

## ABSTRACT

Title of Document: MEASUREMENT AND DETERMINATION  
OF RULES OF ORIGIN IN PREFERENTIAL  
TRADE AGREEMENTS (PTA'S)

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Economics

This dissertation explores the measurement and determinants of product-specific rules of origin (PSRO) in preferential trade agreements (PTAs). In order to study PSRO empirically it is necessary to be able to measure them in some objective way. We analyze in great detail the mechanisms for specifying PSRO in PTAs, propose a methodology for measuring their relative restrictiveness, and demonstrate that accounting for several previously overlooked factors can have important empirical implications. We then employ the proposed measurement methodology to analyze the determinants of restrictiveness in a panel dataset of five recent PTAs in the Western Hemisphere. Exploring four alternative hypotheses we find that, except in a few particular sectors, governments tend to negotiate less restrictive rules so as to assure market access rather than more restrictive rules that would serve as hidden protection.

MEASUREMENT AND DETERMINATION OF RULES OF ORIGIN IN  
PREFERENTIAL TRADE AGREEMENTS (PTA'S)

By

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Dissertation submitted to the Faculty of the Graduate School of the  
University of Maryland, College Park, in partial fulfillment  
of the requirements for the degree of  
Doctor of Philosophy  
2007

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## Preface

This dissertation explores the measurement and determinants of product-specific rules of origin (PSRO) in preferential trade agreements (PTAs). Chapter 1 provides an introduction to the subject and reviews the pertinent theoretical and empirical literature. Chapters 2 and 3 contribute to the field by developing an improved methodology for the measurement of the restrictiveness of the PSRO, and by using the resulting index to analyze the determinants of restrictiveness in a panel dataset of the PSRO of 5 recent PTAs.

In order to study PSRO empirically it is necessary to be able to measure them in some objective way. In Chapter 2 we analyze in great detail the mechanisms for specifying PSRO in PTAs that follow the NAFTA model, and propose a methodology for measuring their relative restrictiveness. The resulting index improves on those existing in the literature in two important ways. First, our index is more complete in the sense that it considers all of the elements of PSRO as they are specified in the agreement texts, whereas existing indices neglect important elements. Furthermore, where some authors have attempted to improve existing indices by including some of the elements we discuss, they still neglect variation within these elements. We thus consider our approach to be the most complete measure available.

Second, where previous indices are based solely on inferences and ad hoc judgments within the context of NAFTA and/or E.U. PSRO, our methodology includes a calibration of the index based on the observed frequencies of different combinations

of alternative rules in 13 different agreements. Many PSRO provide two or more alternative sets of criteria by which a product may be considered originating and thus eligible for preferential tariff treatment. Observing that these alternatives must be expected to have equivalent restrictive effects on the average firm, the ways in which different criteria are combined in alternative rules allows us to infer equivalent restrictiveness of rules expressed in different ways.

Finally, using a dataset for NAFTA from an existing study in the literature we compare the results obtained from the existing index with our new index. We find that the empirical implications of the new index differ both quantitatively and qualitatively from those derived from the existing methodology. By decomposing our index into its constituent parts we show that it is the inclusion of the previously missing elements that generate the different results.

In Chapter 3 we employ the measurement methodology developed in Chapter 2 to analyze the determinants of restrictiveness in a panel dataset of five recent PTAs in the Western Hemisphere. We first address the “Standard Explanation” for rules of origin as mechanism for the prevention of trade deflection, wherein producers in non-member countries export all goods to the PTA markets to the member with the lowest tariffs, and from there re-export to other members thereby avoiding the higher tariffs in those countries. We evaluate this explanation by regressing restrictiveness on the MFN tariff differential and a measure of transport costs, and conclude that this explanation is incomplete at best.

Next, we consider 3 non-exclusive alternative mechanisms that could drive the restrictiveness of PSRO. These consist of conservation of tariff revenues for fiscal purposes, protection of domestic producers, and export promotion. While our specification is not able to definitively reject any of these hypotheses, we are able to conclude that export promotion motives tend to dominate both fiscal and protection considerations.

An important innovation in this analysis is the use of the 13-PTA dataset from the calibration exercise in Chapter 2 to identify the mode level of restrictiveness. We are then able to subtract this mode level from the observed levels in the 5-PTA panel. In this way we control for cross-product variation in the input-output structure of the Harmonized System (HS) classification in which the rules are specified. This is important because the HS is not designed for the definition of PSRO, leading rules with identical criteria to have potentially very different restrictive effects across products. This is the first time this control has been used in empirical analysis of rules of origin. This innovation is made possible by the greater detail of the variation in specification that is captured by the methodology devised in Chapter 2.

## Dedication

To my father, for teaching me that hard work can be worth the effort.  
To my mother, for teaching me what to work for.  
To my wife, for endless dedication and support.  
To my children, of whom I am most proud.

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# Chapter 1: The Role, Effects, and Politics of Rules of Origin in PTAs

## 1.1 Introduction

According to WTO Director-General Pascal Lamy the world faces the prospect of 400 preferential trade agreements by 2010<sup>1</sup>. Preferential Trade Agreements (PTA's) have as their core component the elimination of barriers to trade among the member countries, but not to imports from non-members. These agreements thus are distinct from multilateral trade agreements in the context of the World Trade Organization (WTO) which aim to reduce trade barriers on trade among nearly all the countries in the world – that is – on a non-preferential basis.

There is a somewhat uneasy coexistence between PTA's and the non-preferential, multilateral trading system administered through the WTO. PTA's are in direct contradiction to the nondiscriminatory Most Favored Nation (MFN) principle of the multilateral system. The General Agreement on Tariffs and Trade (GATT), which was the predecessor to the WTO, in Article XXIV provided for the existence of these preferential arrangements, primarily to allow for European integration but also to give space for integration of developing countries, only under the condition that they remove barriers to substantially all trade within a time frame of 10 years<sup>2</sup>.

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<sup>1</sup> Speech to the Confederation of Indian Industries in Bangalore on 17 January 2007 ([http://www.wto.org/english/news\\_e/sppl\\_e/sppl53\\_e.htm](http://www.wto.org/english/news_e/sppl_e/sppl53_e.htm)).

<sup>2</sup> These requirements were only specified, even in these vague terms, in the Uruguay Round. “Substantially all trade” has never been quantified and has become a topic of debate with the rapid proliferation of PTA's in recent years

In order for preferential treatment to be applied in practice, it is necessary to be able to differentiate between goods that are eligible for the established preference and those that are not. This means that goods arriving in a shipment from a determined country must be able to be identified as actually originating from that country in an objective way. The objective criteria for making this determination are the rules of origin.

This dissertation will explore the measurement and determinants of these rules in the context of recent PTA's in the western hemisphere. For the most part we abstract from the discussion of the motivations for entering into PTA's in the first place, and which PTAs are politically viable and which are not. We start from the observation that the observed PTAs exist and as such were viable when negotiated, and in that context we analyze the determinants of the restrictiveness of the rules of origin. This chapter discusses the role and application of rules of origin along with the existing economic theory and empirical analyses of the subject. Chapter 2 develops a detailed methodology for measuring the restrictiveness of product level rules of origin, calculates the proposed restrictiveness index for the NAFTA rules of origin, and compares the empirical implications of this index to those of the only other such measurement index in the literature. Chapter 3 applies the measurement methodology developed in Chapter 2 to NAFTA and four additional PTA's in the western hemisphere, using a panel data set to explore the determinants of the restrictiveness of the rules of origin.

### 1.2 Structure of a preferential trade agreement: Tariff Elimination and Rules of Origin

Preferential trade agreements must at a minimum address the subjects of tariff elimination and rules of origin<sup>3</sup>. Specification of tariff elimination schedules establishes the mechanism for the creation of preferential trade among participating countries and the rules of origin define what constitute products “of these countries”. While the determinants of the timing of the tariff elimination is outside the scope of the analyses in this dissertation, there are several significant papers in the literature that treat the tariff phase-out schedules and the rules of origin as co-determined, and as such it is worth briefly describing their structure. To determine tariff elimination, agreements define a series of “baskets” that establish different calendars of tariff reduction and eventual elimination, and then assign each product in the tariff nomenclature to a basket. Baskets may be defined as immediate elimination of tariffs or a gradual elimination over a period of years. In most cases nearly all tariffs are eliminated within 10 years of an agreement’s entry into force, though tariffs on particularly sensitive products may not be fully phased out for 15 or more years. Some agreements choose to exclude groups of products from preferential treatment altogether.

The rules of origin establish for each product in the tariff nomenclature a set of criteria specifying the amount and/or type of third-party materials that may be incorporated into a product without the product being disqualified for the preferential tariff treatment. These criteria, examined in great detail in Chapter 2 of this dissertation, can specify a share of

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<sup>3</sup> Most recent agreements also include lengthy provisions covering government procurement, investment, services, and intellectual property among other topics. While these additional disciplines can have important effects on the bargaining process in the negotiation of a PTA as well as on the decision to enter into a PTA in the first place, they are unlikely to affect the cross-product variation in the rules of origin and as such are external to the analysis in this dissertation.

value added that must be originating, specific stages of the physical processing that must be carried out in the territory of a member country, or specific inputs that may not be imported from a non-member.

In a PTA each participating country will have its own tariff elimination schedule, allowing for a tariffs on a given product to be phased out at different rates in different countries. On the other hand, generally speaking each PTA will have only one set of rules of origin<sup>4</sup>. In this way, the tariff elimination schedules establish the preferential opening of each member-country economy to the combined economy of the PTA, while the rules of origin establish the degree of openness of the combined economy to intermediates from the rest of the world.

