over which firms find ROO too costly and simply ignore them, as was the case in Krishna and Krueger, 1995). There are many scenarios considered. As a flavor for the results in one particular case (using the RVC and 20 percent CTC constraints), the distortionary cost estimates of ROO range from one to five percent, depending on the industry.

[15] This is specified in two different ways. In the first, firms use Cournot mark-up pricing behavior. In the second, contestable markets pricing is used.

[16] The RVC constraint assumes the net cost method, is selected by all firms. This is set to 62.5 percent for autos and 50 percent for all others industries. Recall that Krueger and Krishna (1995) discovered that firms may prefer the transaction value/price method instead, since price increases can be used to relax the constraint.

[17] This is varied from 20 percent, to 30 percent, to 40 percent. Please refer to page 63 of Appiah's thesis if further detail is required.

In line with the earlier theoretical results, introducing binding ROO increases production costs and reduces output. The welfare of domestic factor owners increases since they earn more (consistent with the political economy literature on lobbying). The welfare gain of introducing ROO is nonetheless offset by the welfare losses of consumers who suffer lower output/consumption, less product variety, and higher prices. On net, aggregate welfare is lower in a FTA when ROO are present relative to a FTA without ROO.

Here is an example to illustrate the effect of the Industrial Organization, imperfectly competitive firm behavior assumptions. With ROO, as a result of the reduced demand for foreign intermediate inputs, domestic intermediate producers enjoy a more captive market, *i.e.* they face more inelastic demand, and (depending on the assumptions made regarding firm competition) this causes higher mark-ups and larger welfare losses.

Finally, Appiah examines the welfare gains of moving from a Pre-FTA regime to either a Customs Union or a Free Trade area (*i.e.* one benchmark and two counterfactuals experiments). He examines three arrangements for the common external tariff (CET): set to the minimum, average, and maximum of the three countries external tariffs, chosen separately by industry. The simulations suggest that a North American Customs Union is always welfare superior to a North American free trade area if the common external tariff is not the maximum or "protectionist" CET (the protectionist CET would result in substantial diversion of trade from the rest of the world). The difference in aggregate welfare gains of moving to a CU instead of moving to NAFTA can be as much as 1.1 percent of income for Canada, 1.2 percent for the United States and 1.5 percent for Mexico.

For Canada, Appiah estimates a welfare gain of moving from no NAFTA to NAFTA with no ROO at 4.3 percent. Table 3 (reproduced from Finance, 1988, p. 32) compares Appiah's estimate with previous estimates of moving to NAFTA (in experiments that do not include ROO) that range from a high of 8.9 percent to a low of 0.7 percent. Appiah's estimates that ROO shave off 0.3 to 2.8 percentage points of this 4.3 percent gain, depending on the calibration (Table 4).

3.3.2 Brown, Deardorff and Stern (2001)

Brown, Deardorff and Stern (2001) attempt to model the impact of the move from NAFTA to a Customs Union between Canada, the US, *and* Mexico (*i.e.* the adoption of a CET and supposedly, the elimination of ROO). This experiment is done using the Michigan Model of World Production and Trade which is a static multi-country, multi-sector CGE model. Like Appiah's model, the Michigan model incorporates some aspects of New Trade Theory, including increasing returns to scale, monopolistic competition, and product heterogeneity. The model uses data from 1995, but the basecase for the policy experiment is NAFTA *once all Uruguay round concessions have been implemented*. In a similar vein to Appiah, Brown et al. chose three CET levels: a simple average, an import-weighted average, and a production weighted average for the three countries. In all scenarios the impact on Canadian GDP is practically non-existent (*i.e.* less than 0.3 percent with a range from -.01 to +0.26 percent). The effects for the US are even smaller.

A few criticisms of the paper can be made. First, the minuscule impacts are simply because there is no explicit modeling of ROO whatsoever. As other authors have noted, simply agreeing to a CET will have very little impact on the NAFTA economies.[18] The removal of ROO is expected to be the bulk of the gain from the Customs Union. Secondly, while there is not necessarily a clear choice for the CET levels, the choices made in this paper are particularly unfortunate as they violate WTO/GATT conventions that require trade agreements not to raise existing tariffs on non-members (Appiah makes the same mistake in his work). Finally, the authors acknowledge that aggregate sectoral tariff averages were used, rather than more disaggregated data (due to time and data constraints). Overall, the contribution of this paper to the liberalization of NAFTA ROO debate is minimal. The analysis is confined to three pages as part of a much larger project, compared to Appiah's nearly 200 page treatise on the subject.