### 1.3 Purpose of Rules of Origin

The primary purpose of rules of origin is to prevent goods from non-member countries trans-shipping through the member with the lower tariff to be sold in the country with the higher tariff, thus avoiding payment of the higher tariff. Figure 1 illustrates the problem. Suppose countries A and B sign a PTA which drives the tariff on trade between them to zero. Because this is not a customs union, both countries are free to maintain different tariffs on imports from the rest of the world, represented by country C. In this example, A maintains a 10% tariff on imports from C while B charges no tariff on imports from C (0%). From the point of view of exporters in country C, they now face a disadvantage when selling in country A, as exporters from B have a 10% cost advantage. Furthermore,

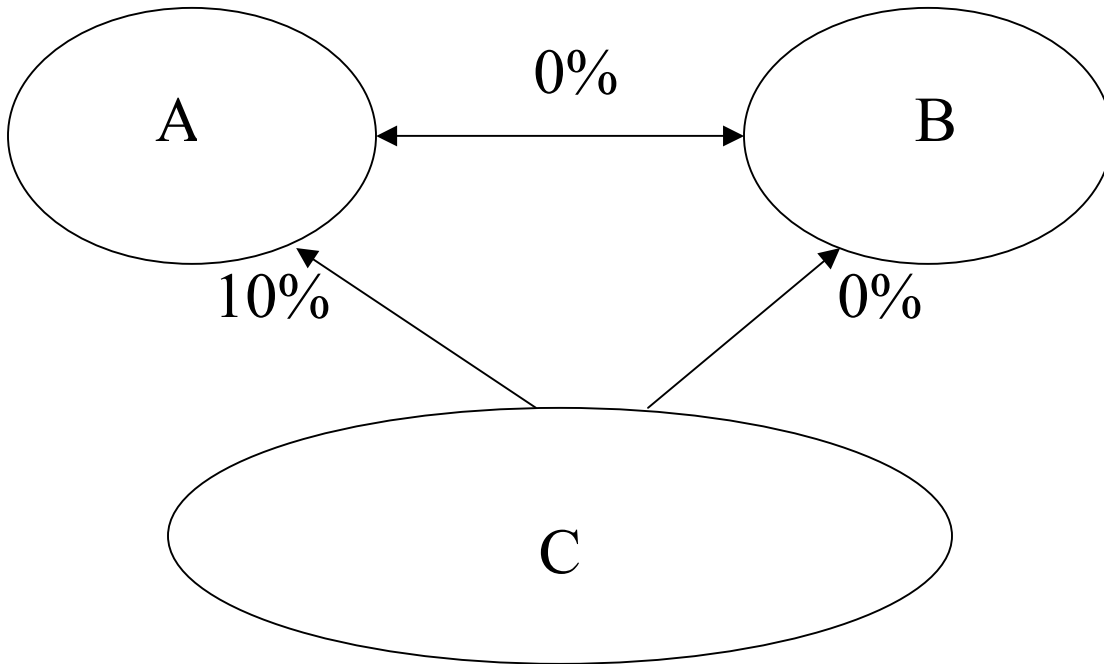
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<sup>4</sup> There are a few cases of recent agreements in South America where the product level rules of origin were negotiated bilaterally in the context of a PTA among 9 countries. The resulting problems of potential triangulations to circumvent one set of rules by transshipping through third member of the agreement are resulting in some initial modifications to the agreements. See Cornejo and Harris (2007).

if the marginal transport cost of shipping the good from *C* to *A* *by way of B* were less than the 10% tariff to be paid in *A*, then the exporter in *C*, absent other impediments to this transshipment, would choose this option.

Furthermore, if the quantities deflected were “small” enough to leave the price in *A* unchanged, the exporters would even enjoy the “protection” afforded by the tariff. Note that this trade deflection represents a pure efficiency loss, as the tariff revenues are not collected, but the additional transport costs reduce the gains to the exporter in *C* to less than the value of the tariff revenue not collected.

**Figure 1**



To prevent trade deflection, the PTA must include a barrier of some sort to trade between A and B of goods originating in C that increases the cost by an amount in excess of the tariff savings net of the transport costs. Rules of origin are included in PTAs explicitly to serve as this barrier. Historically, PTA's in the western hemisphere have used very simple rules of origin. Most notable of these are the series of agreements in the Latin American Integration Association (ALADI in Spanish) framework, the Andean Pact agreement, and the Common Market of the South (MERCOSUR). These agreements all specify a "general rule"<sup>5</sup> that applies to all products in the tariff nomenclature for which no "specific rule" has been specified. This is noteworthy in the context of this dissertation in that the use of a general rule does not allow for any degree of

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<sup>5</sup> The general rule in all three cases is alternatively a change of classification at the heading level or a regional value content of between 40 and 60 percent, depending on the agreement. See Chapter 2 for a discussion of the relative restrictiveness of this rule.

responsiveness of the rule to the particulars of the trade pattern between the member countries. The general rule is meant to serve as nothing more than an impediment to trade deflection. This makes sense considering that these countries trade a very limited number of products among them, and that the products that they do trade are predominantly primary goods with little capacity for incorporation of inputs imported from non-members. The specific rules used to supplement the general rule, though, have increased in number over the years, and these rules do respond directly to the interests of producers in the participating countries. The increasing importance of specific rules can be largely attributed to the increasing globalization of production processes in these countries.

The major turning point in the evolution of rules of origin in western hemisphere PTAs was the negotiation of NAFTA in the early 1990s. While the U.S.-Canada Free Trade Agreement that preceded NAFTA by a few years used relatively simple rules, in NAFTA the countries made an effort to tailor the rules of origin to the specifics of the production process and input-output structure of each product. Much of the pressure for greater precision came from the Canadian side, in an attempt to correct for a lack of specificity in the U.S.-Canada rules that had resulted in discretion in interpretation that had frequently not resulted favorable to Canadian exporters.

The preferences of producers in the countries were, unsurprisingly, also taken into account<sup>6</sup>. All subsequent PTAs signed by each of the three NAFTA members have

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<sup>6</sup> See, for example, anecdotes included in Destler (2006).



included rules of origin that are similar in structure and variability to the NAFTA rules<sup>7</sup>. An interesting question, then, is how and in what circumstances these preferences affect the restrictiveness of rules. That is the central question of this dissertation.

Another interesting question is why rules of origin have become more important in recent years<sup>8</sup>. Preferential trading arrangements have existed through most of the post-war period, especially among developing countries. In the western hemisphere alone, the Latin American Free Trade Association (ALALC in Spanish) which later morphed into ALADI dates to the early 1960's, as do the Central American Common Market and the Andean Pact. All of these arrangements included rules of origin provisions, though the rules tended to be quite simple in their expression and fixed across products (the "general rule" mentioned above).

This style of defining the origin regime, with a general rule that applies to most products and "specific rules" that apply to those few products where the need arises, has some obvious benefits, especially for trade among countries with similar economic structures. First, the general rule provides a high degree of predictability for users of the rules, as the general rule applies to almost all goods. Furthermore, for all primary goods, the classification change at the heading level in the general rule implies that these sorts of

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<sup>7</sup> The only exception to this generalization are the US agreements with countries in the Middle East. Having signed a PTA with Israel in 1985 that was based on an across the board regional value content provision, it was not politically practical to put forth rules of NAFTA-like complexity in PTA's with Jordan, Bahrain, and Morocco. Nonetheless, these latter two do include NAFTA-style rules for textile and apparel products.

<sup>8</sup> The following draws on Harris (2007).

goods will have to be wholly obtained<sup>9</sup>, and so evaluation of origin for the bulk of trade among these countries is very straightforward.

At the time these agreements were negotiated, the trade among the countries involved in each agreement was fairly concentrated in primary goods, with the few exceptions well known and easy to account for. That made this sort of origin regime more than adequate to the task of defining which goods were originating and which were not. Even for developed countries, these simple sorts of rules of origin were observed. The U.S. PTA with Israel in force since 1985 has an across the board 35% value added requirement.

In more recent decades as production processes have become more globalized these simple fixed criteria are becoming less helpful. Especially when considering trade with developed countries that have an export supply that is much more diverse, an across the board rule that does not respond to the varying levels of aggregation of the Harmonized System<sup>10</sup>, much less the productive capacities of the countries involved, is not practical. Consequently, most agreements signed by developed countries post-NAFTA establish detailed rules for each product in the tariff nomenclature.

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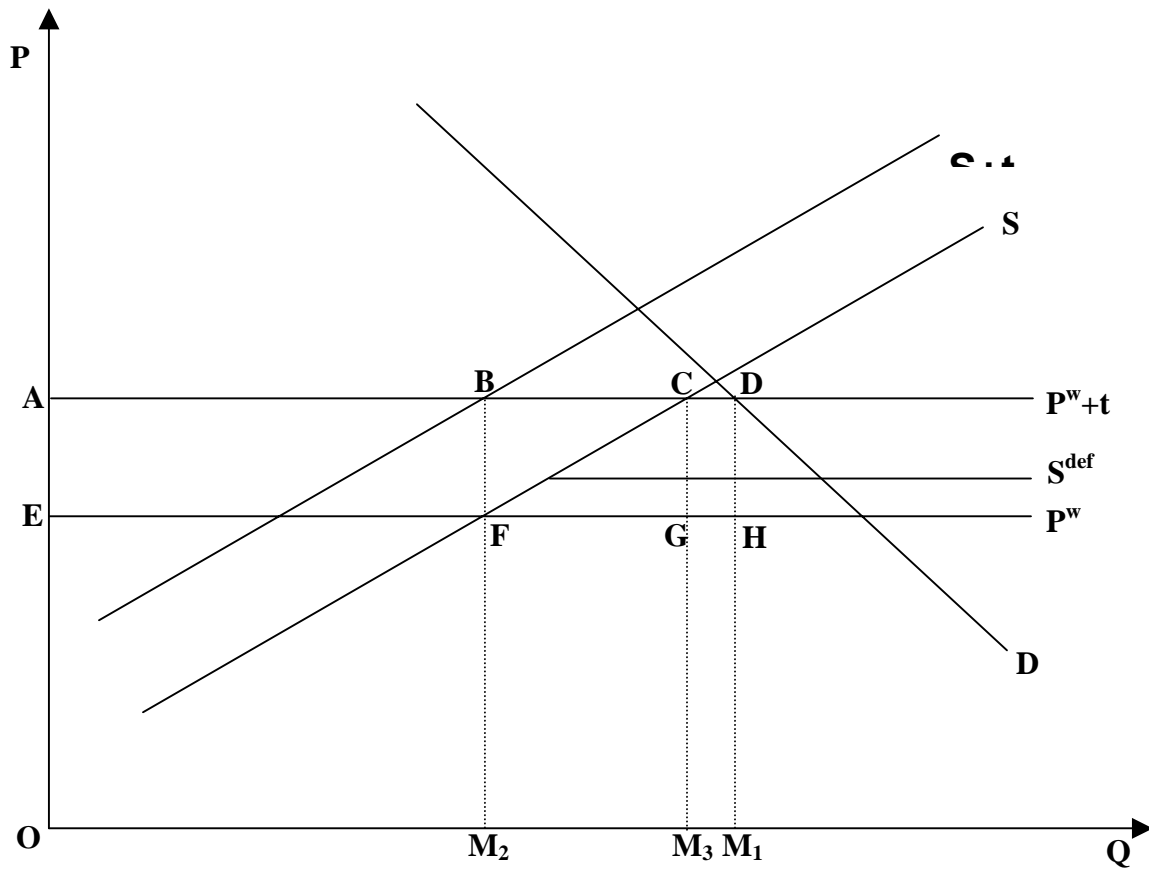
<sup>9</sup> This is because the heading change tends to imply transformations that are physically impossible, like turning goats into horses.

<sup>10</sup> The Harmonized System (HS) is the product classification system maintained by the World Customs Organization that establishes approximately 5,000 product categories. The HS is used as the tariff nomenclature by nearly all countries.

1.4 Effects of a PTA

Subsection 1

**Figure 2**



The effects of a PTA in a given market can be described by the graph in Figure 2<sup>11</sup>. For simplicity here the importing country (whose market is represented in the figure) is assumed to be small relative to the rest of the world, but large relative to the PTA partner. The good in question is imported from the rest of the world at a constant price  $P^w$  and from the PTA partner whose supply schedule  $S$  is upward sloping. The country's import

<sup>11</sup> This depiction was developed by Panagariya (1999).

demand schedule is represented by D. Before the entry into force of the PTA all imports pay a specific tariff  $t$ , resulting in total imports of  $OM_1$ , of which  $OM_2$  is imported from the PTA partner and  $M_2M_1$  is imported from the rest of the world. The importing country's government collects tariff revenue corresponding to the area ADHE.