[18] See, for example Ghosh and Rao (2004) in the next section.

3.3.3 Ghosh and Rao (2004)

Ghosh and Rao (2004) use a CGE model to estimate the impacts of a Canada-US customs union. The simulation results suggest the overall economic gain to Canada from a Customs Union with the US could be as much as one percent of GDP and Canada's trade could expand by almost 20 percent. The authors, however, acknowledge that their results may be an upper bound estimate. The majority of the gain from the CU is attributable to the elimination of ROO.

The model uses data from 1997 for the basecase (with one important modification described in the next paragraph). There are seven regions included in the model: Canada, the US, Mexico, the Mercosur region, Latin America, Europe, and the rest of the world. Eight industries are considered: agriculture, food processing, resource sector, textiles, manufacturing, automotive, M&E, and services.

The simulations are carried out in three scenarios. In the first two scenarios, Ghosh and Rao consider two different levels for the CET: 1) the minimum of the Canadian and American tariffs, and 2) the adoption of US tariff levels. For both cases the effects are similar, increasing Canadian GDP by roughly 0.1 percent, and trade by four to five percent. In the third scenario, the removal of ROO is considered. In this experiment, the authors start with the current MFN tariff rates applied to Canada-US trade, so they essentially remove all preferential trade under NAFTA, thus making the benchmark 'worse' than it is in reality. For the counterfactual experiment, they lower the MFN tariffs rates to the corresponding NAFTA rates. The authors interpret this experiment as providing an upper bound estimate of the gains from removing ROO. The results estimate an increase in Canadian GDP of one percent and trade increases of 13 percent. So by combining the two results for the CU estimates, Canadian GDP increases by 1.1 percent, trade by 18 percent, Mexican GDP increases by five percent, and US GDP is practically unchanged, up a mere 0.1 percent.

Note the third scenario is quite a different experiment than liberalizing ROO. Their approach does not address the removal of ROO, since the ROO distortions are absent at the beginning and the end of the experiment. The authors do not explicitly model ROO due to a lack of detailed micro data. It is also somewhat puzzling then, that the authors report

the current overall NAFTA utilization rates for Canadian exports in 2002 to be 55 percent, with large variations by industry. Yet, they impose or implicitly assume a utilization rate of zero percent in the basecase for the experiment, since all firms are forced to pay the MFN tariff rate.

3.3.4 Papadaki et al. (2004)

Papadaki et al. (2004) investigate the gains to further economic integration with the US through a thought experiment involving the removal of *unobserved trade costs.* Their model is unique in that it disaggregates Canada into three regions; the full model contains five regions: Canada West, Ontario, Canada East, the US, and the rest of the world. Their methodology is also unique because they use the results of gravity regressions on bilateral trade (see Section 3.1) to incorporate these "unobserved trade costs" (UTC) as ad-valorem tariff equivalents in the calibrated CGE model. The base year data are for 1999. Their results suggest a minimal benefit from the adoption of a CET confirming Ghosh and Rao and Brown et al.'s work. They do find, however, sizable gains to removing UTC.

The authors' interpretation of UTC, which is essentially that the residual/unexplained component of the gravity regression, is attributable to a lack of harmonization of standards and regulations between Canada and the US, may be criticized. The Canada-US common market analogy implicitly, and in my view erroneously, assumes trade policy could completely remove *all* market segmentation, whereas a sizeable part of this residual will be due to national market segmentation. This approach disregards some empirical literature that finds market segmentation may be as important within, as between countries.

So why does this paper focus on eliminating UTC? The motivation is McCallum's (1995) puzzling findings that after controlling for distance, size and other factors, trade between Canadian provinces was on average 22 times larger than trade between Canadian provinces and US states. The exact result may be disputed, nonetheless, there is a sizeable border effect in Canada-US trade. There are two possible interpretations of the UTC/border effect: a) it reflects different national preferences; or b) it reflects different standards and regulations (the authors' chosen interpretation). The authors astutely note that if a) is correct, further integration will not provide much benefit. On the other hand, if b) is

correct, then integration may provide substantial gains.

Generally, the UTC estimated in this study are big, and larger trade impediments to Canadian exports to the US than vice versa. As an extreme example of the size of these effects, in the wholesale trade sector UTC are estimated to be equivalent to a 95 percent tariff on exports (in the calibration). The estimates from a gravity equation, suggest Canada-US trade would increase by 1.8 times without UTC.

4 Conclusions

This paper attempted to summarize and synthesize the broad literature on the topic of ROO by distinguishing between various branches of the theoretical work (economic and political economy) and empirical approaches (gravity equations, revealed preferences, and CGE models).

There is quite a wide range of estimates of the overall costs of NAFTA ROO. None can claim to be entirely conclusive, and the distortionary costs estimates are particularly suspect. Using the revealed preference approach, Kunimoto and Sawchuk (2005) arrive at a NAFTA ROO cost estimate of 5.4 percent for Canada. Appiah (1999) uses a CGE methodology to generate estimates ranging from 0.3 to 2.8 percent depending on the calibration. The other CGE experiments that do not adequately capture ROO (Brown, Deardorff and Stern (2001), Ghosh and Rao (2004), and Papadaki et al. (2004)) suggest more liberal NAFTA ROO may have very minimal impacts, or quite large impacts that could increase Canadian GDP by up to 1 percent.

Appiah's work is the most extensive, but his results are dated, since he uses data from 1988, as an attempt to gauge the general equilibrium impact of moving from a pre-NAFTA regime to either a NAFTA regime that also includes ROO or to a Customs Union. Of course, after a decade of FTA, the objective is now to gauge the impact of going from a FTA regime that includes ROO to a deeper level of integration with the U.S. — whether a Customs Union or a "NAFTA+" regime — that would also include the removal of the NAFTA ROO. A CGE model that incorporates more recent data and appropriately models the current regime under ROO constraints in the base case scenario and their removal in

the counterfactual is a much needed tool in the current policy debate.

If such research is completed some important considerations remain. The sentiment at the very crux of Appiah's argument, as Krueger (1993), Harrison et al. (2003) and the authors of the gravity equation approach note, is that the large potential gains from preferred access in PTAs may be illusory in practice.

This lesson should be applied to current work, so that the estimated gains from the liberalization of restrictive ROO, are not overstated. Taking the results of CGE experiments at face value would endanger the very thing Appiah warned against — overestimation of the gains of a specific policy option. For instance, proposing more liberal ROO while ignoring trade remedy laws (*e.g.* countervailing duties) will clearly fail to realize the potential gains suggested by CGE modeling.

At least two issues remain significant challenges for future work. First, researchers might attempt to allow for endogenous compliance rather than simply imposing an unrealistic all-or-nothing compliance behavior by firms. Second, more work is needed to determine the sensitivity of the results of the CGE policy experiments to assumptions regarding firm's technology (returns to scale properties) and pricing behaviour. Accordingly, a review of the micro evidence of firm concentration in Canada might be helpful to make more realistic assumptions for each industry.