When the PTA goes into force, the imports from the partner country are no longer required to pay the tariff, shifting the partner's supply curve downward from  $S+t$  to  $S$ . Because the partner country is unable to fully supply the import demand at the tariff inclusive world price, this has no effect on the market price in the importing country. The partner country now supplies  $OM_3$ , and the quantity  $M_3M_1$  is imported from the rest of the world. This is a case of pure trade diversion<sup>12</sup> where the quantity  $M_2M_3$  is diverted from more efficient producers in the rest of the world to the relatively less efficient producers in the partner country due to the preferential tariff<sup>13</sup>.

Importantly, under the PTA no tariffs are paid on imports from the partner, so tariff revenue falls to an amount represented by the area CDHG. The exporter continues to receive the price  $P^w+t$  but no longer pays the tariff. The area ACGE that before the agreement was tariff revenue becomes producer surplus for the exporter in the partner country. This transfer from tariff revenue to partner-country producer surplus is dubbed the "revenue transfer" effect<sup>14</sup>.

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<sup>12</sup> Viner (1950)

<sup>13</sup> Some of these results are dependent on assumptions regarding elasticities and the initial distance between B and D relative to the magnitude of  $t$ . However, this general case is likely to obtain in many instances.

<sup>14</sup> Panagariya (1999)

An assumption that is embedded in the above graph is that the full export supply of the partner country qualifies as originating and is thus eligible for duty free treatment under the PTA. If the rules of origin are written such that none of the partner country's exports would qualify, then the supply curve would not shift at all and the import quantities and tariff revenues would not change.

On the other hand, if the rules of origin are written such that a minimal amount of processing (for example, repackaging a product imported from the rest of the world) would confer originating status the result would be a partner-country export supply curve that becomes perfectly elastic because agents in the partner country would be able to import the product from the rest of the world, repackage it, and then ship it to the importing country. This new perfectly elastic export supply would be above  $P^w$  by a distance equal to the repackaging costs and the additional transport costs involved in shipping the goods imported from the rest of the world through the partner country. In this case all tariff revenue would be lost, with a fraction recaptured as consumer surplus in the home country. The area between the supply curve from the rest of the world at  $P^w$  and the new "deflected supply" (represented by  $S^{def}$  in Figure 2) would be pure efficiency loss due to repackaging and transport costs<sup>15</sup>.

In this case there is no gain (or loss) in producer surplus in the partner country. Production up to the "kink" in  $S^{def}$  continues to occur in the partner country. Beyond the kink, production occurs in the rest of the world and is repackaged in the partner country. The market price in the home country falls, but remains above the world price  $P^w$ .

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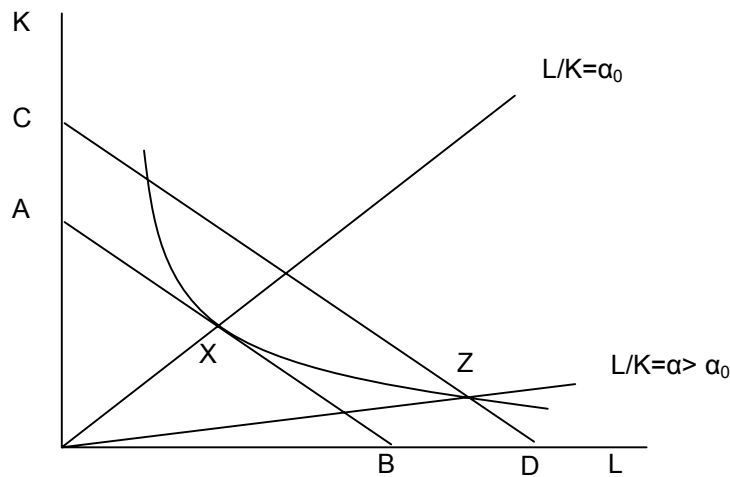
<sup>15</sup> Assuming perfect competition among the "repackaging" firms in the partner country.

## 1.5 Effects of Rules of Origin

### 1.5.1 Theoretical Analysis

An important first observation is that binding rules of origin raise the cost of production. By requiring a final good producer to source inputs from a regional producer of intermediates when that final good producer would not otherwise choose to (i.e. when the rule is binding) there is an increase in costs. Krishna and Krueger (1995) present an elegant illustration in the context of a rule of origin specified in terms of physical content.

**Figure 3**



A country produces, using capital (K) imported from a non-member of a PTA and domestic labor (L), with a unit isoquant depicted by the curve in Figure 3, minimizing cost by using the combination of inputs with Labor/Capital ratio  $\alpha_0$  at point X. The unit cost of this production then would be represented by the area under the line AB. A rule of origin that requires a higher level of domestic inputs measured by  $\alpha > \alpha_0$  would move the cost-minimizing production point to Z with unit cost represented by the area under line CD which is clearly greater than the area under AB. This effect on production costs

is the fundamental mechanism that makes rules of origin useful as a trade policy tool for the prevention of trade deflection, as well as other potential uses.

The earliest work relevant to the effects of rules of origin comes from Grossman (1981) in the context of domestic content requirement imposed by governments on their own producers. More recent work by Krueger (1993), Krishna and Krueger (1995), and Ju and Krishna (1998, 2002), and Krishna (2003) worked out more fully the economic effects of rules of origin, succinctly summarized in Krishna (2006).

Krishna (2006) sets forth four “laws” regarding the effects of rules of origin. First, that rules can shelter industries from the effects of a PTA; second that details in the rule specification can matter significantly; third that the time frame matters, with short-term and long-term effects differing meaningfully; and finally fourth that the effects of increasing rule restrictiveness can be non-monotonic, and thus more complex than is commonly supposed and potentially counterintuitive.

Krishna’s first law covers the most obvious, or at least most discussed, effects of rules of origin. In addition to preventing trade deflection, rules of origin can be used (or abused) to dramatically alter the liberalizing nature of a PTA. For example, a rule of origin for coffee that required that the coffee beans be grown in a member country would not be considered to be terribly restrictive if the agreement included a country that is a major producer of coffee beans (such as Colombia, Brazil, or Indonesia). If this rule were established in an agreement between the U.S. and Canada, on the other hand, it would

effectively rule out free trade in coffee products between the two countries because no producer would be able to meet the rule of origin due to a complete absence of originating coffee beans in these countries. Rules of origin that require that a key input be originating can undo all liberalization if that input is not produced in any of the member countries.

More subtly, imagine a case where producers of an intermediate input in one country are protected from international competition by a tariff. When the country enters into a PTA, producers of a final good in the partner country that use this intermediate can be compelled by the rule of origin to use these protected intermediates, at the protected price, in order for their final goods to be able to enjoy the preferential tariff treatment afforded by the PTA. In this way, even though the partner country may have a zero tariff on the intermediates, the final good producers are effectively paying the tariff-ridden price in order for their product to qualify<sup>16</sup>.

Krishna's second law, that details matter, focuses primarily on the calculation of regional value content (RVC) requirements. RVC's fundamentally specify the fraction of value added in a product that must be originating in a PTA member in order for the good to qualify as originating. As any accountant would suspect, the calculation of the value added can be manipulated to include or exclude a variety of concepts, thus favoring or prejudicing producers depending on the specification. In this discussion as well as in previous papers<sup>17</sup>, the author focuses primarily on the relative effects of inclusion or

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<sup>16</sup> This phenomenon was dubbed "exporting protection" by Krueger (1993)

<sup>17</sup> See for example Krishna and Krueger (1995).



exclusion of capital costs in value added and on price versus cost-based calculations, as this was a major sticking point in the NAFTA negotiations. Only limited mention is given to the administrative costs implied by different RVC calculation methods. In practice, while more precise methods of accounting can be preferable on a theoretical level, the documentation costs of demonstrating origin under these systems can be quite burdensome<sup>18</sup>. Origin RVC calculations are not required for any purpose other than origin determination, and so imply an added administrative overhead cost for any producer that wishes to export under a PTA with a rule of origin based on regional value content.

Another instance in which what may seem to be details can be very important are the use of exceptions in rules based on a change of tariff classification. This point is not included in Krishna (2006) but can have important consequences<sup>19</sup>. By modifying the scope of non-originating inputs permitted by the rule of origin these provisions, which are broadly used in some agreements, can have important effects on the ability of producers to qualify for preferential treatment.

Krishna's third law, that the time frame matters, is based largely on work done in Ju and Krishna (1998, 2002) and Krishna (2003), the last of which is the first full treatment in the literature of conditional policies like rules of origin in a full general equilibrium framework. The authors show that a rule of origin that is just binding or minimally restrictive based on the pre-PTA structure of prices and costs becomes non-binding once

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<sup>18</sup> See for example Herin (1986) and Anson et. al. (2003).

<sup>19</sup> This topic, noted also in Carrère and de Melo (2006) is developed in detail in Chapter 2.

these prices and costs adjust in the PTA environment. This result stems from changes induced by the conditional policy (preferential access conditional on meeting the rule of origin) on the factor price frontier faced by producers. Furthermore, the changes in the factor price frontier can induce changes in the wage-rental ratio, which can then induce capital inflows.

Indeed, it is precisely this investment effect that may lead countries to set binding (but not prohibitive) rules of origin. Preferential access to a protected market under binding rules of origin will attract investment in the production capacity of that good. This long run effect is especially in the interest of relatively capital scarce countries (i.e. developing countries).

Krishna's fourth law, that the effects of the restrictiveness of a rule of origin on several different variables are non-monotonic, also draws heavily on Ju and Krishna (1998, 2002). The arguments presented for the non-monotonicity are based on a setup with heterogeneous firms<sup>20</sup> that, as restrictiveness of the rule of origin increases, begin to opt out of the preferential regime and revert to the MFN regime – that is, they cease to make use of the PTA. In this context the authors show that the combined imports of the PTA members from the rest of the world of the final good first increase and then decrease as the restrictiveness of the rule increases. At low but binding levels of restrictiveness all firms in the country that produces the final good will be substituting regional intermediates for imported intermediates, reducing imports. As the restrictiveness

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<sup>20</sup> Heterogeneous in the degree to which the rule increases costs.

increases, firms will begin to switch to the MFN regime and imports of intermediates will increase again.

The same situation presents in reverse for imports of the final good. At low levels of restrictiveness, final goods producers redirect their output from their domestic market to the PTA partner to take advantage of the benefits of the agreement as described in the previous section (the revenue transfer effect). This redirection of production from the domestic to the PTA partner market will require the domestic market to be supplied by imports from the rest of the world. As the restrictiveness of the rule of origin is increased, the cost increase caused by the rule erodes the benefits of the PTA and firms begin to switch from the PTA regime back to the MFN regime, which will also imply switching back to supplying their domestic market, reducing imports from the rest of the world. Similar non-monotonicities are observable in the prices of intermediates and final goods.

### 1.5.2 Empirical Analysis

The empirical literature on the effects of rules of origin is quite scarce. There are no studies of the effects of rules of origin on good or factor prices. With the exception of the political economy models that will be discussed in the next section, most of the few empirical analyses of rules of origin focus either on the effects of rules of origin on aggregate trade flows or on quantifying the cost of complying with rules of origin.

Of the first sort, the most thorough analysis is Estevadeordal and Suominen (2005). Using a gravity specification the authors test for the effects of the average restrictiveness

of the product-specific rules of origin in nearly 100 PTA's. Their principal findings are that more restrictive rules of origin are associated with reduced aggregate trade flows, and that these effects fade over time.

At first glance, neither of these two results is particularly surprising. The purpose of rules of origin is to impede specific trade flows, not to facilitate trade. More restrictive rules should impede trade more. What is surprising is that the result is so strong and robust. There are several instances in which more restrictive rules as measured by the authors would not necessarily imply greater impediments to trade<sup>21</sup>. The strength of this result is fairly convincing evidence that rules of origin are indeed used as a protective device.

The fact that the trade-restrictive effect of rules of origin decreases over time is quite straightforward. The authors suggest that this result is due to traders learning to comply with rules of origin such that the costs of compliance fall. They mention in passing more convincing explanations. First, the dummy variable used to indicate the presence of a PTA covering a country pair in the gravity estimation is constant from the year of the PTA's entry into force. As discussed above, however, PTA's do not eliminate all tariffs immediately at entry into force, but rather specify tariff elimination schedules that provide for the gradual removal of tariffs over time. The benefits of the PTA, that is, the benefits of complying with the rule of origin, are therefore increasing over time. The rules of origin, on the other hand, are fixed and constant from the date of entry into force.

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<sup>21</sup> For example, see discussion of the correlation between rule restrictiveness and economy size in section 1.7 below.

Thus, the cost is fixed and the benefit increasing. The observation that the trade-restrictive effects of rules of origin is decreasing over time is consistent with increasing benefits and constant costs. The authors also acknowledge that their time period includes the beginning of multilateral tariff reductions stemming from the Uruguay Round of GATT negotiations, which should be reducing the distortionary effects of PTA's generally. Finally, given the time frames involved, it is reasonable to expect that firms will have had time to make investments that would allow them to more easily meet rules of origin. The authors have an additional study in progress (Estevadeordal, Suominen and López Córdova (2006)) that examines the effects of rules of origin on industry level FDI flows in NAFTA that shows initial support for the contention that rules of origin create an incentive to invest in the production of regional inputs.

The gravity study also analyzes the effects of two other variables, though these are more problematic. First, the authors hypothesize that regimes with greater variation across products in the level of restrictiveness may be more restrictive of trade than regimes with more uniform rules (basically, product by product negotiations as opposed to general rules). They find that this is true, but never include the two variables in the same regression, and so leave unanswered the degree of correlation between the two variables. It seems likely that there is significant positive correlation between a regime's average level of restrictiveness and the standard deviation of this restrictiveness.

Second, the authors explore the effects of an index of compliance facilitation measures that are included frequently in different agreements. These measures include *de minimis*

provisions that allow the use of small amounts of non-originating materials that do not meet change of classification requirements, and provisions that expand the set of countries whose products may be considered originating when used as inputs (cumulation provisions). This index is found to have a positive effect on trade flows. However, the index is quite crude; some of the provisions included in the index are used differently across regimes, and could be expected to have different effects. Furthermore, the different types of provisions, aside from all being likely to reduce the incidence of rules of origin on trade flows, are quite different mechanisms that are aggregated in a very simplistic manner. More helpful, perhaps, would have been to include each as a separate dummy variable.

Finally, the authors analyze the effects of rules of origin on the trade in intermediates, and find that restrictive rules on final goods increase the trade in intermediates. They concentrate their analysis on 5 industries, and their input/output structure is simply the division between final and intermediate goods within an ISIC industry. Their results are not surprising, as much of the point of rules of origin is to provide incentives for the utilization of regional inputs. The data difficulties of gravity analysis at the sectoral level, however, present enough concerns to leave some question as to the strength of the end results. For example, they choose to exclude the PTA variable from the sectoral regressions due to inconsistent results, but this leaves the origin restrictiveness variable to capture the presence of a PTA. Furthermore, at least among PTA's that do not rely on a general rule, the restrictiveness of a rule is likely to be higher in PTA's that have a developed industry to protect, and thus are more likely to trade in both final and

intermediate goods. The higher restrictiveness then may be an effect of higher trade in intermediates, not the cause.

A number of authors provide anecdotal treatment of the costs of complying with rules of origin in PTA's. For example, Herin (1986) reports costs to firms in Finland of demonstrating the origin of goods exported to the EC on the order of 1.4%-5.7% of the value of the shipment.

Carrère and de Melo (2006) provide a fascinating analysis of the compliance costs of rules of origin in NAFTA. It is an observed fact that not all imports from a PTA partner necessarily enter a country under the PTA regime. By comparing the "utilization rate" of the NAFTA regime by imports from Mexico into the U.S. with the preferential rates and the rules of origin, the authors are able to draw inferences in a revealed preference framework as to the cost implications of the rules of origin. As a first step, they use a methodology suggested in Anson et. al. (2005) and take the preference margin in goods with 100% utilization as the upper bound for a compliance cost estimate, and the preference margin on goods with a 0% utilization rate as a lower bound. Assuming that utilization rates between 0% and 100% indicate indifference on the part of firms between the two regimes (heterogeneity of firms notwithstanding), they then arrive at an estimate of compliance costs of just over 6% of the value of the goods on average.

Moving beyond these non-parametric estimates the authors then specify a simple functional form for the relationship between utilization rates on one side and tariff

preferences and rules of origin on the other. This then allows for a regression analysis where the rules of origin are quantified using dummy variables for three different forms of rule (Change of Chapter, RVC, and Technical Requirement). The estimated coefficients allow for a calculation of estimated costs for different types of rules of origin in different sectors. They find that average compliance costs are more on the order of 3%-4% for products with positive utilization rates<sup>22</sup>. The authors are also able to generate an ordering of the costs implied by different specifications of the rule of origin, and compare this ordering to the order implied by a “synthetic index” of restrictiveness in the literature<sup>23</sup>. These results are discussed in more detail in Chapter 2 of this dissertation. Suffice it to say at this point that the order of the cost estimates differed meaningfully from the order implied by the existing index.

### 1.6 Politics of Rules of Origin

One might ask the question “Why do we find rules of origin at all?”. Indeed, many of the more important papers that provide theoretical analysis of rules of origin compare the cases of PTA’s “with” and “without” rules of origin<sup>24</sup>. In the theoretical counterfactual cases of PTA’s without rules of origin, these papers explicitly assume no trade deflection. This is useful for expositional clarity in the context of these papers as well as necessary for the comparative statics analysis of the effects of the rules of origin. However, the fact is that the only mechanisms in practice that impede trade deflection are the very rules of origin. Trade deflection is defined as transshipment of a product from a non-member

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<sup>22</sup> The cost estimates are below 2% for products with 0% utilization rates, but the average tariff preference in these goods is also much lower (<0.4%).

<sup>23</sup> Estevadeordal (2000)

<sup>24</sup> For example Panagariya and Duttagupta (2001).



through the lowest-tariff member country for final sale in a high-tariff member country. In a model where there are intermediate inputs from multiple countries employed in the production of a final good, the absence of trade deflection must necessarily imply the presence of some processing, and therefore value added, within the territory of a member country. Any rule requiring value added in a member country is by definition a rule of origin. The question then becomes how much member-country value added is to be required, in other words, how restrictive is the rule of origin.

This observation leads one to distinguish between the level of origin restrictiveness necessary to rule out trade deflection, and the requirements observed in practice. In principle if there are no rules of origin, merely transporting a good from a non-member country to the low-tariff country adds value in that it can then be sold in the high tariff country at the tariff-protected price. Thus, in the absence of transport costs, to prevent deflection the rule of origin must require that the value added in a member country exceed the difference in the MFN tariffs of the two member countries, because this amount of value is added simply in the act of deflection. In the presence of transport costs, to prevent deflection the value added required by the rule of origin must exceed the MFN differential net of the transport costs. Only in the cases where the transport costs exceed the MFN differential is there truly no need for rules of origin. Even then, MFN rates and transport costs can be expected to vary over time, and some precautionary rule would make sense.

Although for the most part we exclude welfare analysis in this dissertation, it is interesting to point out that in the presence of transport costs, rules of origin that prevent deflection are welfare improving<sup>25</sup>. This is because when there is deflection, the increased transport costs derived from the transshipment through the low-tariff country waste resources, reducing welfare. By preventing deflection the rule of origin ensures that this loss is prevented.

While the prevention of trade deflection makes rules of origin a necessary elements of any preferential trading scheme, the opportunity to tailor these rules to the needs of particular interests in one or more of the participating countries is frequently seized. In the recently concluded negotiations between the U.S. and Colombia, the conditions for coffee products to be considered originating presented a difficult problem. While Colombia is a major producer of coffee, the U.S. does not have a climate conducive to its cultivation. Nonetheless, there are a number of businesses in the U.S. that specialize in roasting coffee imported from all over the world and creating blends suited to particular tastes. Thus, Colombia had an interest in protecting its domestic market from competition with beans from Indonesia, Thailand, Brazil, and others, while the U.S. negotiators were pressured to establish rules that would allow American companies like Starbucks to export their blended coffees to Colombia duty free. The elegant compromise that was eventually reached established a rule of origin for coffee that required all such products to be elaborated from originating coffee beans. However, a quota was established in Colombia that provides for duty free access for a fixed amount

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<sup>25</sup> This has been pointed out by Krishna and Krueger (1995), among others.

of coffee from the U.S. that complies with a less restrictive rule of origin that requires only roasting.

This arrangement perfectly exemplifies several interesting points. First, rules of origin are negotiated for purposes beyond simple prevention of trade deflection. Second, rules of origin can be written so as to favor or prejudice producers in either country or both. Finally, the agreed rule reflected the interests of both parties. A significant share of the nascent political economy literature is based on an assumption that rules of origin in North-South PTA's are designed to capture all of the surplus generated in the South for producers in the North. In this case at least, the division of surplus seems to be fairly even. Broader study is necessary to ascertain if this anecdote is representative, which is something we try to do in Chapter 3.

The earliest discussion of the politics of rules of origin appears in Krueger (1993) and Krishna and Krueger (1995), with the most salient result being the description of the possibility of using rules to "export protection" of intermediates. Additionally these papers laid the initial groundwork for much of the discussion of the effects of rules of origin mentioned in the previous section.

Subsequently, Estevadeordal (2000), in addition to proposing a simple methodology for measuring the ex ante restrictiveness of rules of origin set out a fairly simple model in which the players negotiate rules of origin in a first stage, and then negotiate tariff elimination schedules in a second stage taking rules as given. This framework was tested

empirically for the case of NAFTA and a positive correlation was found between the restrictiveness of the rules of origin and the length of the tariff phase-out period<sup>26</sup>. The objective of the analysis was more focused on the relationship between rule restrictiveness and the length of the phase-out period, with very little careful analysis of the determinants of restrictiveness in the first stage of the game. These determinants are explored in Chapter 3 of this dissertation.

The most fully developed political economy model that studies the determination of the restrictiveness of rules of origin is Cadot, Estevadeordal, and Suwa-Eisenmann (2006) (henceforward CES). The authors use a framework based on the principal-agent model of policymaking established in Grossman and Helpman (1994) to analyze the simultaneous determination of rules of origin and tariff preferences in the context of a North-South PTA<sup>27</sup>, with particular focus on NAFTA. They then argue that the rules of origin function as an implicit subsidy to producers of intermediate inputs in the North country by using a combination of tariff preferences and rules of origin (The article title is “Rules of Origin as Export Subsidies”)<sup>28</sup>. In the context of Figure 1, the revenue that would have been transferred to the final goods producer is captured and re-transferred to producers of intermediates by setting the rule of origin such that the final good producer in South is left indifferent between complying with the rule and obtaining the preference and not complying and paying the MFN tariff.