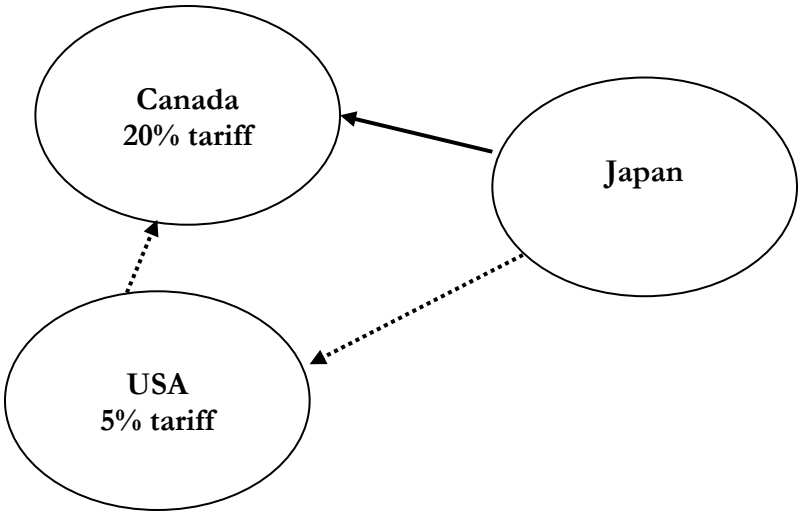

Figure 1: Trade Deflection

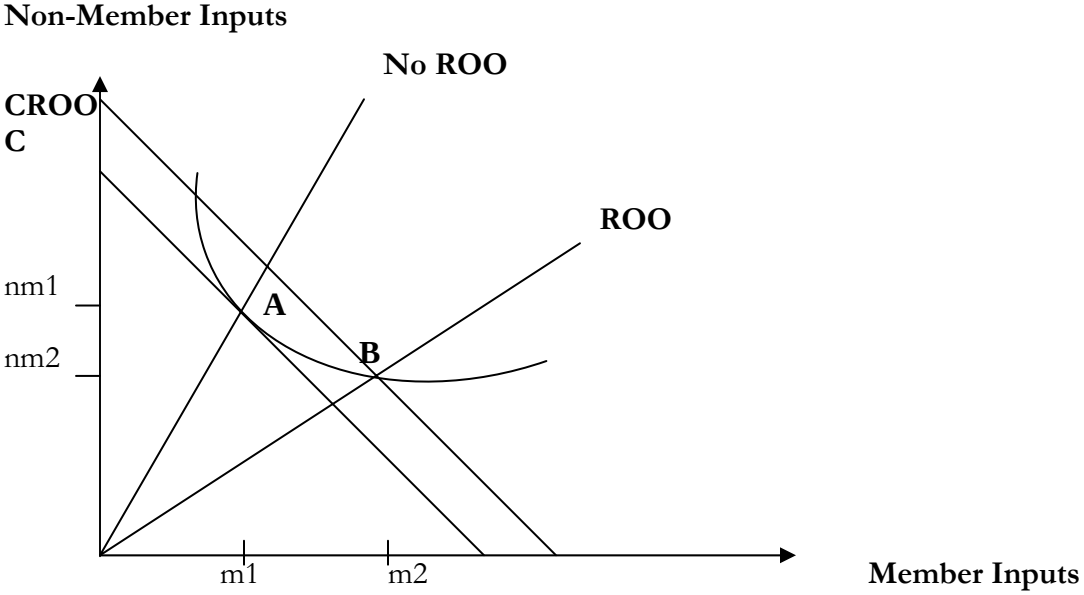

Figure 2: ROO cause inefficient input choices

Table 1: Upper bound estimates of ROO administrative costs

	Study	Total Costs	Administrative	Distortion
MEX exports to US	Cadot et al. (2002)	5.06 %	1.94 %	3.12 %
MEX exports to US	Carrere and de Melo (2003)	6.16 %	1.72 %	4.44 %
CAN exports to US	Kunimoto and Sawchuck (2005)	5.37 %	1.05 %	4.32 %

Source: Kunimoto and Sawchuck (2005)

Table 2: 2003 NAFTA Utilization Rates by Sector for Canada-US Trade*

	Canadian Exports to US	US Exports to Canada	Estevadeordal Restrictiveness Index
1. Live Animals	33	50	6.0
2. Vegetable Products	72	21	6.0
3. Fats and Oils	98	93	5.9
4. Food, Beverage, and Tobacco	64	81	5.7
5. Mineral Products	45	24	5.6
6. Chemicals	26	563	3.1
7. Plastics	93	82	4.8
8. Leather Goods	57	37	5.6
9. Wood Products	19	30	4.1
10. Pulp and Paper	26	28	5.4
11. Textiles and Apparel	94	84	6.0
12. Footwear	72	71	4.8
13. Stone and Glass	58	43	5.1
14. Jewellery	14	17	5.3
15. Base Metals	62	49	4.8
16. Machinery and Electrical Equipment	41	23	3.8
17. Transportation Equipment	85	55	4.2
18. Optics	40	16	4.3
19. Arms and Ammunition	22	52	5.4
20. Miscellaneous	15	55	5.8
Average	**57**	**44**	**5.1**

*Reproduced from Kunimoto, Sawchuk (2005)

Table 3: Comparing the impacts for Canada from moving from no NAFTA to NAFTA		
	FTA no RoO	Market structure
Appiah	+4.3%	Imperfect
Harris and Cox	+8.9%	Imperfect
Dept. Finance	+2.5% ---------- +0.4%	Imperfect ---------- Perfect
Hamilton-Whalley	+0.7%	Perfect

Table 4: Appiah's (1999) Welfare Gains to Canada*			
FTA no RoO	FTA + RoO (20% CTC constraint)	FTA + RoO (30% CTC constraint)	FTA + RoO (40% CTC constraint)
+ 4.3%	+ 4.0%	+ 2.7%	+ 1.5%

*Measured for the representative consumer using equivalent variation, assuming Cournot competition in the industrial sector.