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<sup>26</sup> This result turns out to be sensitive to important features of the restrictiveness measurement methodology employed, which we explore in great depth in Chapter 2.

<sup>27</sup> The relative level of development is less important than the relative bargaining power and the relative capital intensity.

<sup>28</sup> The PTA with rules of origin is used to implement a de facto subsidy because explicit export subsidies are forbidden by the GATT/WTO.

CES then provide an empirical analysis of their model in the context of NAFTA. In a first stage, they find a negative correlation of rule restrictiveness with the initial Mexican tariff and an inconsistent correlation with the U.S. tariff. They then find a negative correlation between the predicted values of the rule restrictiveness and the initial preference margin granted by the U.S. (where the initial preference margin is the ad valorem preference granted in the first year after entry into force of the agreement). These results are consistent with Estevadeordal (not surprisingly, as they are based on essentially the same data).

In a regression whose dependent variable is the level of Mexican preferential exports to the U.S. they include a specification in which the rules of origin are included on the right hand side as dummy variables for the level of change of classification and the presence of exceptions, RVC requirements and technical requirements. The coefficients on these variables are as expected (negative, with greater magnitudes for larger classification changes) except for the exception and technical requirements, which are both positive. However, there is no control for industry or section of the HS, and in NAFTA neither of these elements ever occur independent of a classification change, making the specification somewhat suspect. Still, it is a curious result that the authors do not explain.

It must be acknowledged that the model fits intuitively well with the rules of origin observed for some sectors in some agreements, with the textile and apparel sector in NAFTA being perhaps the most dramatic example. However, there are many nits to pick

with the setup in this paper. First, on the theoretical side, the authors treat the tariff preference as a choice variable in the policymaker's objective function<sup>29</sup>. Indeed, the negotiation bargaining game is solved by assuming that the North country holds the South country to its participation constraint, which is expressed as a first order condition strictly (directly) relating the restrictiveness of the rule of origin to the margin of preference. In a very limited sense, in the context of the tariff elimination schedule, this may be valid. The tariffs on bilateral trade (subject, of course, to the rules or origin) are removed gradually over time, and the length of time is most certainly a choice variable for the negotiators. However, in the medium and long term (5-10 years), Article XXIV of the GATT/WTO requires that the preference margin be equal to the MFN tariff. If the MFN tariff rate is taken as predetermined in the negotiations of the PTA, then it is difficult to treat the preference margin as a variable of choice.

In the specific context of the NAFTA negotiations, it is easier to argue that the MFN rates were endogenous, because these negotiations were simultaneous with the GATT Uruguay round of multilateral tariff negotiations in which the MFN rates were determined. For later agreements, it is harder to argue that the MFN rates depend in any significant way on the rules negotiated in the PTA.

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<sup>29</sup> The idea that the MFN tariff is a choice variable in the process of establishing the architecture of a PTA is consistent with models of PTA's where MFN tariff reduction in the WTO is resisted in order to maintain the self-enforcing qualities of the preferential agreements and their capacity to induce non-trade actions in the PTA partner (e.g. observance of labor or environmental standards) Limão (2006). The CES model would conflict with these other models, however, in that they assume that all surplus is captured by the North, with none left to serve as a self-enforcement mechanism.

Another consideration is that the scope of products subject to prolonged tariff elimination periods is generally quite limited. For example, in NAFTA the U.S. fully eliminated tariffs on 77% of tariff lines upon entry into force of the agreement – that is, immediately. Fully 94% of tariff lines were liberalized within 5 years. While it is possible that the remaining tariff lines represent a disproportionate fraction of Mexican exports to the U.S., even if the CES model can be considered a good description of products with prolonged tariff phase-out, this accounts for only a small fraction of the product universe. Products in the textile and apparel sector on the other hand have on average some of the longest phase-out periods, with many products not reaching free trade for 10 years. Again, the model intuitively fits well with the textile and apparel sector in NAFTA, but is hard to generalize.

In fact, Anson et. al. (2003)<sup>30</sup>, which presents an earlier version of this model, mentions in a footnote that one could take as given that all intra-bloc tariffs must go to zero and that therefore the rate of preference is predetermined by the MFN rates. They point out, then, that as MFN tariffs proxy for lobbying power, this power may then feed through to protection in rules, and thus the same rules/preferences tradeoff would obtain. However, while perhaps the tradeoff remains, it's interpretation is quite different. If the preference is determined by the pre-existing tariff structure, it's not so much of a tradeoff as it is the rules responding to an exogenous, or at least predetermined, variable. As such, all of the action is on the rules of origin side, and the rules can only be as restrictive as the combination of the existing MFN structure and the south country's participation constraint permit.

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<sup>30</sup> Anson, Cadot, Estevadeordal, de Melo, Suwa-Eisenman, and Tumurchudur (2006).

CES also assume that the stock of specific capital is fixed. This is a perfectly reasonable assumption in the short run. Indeed, the authors make explicit that their analysis is relevant to the transition period where preferences are partial. However the structure of PTA's tariff elimination schedules is such that the more sensitive, and therefore more protected, products are liberalized over a period of from 5 to as many as 15 years. This delay in the realization of tariff preferences, and therefore in the realization of benefits to complying with the rules of origin, is sufficiently long to expect investment flows to change the stock of specific capital.

Also questionable is the ability of the North (U.S.) to fully hold South (Mexico) to their participation constraint as defined. While this assumption simplifies the model considerably, no consideration is given of the effects of relaxing this assumption. Furthermore, in Chapter 3 we show that the evidence for dramatic asymmetries in bargaining power, or at least in the application of bargaining power, is weak in a sample of PTA's that includes NAFTA.

Another problem of the export subsidy is in the potential magnitude of the subsidy given the level of tariffs in the "North". In Appendix 1 we present a simple model of the production implied by the CES model and then calculate the potential magnitude of the subsidy for various levels of the key parameters. For example, we calculate that with an RVC requirement of 50%, a subsidy worth 20% of the value of the intermediate requires



an MFN tariff in the North country of at least 10%. A subsidy of 50% requires an MFN in North of 20%.

This analysis shows that high but not astronomical tariffs are needed to support a significant “export subsidy” as described by the CES model. However, even tariffs as high as 20% are relatively scarce in the U.S. MFN schedule. Only 371 tariff lines (out of over 10,000) have tariffs this high and these are heavily concentrated in dairy, sugar, citrus, tobacco, and textile and footwear products. A significant share of tariff lines (991) have tariffs between 10% and 20%, but nearly all of them (865 lines) are again either agricultural goods (registered in chapters 01-24 of the HS) or textiles and apparel or footwear.

For most agricultural products, even a rule requiring that products be wholly obtained is of limited real restriction, as most goods are either cultivated in a member country or they are not – there is little scope for imported inputs, and as such little scope for “subsidizing” intermediates. Textiles and footwear are sectors with a long history of protection, and clear examples of the structure described in the CES model. The rest of the products in the nomenclature are not explained by CES.

In their empirical section, perhaps the most significant problem is the reliance on NAFTA as the sole PTA of reference. While it is the best known agreement of its type, and also old enough that most of its effects should be realized and included in available data, the very fact that it is the first of its kind, and includes three countries as integrated ex ante as

the US, Canada and Mexico would lead one to question whether it is truly representative of PTAs in general or North-South PTAs in particular.

Furthermore, the authors gloss over several curious results. Rather than exploring the effects of the absolute value of the difference in MFN tariffs between of two countries they use a specification that considers the two tariffs individually. The finding of a negative coefficient on the Mexican MFN tariff is explained as supportive of the interpretation of preventing deflection, but only from the U.S. point of view that the products where it is easier to access the Mexican market (i.e. lower Mexican MFN tariffs) there are more restrictive rules of origin. However, the outcome is perfectly consistent with an interpretation based on U.S. exporters urging the negotiation of rules of origin that they would be able to meet, especially in the presence of high MFN tariffs that would make it harder to “access the Mexican market”. The coefficient on the U.S. MFN tariff is inconsistent in the various specifications they use.

### 1.7 Drivers of Restrictiveness

With a view to sketching an alternative model, what factors ought to be considered as determining the observed restrictiveness of rules of origin? We consider four factors that may serve as determinants of the restrictiveness of rules of origin, and test them empirically in a panel data set in Chapter 3.

- Anti-deflection

This is, of course, the most basic motivation, and matters for a variety of reasons: 1) allowing third-parties to access the preferences via trade deflection reduces the incentive

of those parties to negotiate full-scope agreements directly; 2) in self-enforcing agreements, the leverage on other issues is lost/cannot be applied to third parties; and 3) it is not in the interest of the exporting party to have to compete with non-members in the sheltered market (there is no revenue transfer if ROW exports don't pay the tariff).

While the inclusion of other disciplines such as investment, services, and intellectual property as well as agreements on labor or environmental standards in a PTA are strictly speaking outside the scope of this dissertation, their existence is relevant insofar as any negotiated agreement will involve a balance of concessions across disciplines in order for the agreement to be self-enforcing. Points (1) and (2) can be seen in the observation that if the benefits of preferential access can be had by deflecting trade through a member of an existing PTA without agreeing to a PTA directly with the final market country, that end-market country loses the leverage to gain reciprocal preferential market access and to include additional disciplines. Point (3) is based on the observation that even the low-tariff country has an interest in preventing deflection from non-members into the high-tariff country as this would tend to reduce the market price in the high tariff country and erode the value of the preference. (See the absence of gains in producer surplus under the lax repackaging rule in Figure 2.)

- Protection of Fiscal Income

The elimination of tariffs on imports from a major trading partner can have significant adverse effects on the level of a government's tariff revenues, especially in less developed countries which tend to be more dependent on taxes on foreign trade. Given

that rules of origin can act as impediments to preferential trade flows, one might expect governments to use this tool to reduce this potential loss of income by negotiating more restrictive rules for products that generate more tariff revenue. Indeed, rules of origin are frequently described as being used to take back the market access that was given in tariff reductions.

- Protection of Domestic Industry

For the same reason that protective tariffs were erected to shelter domestic production before a PTA was negotiated, one may expect more restrictive rules of origin to be negotiated on products that were protected by tariffs *ex ante*. For example, the oft criticized rules of origin in U.S. agreements governing trade in textiles and apparel provide significant protection to U.S. textile producers in addition to the relatively high MFN tariffs observed for these products, especially after the elimination of the quotas under the Multi-Fiber Agreement.

- Promotion of Exports

As one of the oft stated goals of PTA's, countries may be expected to negotiate rules of origin that their exporters will be able to comply with and thus gain the preferential access established in the agreement. Especially in the case of products that are otherwise protected by high MFN tariffs, one might expect rules to be even less restrictive in order to assure that the partner country's exporters are able to make use of the preferences.

These four mechanisms are not mutually exclusive, and will be explored in detail in Chapter 3.