Appendix A: Implementation of ROO with a Focus on NAFTA

The implementation of ROO *within* the context of a given preferential trade agreement is complex and detailed. Furthermore, this process varies considerably *across* PTAs. In the discussion that follows, a general ROO description is given, followed by its specific application under NAFTA.

Section A1 briefly compares preferential and non-preferential ROO. Section A2 describes the different types of preferential ROO. Section A3 discusses various special provisions. Finally, Section A4 concludes.

A1. Preferential vs. Non-Preferential ROO

There are two broad types of ROO: non-preferential and preferential. Non-preferential ROO are used to distinguish origin for the application of anti-dumping, countervailing duties, quotas, voluntary export restraints, or statistical purposes. Preferential ROO are applied to determine if an imported good is eligible to receive preferential tariff treatment under a PTA. This paper focuses on preferential ROO.

A2. Preferential ROO

This section outlines the various criteria that fall under the heading of preferential ROO, and explains what constitutes a "substantial transformation".

Box 1: Types of Preferential ROO

- Wholly obtained or produced - good involves only one country's inputs
- Substantially transformed - good involves more than one country's inputs; note the following subcomponents can be used by themselves or in combination
  - Change in Tariff Classification (CTC) (or Exception to CTC (ECTC)) – requires the HS code of any non-originating inputs be 'suitably different' from the output
  - Regional Value Content (RVC) - stipulates that the product have a certain minimum local value from the exporting country
  - Technical Requirement - requires certain manufacturing operations (e.g. textiles)

Box 1 below lays out the general hierarchy for preferential ROO. (For the specific NAFTA criteria see the Appendix B.) There are two broad categories of preferential ROO: *wholly obtained or produced*, and *substantially transformed*. In the simplest case of origin determination,

the good comprises inputs exclusively of one country. Such goods are considered wholly obtained or produced in that country, and are deemed to *originate*.

Origin determination becomes more difficult when the good is comprised of inputs from (potentially several) different countries. In order to be deemed originating in this case, the good must undergo a substantial transformation in the originating country. The following three basic criteria can be applied to ensure a substantial transformation has occurred: change in tariff classification, regional value content restrictions, and technical requirements. These three criteria are discussed in turn.

A2.1 Substantial Transformation

A2.1.1 Change in Tariff Classification (CTC)

All goods are classified according to the Harmonized Commodity Description and Coding System (HS). The HS is structured into chapters, headings, subheadings, tariff items and statistical breaks on the basis of economic activity or components (see below). Classifications are harmonized internationally at the (six-digit) subheading level. As a simple example, for all countries, chapter 3 pertains to fish and crustaceans; heading 0301 is live fish; and subheading, 030193 is carp.

Harmonized Classification System	
Chapter	2 digits
Heading	4 digits
Subheading*	6 digits
Tariff Item	8 digits
Statistical Break	10 digits

* Classifications are harmonized internationally at the 6-digit subheading level. Tariff items and statistical break items, are specific to each country. Under NAFTA, the 6-digit Harmonized System (HS) classification is generally used (if the good is subject to a specific ROO in Annex 401, the 8 digit HS classification of the good in the country to which the good is be imported is used).

The Change in Tariff Classification (CTC) criterion is used for most NAFTA ROO determinations. More specifically, under NAFTA, over half of all goods require a CTC at the chapter level (in some cases, in addition to other substantial transformation requirements). Please see Table A1 for further details. The classification of non-member intermediate inputs is compared to the classification of the finished goods to be exported. If a sufficient

change has occurred, then origin is granted. Here is a specific example (taken from Document 5001) to clarify:

Substantial Transformation Example

Products: Breads, pastries, cakes, biscuits (HS 1905.90) Non-North American input: Flour (classified in HS chapter 11), imported from Europe. Rule of Origin: "A change to heading 1902 through 1905 from any other chapter." Explanation: For all products classified in HS headings 1902 through 1905, all non-North American inputs must be classified in an HS chapter other than HS chapter 19 in order for the product to obtain NAFTA tariff preference. These baked goods would qualify for NAFTA tariff preference because the non-originating inputs are classified outside of HS chapter 19 - the flour is from chapter 11. However, if these products were produced with non-originating mixes, then these products would not qualify because mixes are classified in HS chapter 19, the same chapter as baked goods.