### Other Considerations

One generalization that can be made is that, on average, producers in PTA's that combine larger economies will face a larger set of suppliers of originating inputs than producers in PTA's that group smaller economies. A consequence of this is that we observe more restrictive rules of origin (on average) in PTA's that group larger economies. NAFTA, which groups the U.S. with Canada (another developed country) and Mexico, the second largest economy in Latin America after Brazil, has the most restrictive rules of origin, on average, of any agreement in the hemisphere. Towards the other end of the spectrum, the agreement between Canada and Costa Rica (much smaller combined economies) has some of the most permissive rules. While the sample size is quite small, a simple rank correlation between combined economy size and average restrictiveness for 10 agreements in the hemisphere yields a coefficient of 0.85.

One could argue that NAFTA is a case of the U.S. extracting all surplus from its partners using the rules of origin. However, in any negotiation, all parties will have participation constraints, whatever the relative bargaining power. A counter argument could be that more restrictive rules of origin were feasible in NAFTA because the combined economies produce a greater variety of inputs, both generating the incentive for more restrictive rules and reducing their effective restrictiveness. Any analysis of the restrictiveness of rules of origin across agreements will have to consider this feature.

### 1.8 Conclusions

The economic literature at this point has provided a fairly complete theoretical description of the economic effects of rules of origin in preferential trade agreements. The empirical evidence of these effects and the political economy driving their restrictiveness, however, is only beginning to be studied. Part of the lack of progress on the empirical side is due to the difficulty of measuring the restrictiveness of rules of origin, especially their ex ante expected restrictiveness based on the agreed texts of the agreements. The lack of political economy analysis is due partly to the lack of empirical evidence on the rules' effects that may be used to indicate the important elements to be included in any analysis.

The following two chapters seek to address these problems. Chapter 2 develops a detailed methodology for measuring the ex ante restrictiveness of product specific rules of origin. This methodology takes into account all of the elements observed in NAFTA-style rules of origin which are rapidly becoming the dominant means of defining rules in modern PTA's.

Chapter 3 uses this methodology to calculate the restrictiveness of the rules of origin in 5 recent PTAs in the western hemisphere, and uses the resulting data to test four non-exclusive hypotheses regarding the determinants of restrictiveness.

## Chapter 2: Measuring the relative restrictiveness of product specific rules of origin (PSRO)

### 2.1. Introduction

Rules of origin are important for two reasons. First, unlike the tariff elimination schedules that are the publicized element of a PTA, the rules of origin constitute a permanent structure that is imposed on the bi- or plurilateral trade covered by the PTA. Second, it is the rules of origin that to a large degree determine the scope of the PTA. As globalization disperses the production of goods across countries, it is progressively less likely that all of the component inputs of a final good will be produced within a single country. By placing restrictions on the inputs that may be imported from countries that are not party to a PTA while still maintaining access to the preferential tariff treatment, the rules of origin can have a significant impact on the degree to which a PTA actually liberalizes trade.

Before we can understand the ways in which product specific rules of origin (PSRO) are defined, let us make clear what rules of origin are meant to do. Because international trade is becoming increasingly globalized, it is becoming more difficult to categorically say that a particular good is “from” a particular country. Automobiles may be assembled in a plant whose location is known, but there is no reason to expect that the parts from which they are assembled were produced in the same country. Even cattle, which may have been born and raised on a given ranch, may be the product of eggs, semen, or embryos from around the world.

At the same time, the tariff to be applied on an imported good can depend on the good's country of origin due to the rapid proliferation of PTA's. Thus, as the production process is increasingly decentralized and the international trading regime fragments to assess different tariffs on goods of different origin, it becomes ever more important to understand the established criteria for defining the origin of goods.

One reason that rules of origin have been relatively neglected in the empirical literature is the fact that the nature of these rules is not readily quantifiable and thus difficult to compare across products and across PTA's, unlike tariffs where *ad valorem* rates give an easily understandable, one-dimensional measure of the trade barrier in question. There are a handful of papers in the economic literature that begin to propose methodologies for comparing these rules, with varying degrees of success. This Chapter reviews this limited number of studies, focusing on the method of analysis, suggests improvements in the methodology, and subjects the proposed new methodology to the same tests as a previous study. The restrictiveness index proposed yields results that are both quantitatively and qualitatively different from previous analyses.

Before advancing further, though, we should be clear what exactly we mean by restrictiveness. There are two ways to think about restrictiveness: how much the rule permits, and how much the rule affects producers and trade. While in general, these two concepts should be highly correlated, market conditions and factor endowments will cause them to differ in any particular case.



An example can be helpful. Imagine preferential trade in coffee. The rule in a given agreement could require that all coffee products be elaborated from coffee beans grown in a member country in order to qualify for the preferential tariff. Alternatively the agreement could specify that roasting and blending coffee beans from any part of the world would confer origin. In the case of a PTA between the U.S. and Canada, the former rule would so restrictive as to completely eliminate the possibility of free trade in coffee because neither country has a climate conducive to the cultivation of coffee. The latter rule on the other hand would prevent pure trade deflection but would allow for free trade in coffee that had been processed (i.e. roasted and blended) in one of the countries. If the PTA were between the U.S. and Colombia, on the other hand, the rule requiring originating beans would be less restrictive because Colombia is a major producer of coffee beans.

When considering restrictiveness to mean the degree to which non-originating inputs are proscribed from use in originating final goods, the requirement that coffee beans be originating in a member country would have the same value of restrictiveness in both agreements. When considering restrictiveness to mean the degree to which a rule increases production costs, then the same rule will have a much lower value of restrictiveness in the agreement with Colombia than with Canada.

This latter concept of defining restrictiveness as the degree to which the rule raises production costs is effectively impossible to measure without actually carrying out a survey of firms, and is likely even to vary across firms in a given industry for a given

rule. In effect, the ideal measure of restrictiveness here would be the value of the LaGrangian in the firm's restricted optimization problem. This value is hard to come by.

Therefore what we seek to do in this dissertation is to adopt the first definition of restrictiveness, that of the extent to which non-originating inputs are precluded from use in the production of originating goods. This concept, which we will show below is fairly straightforward to capture based on the specification of the rules in the agreement texts, can be expected to be highly correlated with the "effective restrictiveness" implied by the effects on production costs. Furthermore, the level of restrictiveness observed in the texts can then be analyzed with respect to the structure of tariffs and trade existing at the time of the negotiations to determine how these variables affect the agreed upon rules. This is what we do in Chapter 3.

The Chapter is organized as follows: Section 2.2 briefly describes the relevant literature, Section 2.3 describes the three forms that PSRO may take, Section 2.4 develops a method for determining a restrictiveness ordering within forms, Section 2.5 addresses alternative rules, Section 2.6 develops a method for determining a restrictiveness ordering across forms using a data set of PSRO from 13 PTA's, Section 2.7 develops a restrictiveness index based on the above orderings, Section 2.8 applies this index using data for NAFTA from a previous study in the literature to assess the relevance of the new method, and Section 2.9 concludes.

## 2.2 Literature

There are a number of theoretical papers on rules of origin, notably Krueger (1993), Krishna and Krueger (1995), and Ju and Krishna (1998). The only empirical evidence in these papers, however, is purely anecdotal.

There is relatively little in the economic literature that addresses PSRO in an econometric framework, and as such there is nothing that could be called a standard approach. The early attempts to develop a methodology for comparing PSRO across products and across agreements are Garay and Cornejo (2001) and Estevadeordal (2000). The first of these develops a basic framework for codification of PSRO that allows comparison. Estevadeordal (2000) uses elements of this approach to establish an ordinal index of restrictiveness of PSRO and then applies it in an analysis of the NAFTA agreement between the U.S., Canada, and Mexico. Several later works apply the Estevadeordal methodology to other agreements in a more descriptive analysis, such as Estevadeordal and Suominen (2006), Sanguinetti (2006), Cadot, Estevadeordal, and Suwa-Eisenman (2006), and Suominen (2004). Cadot et. al. (2005) use a measurement methodology based on Estevadeordal (2000), but with important modifications similar to, but not as extensive as the ones proposed here.

The discussion that follows draws heavily on Garay and Cornejo (2001) and Estevadeordal (2000), and suggests changes to the methodology to better capture the

intended<sup>31</sup> restrictiveness of the PSRO. Estevadeordal (2000) is the first to develop a one-dimensional index of restrictiveness that may be used econometrically as a dependent variable<sup>32</sup>. Garay and Cornejo (2001), on the other hand, develop a restrictiveness “vector” which incorporates better the multiple components of product specific rules of origin. This vector, however, still neglects several components of these rules that impact their restrictiveness.

Estevadeordal and Suominen (2006) use a slightly modified version of Estevadeordal (2000) to accommodate very different rules in European PTA’s. Sanguinetti (2006) uses a simplified adaptation of Estevadeordal (2000) to analyze the Mercosur PSRO. Neither of these modifications fully incorporates all of the important elements of the variation observed just within NAFTA-style PSRO. Even the methodology put forth in Cadot et. al. (2005) while incorporating important elements overlooked previously does not fully account for all of the variation.

We seek in this Chapter to develop a methodology that, while similar in many respects to Estevadeordal’s, provides a complete treatment of the elements used to define rules of origin in a broad range of NAFTA-style PTAs. In addition to being more complete, we also undertake a calibration exercise that permits a restrictiveness ordering across forms of PSRO that is absent from Estevadeordal’s analysis. This calibration by exploiting

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<sup>31</sup> Note that the methodology developed here is conceived of as more useful for political economy analyses that use the restrictiveness of the rule *as written* in the agreement. It is not an *ex post* measure of the effects of the rules on trade.

<sup>32</sup> If one wishes to use rules of origin as an explanatory variable, the different components of the rules may be considered separately. For example Carrère and de Melo (2006) use dummy variables for the use of the three different forms when estimating the cost of compliance with rules of origin. What is scarce and most needed in the literature is a one-dimensional measure of restrictiveness that permits analysis of its determinants.

differences in alternative rules for a given product, allows for a resulting methodology that is better founded on the observed variation in the PSRO.

### **2.3. Three forms of PSRO**

There are three fundamental forms taken by PSRO in practice. The first is a change of tariff classification criterion, that specifies a required change in tariff classification from the inputs imported from a non-member country to the final good output of the member country. All rules of this form are defined using a national or regional tariff nomenclatures based on the Harmonized System (HS). Restrictiveness of the rule then depends on the magnitude of the required change.

For example, a rule for frozen beef steaks, classified in chapter 02 of the HS might require a change in classification at the chapter level, implying that non-originating inputs must be classified in a chapter other than chapter 02. Steaks cut from non-originating sides of beef would thus not meet the requirement, whereas steak obtained from imported live cattle (classified in chapter 01) that were slaughtered in a member country would meet the rule. Alternatively, the rule could require a change from any other chapter except from chapter 01, in which case the steaks would have to be obtained from cattle born and raised in a member country. As the set prohibited of non-originating inputs expands, the rule becomes more restrictive.