In some instances, exceptions to the change in tariff classification (ECTC) are applied. ECTC define certain transformations that cannot be used to deem origin. In the above example, for instance, a ROO could confer origin to any good where non-originating inputs underwent "a change to heading 1902 through 1905 from any chapter *other than* chapter 11".

A2.1.2 Regional Value Content (RVC)

Regional value content (RVC) rules apply formulas to determine the percentage of regional (*e.g.* North American) content by subtracting the value of non-originating materials. In NAFTA, RVC rules are used extensively for automotive and chemical products; their application in other sectors is quite limited. There are two methods used to calculate RVC: the *transaction value method* and the *net cost method*. The exporter is often able to choose the method used.[1]

The transaction value method uses the price actually paid for the good. The formula is given by:

$$RVC = \frac{TV - VNM}{TV} * 100$$

where: TV=transaction value, and VNM=value of non-originating materials.

[1] This would be useful, for instance, if exchange rate fluctuations caused one method to fail to confer origin by having differential effects on price and costs.

Under NAFTA, generally, when the RVC is at least 60 (percent), origin is granted.

The net cost method removes sales, marketing, royalties, and shipping costs:

$$RVC = \frac{NC - VNM}{NC} * 100$$

where: NC=net cost, is the price less these aforementioned indirect costs, and VNM=value of non-originating materials- the same used in the transaction value method.
Under the net cost method, a minimum requirement of 50 (percent) is generally used in NAFTA. The automotive sector, however, requires a minimum RVC of 62.5 percent.[2]

A2.1.3 Technical requirements

Technical requirements specify certain operations that must be carried out in the PTA in order to confer origin. For example, in the NAFTA, textiles and apparels must be made using North American yarn or fabric to qualify (which is equivalent to a 100 percent NAFTA content requirement). For apparel, there is a *triple transformation test* that requires the processing of fibre to yarn, yarn to fabric, and fabric to garment in order to confer origin.

A3. Special Provisions

Certain provisions have been put in place that allow for some leniency in the application of ROO. These are the de minimis, absorption, and cumulation provisions.

A3.1 De Minimis Provision

The *de minimis* provision was created so that the use of a small amount of non-originating materials of low value would not prevent a good from obtaining origin (i.e. if these small amounts of inputs did not satisfy the CTC requirement). In NAFTA, the de minimis provision generally applies if the total value of all non-originating goods used is no more than seven percent (of the transaction value). Here is an example (taken from Document 5014):

[2] In an exception to the exporter's choice, NAFTA stipulates the net cost method is to be used for autos.

De minimis Example

Watches (HS 91.02) can qualify for NAFTA tariff preference based on either the CTC requirement, or a combination of the CTC and RVC criteria. The CTC rule requires that all non-originating inputs be classified outside of chapter 91 in order for the product to get NAFTA tariff preference. If the watch had a non-originating watchband, classified in HS 91.13, the watch would not qualify for tariff preference under the CTC rule. However, the watch could still qualify for NAFTA tariff preference if the value of the watchband was seven percent or less, of the value of the finished watch.

A3.2 Absorption/Roll-up

The absorption or roll-up provision allows materials that are deemed originating (though they contain some non-originating input, *i.e.* they use less than 100 percent originating materials) to be considered 100 percent originating when used as an input in subsequent transformations.

A3.3 Cumulation

Cumulation refers to reconciling gaps and overlap in regional trade agreements. Assume two 'spoke' countries initially have separate PTAs with a single 'hub' country. Trade between the spokes may be discouraged if individual provisions from each agreement are not reconciled, or *cumulated*. Without cumulation, a good that is directly exported to the hub would get preferential treatment over a similar good that is exported using inputs from both spokes.[3]

A3.4 Sectoral Agreements

To make PTAs more viable, sectors that initially receive large tariff protection prior to the PTA, are often able to incorporate special clauses into larger trade agreements when they are negotiated. For instance, in many PTAs, there are often strict ROO in the agriculture, and textile and apparel sectors. The following are a few examples from NAFTA:

- Agricultural goods are covered under separate bilateral agreements not included in NAFTA. The rules from the Canada-US FTA remain in place, and there is a separate Canada-Mexico agreement.
- Automatic data processing goods or their parts are considered originating when shipped between NAFTA members because there is a common external tariff on these goods. Once they enter, they may be traded duty-free among members.

[3] This occurs because inputs from the other spoke would be viewed as non-originating, despite the fact that the hub already has a separate trade arrangement with that other spoke. All inputs from another spoke *should* be viewed as originating- this is exactly what cumulation does.

- Textiles and Apparel goods require a three-step "yarn forward" transformation process in North America to confer origin.
- The automotive sector requires that 62.5 percent of the net cost of automobiles and light trucks be North American to confer origin.
- Computers (monitors) require a North American motherboard (picture tube).

A3.5 Certification

The process of certifying origin differs across PTAs. Many agreements have a two-step, private and public certification requirement. Such systems can burden producers with high administrative and compliance costs- in some cases this deters goods that could claim origin from doing so.

NAFTA, however, relies on self-certification. The exporter must complete a certificate of origin, and give this certificate to the importer at the time of declaration. The completed form must be kept on record and may subject to verification for up to five years after the declaration. Self-certification costs are probably best viewed as one-time sunk costs associated with learning the NAFTA preference criteria and paperwork procedure, and ensuring the product satisfies the appropriate origin requirements.

A4. Summary

- ROO fall into two broad categories: preferential and non-preferential. This paper focused exclusively on the former.
- Good produced solely from member inputs originate; while goods that use non-member inputs must "substantially transform" these inputs before origin is granted.
- Substantial transformation requires (individually, or in some combination) the following three criteria: change in tariff classification, minimum regional value content, and technical requirements.
- Special provisions are written into PTAs, these may include: de minimis, absorption, cumulation provisions, or sectoral agreements.
- Certification of ROO can require both public and private components; NAFTA requires only self-certification by the exporter.

NAFTA Appendix B:

ROO are meant to ensure that only goods entirely from NAFTA, or "substantially transformed" in the NAFTA region receive the preferential/reduced NAFTA tariff. Products from other countries that are merely being shipped through, or only undergo minor operations in North America, should not receive the NAFTA tariff, and instead be subject to the Most Favoured Nation (MFN) tariff. Products that meet ROO are said to be "originating".

There are four different ways for a good to be deemed "North American" (originating) – and therefore eligible for the NAFTA tariff rate. Each is a different preference criterion under NAFTA, and is labelled A through D. A brief description of each is given below:

NAFTA Preference Criteria
A. Goods "wholly obtained or produced" in NAFTA region (i.e. contains only North American inputs)
B. Goods containing non-originating inputs but meeting Annex 401 ROO (e.g. through a change in tariff classification (CTC) and/or regional value content criterion (RVC)) Goods produced from originating materials (i.e. produced from materials which may contain non-NAFTA materials, but meet the NAFTA ROO).
C. Goods that do not meet the CTC, but do meet the RVC.
D. Special Provisions for agriculture, textiles, and data processing equipment, etc.

Table A1: Structure of Rules of Origin (ROO) in NAFTA Percentage of Tariff Items in Each Category		
		All Products
ROO Change in Chapter	CC	27.0
	CC/E	5.8
	CC/E/Tech	5.7
	CC or CH/E/RVC	1.3
	CC or CH/E/RVC	1.1
	CC/E or CS/E/RVC	11.2
	Subtotal	52.1
ROO Change in Heading	CH	7.9
	CH/E	14.2
	CH/RVC	3.1
	CH or RVC	
	CH or CH/RVC	
	CH or CS/RVC	6.9
	CH or CS/E/RVC	
	CH/E or CH/RVC	
	CH/E or CH/E/RVC	1.9
	CH/E or CS/E/RVC	
	CH/E or CI/RVC	
	CH/E or CI/E/RVC	
	Subtotal	34.0
ROO Change in Sub-Heading	CS	1.3
	CS/E	
	CS or CS/RVC	
	Subtotal	1.3
	Total	87.4

Abbreviations: CC: Change of Chapter; CH: Change of Heading
CS: Change of Sub-Heading; CI: Change of Item;
E: Exemption; Tech: Other Technical Requirements;
RVC: Regional Value Content Criteria.
Source: Estevadeordal (2000), Journal of World Trade, p.150.

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