The second form taken by PSRO's is a value test. This criterion specifies either a minimum fraction of the value of the final good accounted for by value added within a

member country, or a maximum fraction of the value of the final good accounted for by the value of the inputs imported from non-member countries. Restrictiveness of this form of rule then varies with the level of regional content required<sup>33</sup>. For example, rules for automobiles are frequently based on value tests, requiring that the value of originating auto parts and production costs exceed a given fraction of the value of the finished automobile. NAFTA sets this requirement at 50%, while other agreements require higher or lower percentages. The higher the percentage, the more restrictive the rule.

The third form taken by PSRO is a technical criterion. This requirement may require that one or more inputs be originating in a member country or that one or more parts of the production process take place in a member country, or both. Technical requirements that specify particular inputs are rare in NAFTA type regimes, but are common in older PTA's. It is also important to keep in mind that input requirements are not terribly different conceptually from the change of classification requirements. The primary difference is the absence, in the technical requirement case, of reference to a standard product nomenclature.

The best example of a technical requirement is found in the rules for apparel products in NAFTA and similar agreements. These rules require first that the fabric of any visible lining of apparel products be originating, and that the final garment be cut and sewn in a member country. Thus, there is a requirement governing the originating status of an input (the fabric for the visible lining), as well as a requirement that a stage of the

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<sup>33</sup> The restrictiveness also varies with the accounting method required for the calculation of regional value content, as pointed out in Krishna (2006).

production process be carried out in a member country (the cutting and sewing of the fabrics to assemble the garment).

The rule for a given product may incorporate one or more of these forms, for example, a change of classification AND a value test.

## **2.4 Restrictiveness Ordering Within Forms**

### **A. Change of Tariff Classification**

All of the PSRO of this form are defined using the Harmonized System. It is important to note at the outset that the HS was not designed for the purpose of defining rules of origin, and thus on several levels leaves something to be desired. However, since tariffs are defined using the HS by all members of the World Customs Organization (WCO) - and also by practically everyone else - the HS has been pressed into service for PSRO to avoid competing and contradictory nomenclatures.

By agreement in the WCO, national tariff nomenclatures are “harmonized” across countries up to the first six digits, allowing for approximately 5,000 uniform product descriptions, depending on the version of the HS<sup>34</sup>. There are three standard levels of aggregation, each coded with two digits. The first two digits of any HS code denominate the Chapter, of which there are 96<sup>35</sup>. The first four digits denominate the Heading, and the first six digits denominate the Subheading. Individual countries may further

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<sup>34</sup> The HS was been revised several times, with products added and removed, most recently in 2002.

<sup>35</sup> Chapters 00, 77, 98 and 99 are unused and reserved for future or national use.

disaggregate their tariff classification adding additional digits, generally up to eight or ten. With relatively few exceptions, all PSRO are defined at the six-digit level of aggregation or at more aggregated levels.

Rules requiring a change in tariff classification, then, may specify that inputs imported from a non-member country must be classified in a different Chapter (C), Heading (H), Subheading (S), or even smaller unit of aggregation (Items (I)) agreed upon by the members. Because like goods are grouped together in the HS, one can generally say that an operation that results in a change of classification from one Chapter to another is a more significant transformation than one that results in a change from one Heading to another, which in turn is a more significant transformation than one that results in a change of Subheading. Ordered by restrictiveness, then, one could say that

$$\Delta C \geq \Delta H \geq \Delta S \geq \Delta I$$

where  $\Delta C$  is “Change of Chapter”,  $\Delta H$  is “Change of Heading”, etc.

An alternative conceptualization of the change of tariff classification would be that the level of change that is required in the rule defines the universe of imported inputs that may not be used in the production of the good if it is to be considered originating in the member country. Thus, a rule requiring a change of Chapter precludes the use of all potential inputs classified in the same Chapter as the final good, whereas a rule requiring a change of Subheading only precludes the use of inputs classified in the same Subheading, which is a much smaller universe.



It is important to bear in mind that there will still be noise in the signal regarding the restrictiveness of the rules. For example, even within a rule form, the true restrictiveness will depend on the underlying production technology<sup>36</sup>, as well as on the availability and competitiveness of excluded inputs in the member countries. In some cases a chapter change requirement is identical in its effect to a heading change requirement, because the final good and all of its technologically feasible inputs are classified in the same heading. In general, it is true that a rule requiring a chapter shift is more restrictive than a rule requiring a heading shift, but in particular cases the two will be equivalent. What is certain is that the restrictiveness is non-decreasing in the magnitude of the required classification change. That is, a change of chapter rule cannot be less restrictive than a change of heading rule.

#### i. Exceptions

A crucial component in the definition of PSRO is the inclusion of exceptions to the specified change of tariff classification. As in the example given earlier, the rule for goods of Chapter 02, Meat, may require that the inputs be classified in any other Chapter, EXCEPT for Chapter 01, which is Live Animals. This rule is much more restrictive than a change of chapter alone because the primary input, allowed by the change (the live animals) is then precluded by the exception.

Exceptions are extremely important in considering the relative restrictiveness of PSRO for two reasons. First, exceptions reduce the universe of permitted third-country inputs (or, alternatively, enlarge the universe of proscribed third country inputs). Second,

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<sup>36</sup> And on the vagaries of the HS.

because the HS was not designed as a mechanism for the definition of PSRO, exceptions to a change of tariff classification rule are specified only in cases where they are actually meaningful for the production of the good in question. The famous<sup>37</sup> example of this would be the NAFTA rule for tomato catsup that is defined as a change of heading, except from subheading 2002.90, tomato paste, which is the most significant input in the production of catsup. Without this exception, all of the ingredients of catsup could be imported from a non-NAFTA country, combined and cooked in a NAFTA country, and exported duty free to another NAFTA country. With this exception in place, only the salt, vinegar, and spices may be imported from a third-country. The use of exceptions can be considered to result in a more restrictive PSRO.

Using the same logic as above, the effect of an exception on the restrictiveness of a rule is derived from its effect on the size of the universe of proscribed third-country inputs. So, ordered by restrictive effect:

$$exC \geq exH \geq exS \geq exI.$$

## ii. Additions

The opposite operation of an exception would be an addition<sup>38</sup>, whereby a change of tariff classification is made less restrictive by specifying as eligible a third-country input that would otherwise be ineligible for use in the production of an originating good. For example, in the rule “A change to heading 12.34 from subheading 1256.78 or any other

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<sup>37</sup> At least, famous for a rule of origin. This rule has also been misinterpreted in the literature, most recently by Krishna (2006) as requiring that the tomato originate in the country in which the catsup is sold, thus closing Mexican tomatoes out of the U.S. catsup market. This is incorrect, as the tomato may originate in *any* of the three NAFTA members without the ketchup losing the tariff preference.

<sup>38</sup> Suominen (2004) calls these “soft rules”.

chapter”, the rule requires a change of chapter but permits non-originating inputs classified in subheading 1256.78, which would otherwise be ineligible because they are classified in the same chapter (12) as the final good. Additions, then, are “negative exceptions” in the sense that they enlarge the universe of permitted third-country inputs, and reduce the universe of proscribed third-country inputs.

Again applying the logic of the effect on the universe of proscribed third-country inputs, the restrictiveness ordering for additions would be:

$$\text{addI} \geq \text{addS} \geq \text{addH}$$

or,

$$-\text{addH} \geq -\text{addS} \geq -\text{addI}.$$

Note that “addC” does not appear. This is because the largest required change of classification observed is a change of chapter, in which case it would not make sense then “add back” a chapter.

### **B. Value Tests<sup>39</sup>**

Value tests, also referred to as Regional Value Content (RVC) or value added requirements, are more common in earlier PTA’s, but are still used to varying degrees in the newer PTA’s as well. When a PSRO takes this form, the value added in the exporting PTA member country must represent a specified fraction of the value of the good. There are quite a few dimensions in which these seemingly simple rules can vary both within and across PTA’s.

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<sup>39</sup> Because the fraction of value added is a continuous, one-dimensional variable, this is the form in which rules of origin is generally modeled in the theoretical economic literature. It is not, however, the most common form taken by PSRO in practice.

The most obvious dimension of variance is the fraction of the value of the good that must be accounted for by member-country value added. In NAFTA-style PTA's this fraction generally varies between 40% and 60%.

Less obvious, and more complex, are the variations in accounting standards for calculation of member-country value added and the value of the good. At the simplest, the value of the good would be the FOB value on the customs declaration, and the value added would be the value of the good less the sum of the CIF values of all third-country inputs. In many cases, the simplest path is not taken. Krishna (2006) points out ways in which the accounting methods prescribed for calculation of regional value content can impact on a rule's restrictiveness.

Nearly all of the variation in accounting methods is seen across PTA's, rather than within individual PTA's across products. Most generally, a PTA's chapter on rules of origin<sup>40</sup> will specify at most two possible accounting methods that can be invoked in the product specific rules annex.

How does one order the restrictiveness of value tests (VT's) with the same content requirement but different accounting procedures? – by judging the difficulty in meeting the requirement plus an administrative burden factor. This is carried out in practice by examining rules that provide alternative accounting standards with different corresponding fractions of value added. The differences in the fraction of value added

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<sup>40</sup> As opposed to the Annex which contains the PSRO.

required across accounting standards should reflect the differences in difficulty in meeting the requirement<sup>41</sup>.

### **C. Technical Requirements**

“Technical requirements” includes two types of requirements: requirements on the origin of specific inputs, and requirements that specific steps of the production process take place in a member country. Requirements on the origin of specific inputs are equivalent in effect to a change in tariff classification with an exception, in the sense that a particular third-country input is proscribed. They differ, though, in the sense that classification change rules are based on a standard product nomenclature, whereas the technical requirement is not.

#### **2.5 Alternative rules**

Most NAFTA-style agreements include alternative rules for fulfilling origin for some products. Estevadeordal (2000) assumes that the two (or, occasionally, more) alternative rules must be equally restrictive, as it would not make sense for the parties to the agreement to have agreed to a great deal of difference in the restrictiveness of the alternative rules for the same product<sup>42</sup>.

This observation is a key insight, and because it underlies the calibration of our index in the next section, it merits analysis. Fundamentally, the argument is one of revealed

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<sup>41</sup> The use of alternative rules to assess/calibrate relative restrictiveness is discussed below in section 2.6.

<sup>42</sup> In his empirical analysis using NAFTA, Estevadeordal (2000) uses the restrictiveness index value of the more-restrictive rule if the index is different between the alternatives, with robustness checks using the less-restrictive value, and concludes that there is no meaningful difference.

preference. Negotiators may agree upon any mutually satisfactory rule for each product. In order for negotiators to establish multiple alternative rules, they must be indifferent between them, which would imply that the rules would have equivalent expected restrictive effects.

Whether this expected equivalence is for an average effect across heterogeneous firms or for the effect on a given firm across states of nature is an interesting question. In principle, one could conceive of a situation in which rules are tailored for a particular firm with alternatives provided that would leave the firm equally restricted across different random outcomes of some ex ante random parameter, for example, the availability of originating inputs that would depend on the success of a harvest or of an expected investment project in the production of particular inputs.

While this is sensible and may indeed be a valid representation of the thought processes that generated some rules, it is equally or more likely that the expected equivalence is of the average restrictive effect on heterogeneous firms both within and across member countries. Consider just one dimension of heterogeneity, firm size. Large firms are more likely to have highly sophisticated inventory control and accounting systems that would allow them to easily measure and report regional value content, whereas smaller operations, having less justification for the expense of such systems would find it simpler and less costly to demonstrate based on a change of classification. The rules will have to be written to take the needs of firms of all sizes into consideration without disadvantaging any. The expectation of equivalent average effect across heterogeneous firms within an

industry seems the more likely explanation<sup>43</sup>. This expected equivalence is used in the following section to establish the restrictiveness ordering across rule forms.

Estevadeordal's approach of treating the alternative rules as equivalent, while based on a useful insight, overlooks the fact that the rule provides alternatives in the first place. In many cases the alternative is between a change in tariff classification rule and a value test. The administrative burdens of qualifying for the tariff preference can be significantly different for these two types of PSRO, and the mere fact that both alternatives are permitted indicates a belief on the part of the negotiators that some traders would suffer less burden under one or the other alternative. Firms will undoubtedly differ within a country, and will exhibit even greater heterogeneity across countries, especially across countries with large asymmetries such as those in NAFTA. Thus, the mere existence of alternatives indicates a less restrictive environment than either rule alone.

## **2.6 Restrictiveness Ordering Across Forms**

Determining the restrictiveness ordering across rule forms is a difficult task, limited to some degree by the low frequency with which some forms are used. NAFTA, for example, does not have any pure VT or pure TECH rules, so Estevadeordal's (2000) index primarily runs off of the change in tariff classification. Other agreements, however, make greater use of other forms. Also, one can not simply say that, for example, a change of classification rule is more restrictive than a value test rule without

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<sup>43</sup> This explanation is also supported by comments of origin negotiators.

considering the internal dimension of the forms. Compared to a value requirement of 50% regional content, a change of item requirement may be less restrictive, but a change of chapter requirement more restrictive.

Perhaps the best empirical approach to determining the ordering across forms is to focus on the subset of products for which alternative rules are provided. As discussed above, it is reasonable to assume that alternative qualification methods for a given product should be of very similar restrictiveness<sup>44</sup>. Because alternative rules for a given product always involve different forms, we can use these rules to calibrate the relative restrictiveness across forms. Note that an implicit assumption for this analysis is that there be a degree of heterogeneity of firms. For any given firm, it is likely that one alternative rule or another will be least costly to comply with. What we assert is that the average effect of each alternative across firms should be equal. In the context of large countries with large numbers of firms, this is not likely a strong assumption, though for smaller or less developed countries it may be harder to sustain.

The main problem in this method, and indeed in the project of ranking the restrictiveness of PSRO in general, is the unobservable production structure that exists parallel to the HS. If there is only one other subheading in which inputs could be classified, the exclusion of the rest of the tariff universe does not change the restrictiveness of the rule of origin. Conversely, if only one subheading is excluded, and it is that one relevant subheading, then a rule that was completely lax becomes completely restrictive. This

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<sup>44</sup> Like the necessary condition for mixed-strategies in game theory, the expected payoff from each alternative must be the same.



problem is overcome to the degree that the negotiators of the PSRO are meticulous in crafting rules that reveal their intent. This is generally the case, but there is still noise in the signal that is visible in the comparison of alternative rules.

The calibration exercise using alternative rules reveals that adjustments to the change of classification criteria (exceptions and additions) are as important as the magnitude of the change requirement itself. This is particularly important because Estevadeordal's (2000) index disregards exceptions and additions altogether<sup>45</sup>.

In a sample of 13 agreements, just over 20% of rules provide two or more alternatives. Assuming that it is valid to extrapolate from this sample to all rules, we can use the observed frequency of particular rule pairings to calibrate restrictiveness across forms. A more extensive explanation of this analysis is provided in Appendix 2.A. The analysis of alternative rules yields 5 rough equivalences that can be used to establish an ordering across forms:

(1)  $\Delta H \approx 50\%$  Value added requirement measured at transaction cost

(2) Requirement to measure value added at Net Cost  $\approx 10\%$  Value added measured at transaction cost

(3)  $VT \approx -addS$

(4)  $exH \approx VT$

(5)  $(\Delta C - \Delta S) \approx TECH$

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<sup>45</sup> Estevadeordal's (2000) approach was modified in Cadot et. al. (2005) to take exceptions and additions into account, though they neglect the variation within exceptions and additions.

(1) is derived from observing the frequency of alternative rules where the first rule is a pure classification change and the second is a pure value test (VT). The mode combination associates a 50% value added requirement with a heading change rule. The next most frequent combination, which is half as common, is change of subheading with 50% value added.

(2) is clear from reviewing the many cases where the option is given between using the net cost or transaction cost alternatives. The differential between the required level of value added under these two accounting methods is almost universally 10% (higher under the transaction cost method). In some cases the difference is just over 8%.

(3) is obtained from the set of alternative pairs where the first rule is a heading change requirement, and the second is a heading change, the addition of a subheading within the same heading as the final good, and a value test.

(4) is derived from a large number of alternative pairs where the first rule is a heading change with an excepted heading and the second rule is a heading change and a value test.

(5) is found from the alternative pairs where the first rule is a chapter change requirement and the second rule is a subheading change plus a technical requirement.

These five equivalences are used to calibrate the restrictiveness index developed below.

### 2.7 Proposed PSRO Restrictiveness Index

In designing a restrictiveness index that can be useful for empirical studies of product-specific rules of origin we must determine the ordering of the potential outcomes. We use a system of points for the different rule forms so as to allow for a mapping into a

single dimension ordinal indicator of restrictiveness. Points are added or subtracted based on the elements used in the definition of the rule.

**Restrictiveness Points:**

Change of classification points:

$\Delta I$	+2
$\Delta S$	+4
$\Delta H$	+6
$\Delta C$	+8
$\Delta S/\Delta H$ w/AI <sup>46</sup>	+2

Exception Points:

exI	+4
>exI and $\leq$ exS	+5
>exS and $\leq$ exH	+6
>exH and $\leq$ exC	+7
>exC	+8

Addition Points:

addI	-5
>addI and $\leq$ addS	-6
>addS and $\leq$ addH	-7
>addH and <addC	-8
add without CC <sup>47</sup>	+8

Value Test Points:

>0% and $\leq$ 40%	+5
>40% and $\leq$ 50%	+6
>50% and $\leq$ 60%	+7
>60%	+8
Net Cost	+1

Technical Requirement Points: +4

Alternative Rule Points: -3

<sup>46</sup> This type of rule does not appear in NAFTA, but is used fairly extensively in Canada's agreements with Chile and Costa Rica. It corresponds to rules that read "A change to (sub)heading (12)34.56 from within that (sub)heading, whether or not there is a change from any other (sub)heading." This is similar in effect to a change of item, but without specifying an item by number.

<sup>47</sup> CC = change of classification.

#### a) Change of classification points

Because the vast majority of PSRO are based on change of classification criteria, this component provides the foundation for most of the index numbers. The ordering here is the same as given in section 2.4.A. The magnitude (even numbers) simplifies calibration of relative restrictiveness across forms.

#### b) Exception Points

Exceptions are used to modify classification change rules to make them more restrictive. It is important to realize that exceptions (and, in the opposite way, additions) represent products specifically chosen by negotiators as ineligible third country inputs. This explicit choice is significant in that the proscribed input is certain to be relevant to the production of the final good (negotiators would not bother to prohibit the use of third-country originating iron ore in the production of sausage, for example).

We can thus infer an equal or greater restrictive effect from an exception than from an increase in the required magnitude of classification change. By combining equivalences (4) and (1) from section 2.6 above, we see that  $exH \approx \Delta H$ . This is reflected in the point values in the index above.

#### c) Addition Points

Like exceptions, additions reflect explicit choices of the negotiators to give special treatment to a particular product. Repeating the example, negotiators would not bother to explicitly authorize the use of imported iron ore in the production of sausage. We can thus take special notice of products that are specifically authorized. Combining

equivalences (3) and (1) we find that  $\text{addS} \approx -\Delta\text{H}$ . This inference is used to set the point values for construction of the index above.

Also, note that “addC” is not possible, due to the structure of the HS and the way that change of classification rules are structured, a chapter could never be excluded by a change requirement in such a way that it could be added back by an addition. Second, note the possibility of “add without CC”. This is a rule where, as opposed to specifying which products imported from third countries disqualify the final good for preferential treatment, specific products are listed as potential imported inputs, to the exclusion of all others. The effect is eventually the same, but its expression is like a photo negative. This type of rule is very uncommon (occurring approximately 32 times out of 64,760 observations in 4 of the 13 agreements included in the sample). We treat this sort of rule as equivalent to a chapter-change rule on the logic that, while the permitted third country inputs are fewer in number than would be the case in a chapter-change rule, these permitted inputs are chosen, and so are relevant to the final good in question, and are often classified in the same chapter as the final good. The latter two points compensate for the first, and we arrive at a level of restrictiveness equivalent to a chapter change requirement.

#### d) Value Test Points

The ordering of the categories is, of course based on the level of required value added, with an additional factor for accounting burden in the case of rules that require a Net Cost measure (as opposed to the more simple transaction value calculation). The magnitude of the points is consistent with generalizations (1)-(4) in section 2.6 above. A

value added requirement of 50% is equivalent to a change of heading requirement, both 4 points (1). An unavoidable Net Cost measurement is equivalent to a 10% increase in the value added requirement (2). The addition of a subheading is opposite and equivalent to a standard value test<sup>48</sup> (3), and the exception of a heading is equivalent to a standard value test (4).

#### e) Technical Requirement Points

The “Technical Requirements” element is essentially a basket category into which rules not based on classification changes or value tests can be lumped. They vary greatly in terms of criteria used for conferring origin. Nonetheless, we can still arrive at the generalization given in (6) in section 2.6, which allows us to calibrate the restrictiveness point value for purposes of the index.

#### f) Alternative Rule Points

The logic for considering rules providing more than one formula for achieving originating status as less restrictive is set out in section 2.5. The magnitude of the difference here is completely ad hoc. However, the analysis in Appendix C.2 gives results for this treatment of alternatives that seem reasonable.

Thus, a given rule earns or loses restrictiveness points based on its use of these six potential elements. The sum of these points permits a comparative ranking across products and across PTA’s. Appendix B lists a few examples of the application of this methodology.

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<sup>48</sup> “Standard” being a requirement of 50% originating content measured at transaction cost.

Despite elements of cardinality derived from the calibration exercise, the final value of the index is still taken to be an ordinal ranking of restrictiveness. Thus, the final value will be insensitive to increasing linear transformation. However, because the index is the sum of the points determined by within each rule form, the index could be corrupted if such transformations were applied to its component elements, depending on the type of transformation<sup>49</sup>. The degree of cardinality that is introduced, however, is informed by the relative frequencies of the alternative rule combinations in the sample of 13 agreements, compensating for any weakness it causes.

There is also empirical support in the literature for this approach. Carrère and de Melo (2006) analyze the role of rules of origin in determining NAFTA utilization rates<sup>50</sup>, and compare their estimates of the costs of meeting different rules of origin with the ordering of Estevadeordal's index. The order of their cost estimates has a 0.66 correlation coefficient with Estevadeordal's index. Strikingly, they find that using the level of classification change as the first element in a lexicographic ordering of restrictiveness (where restrictiveness here means more costly compliance) is not necessarily appropriate. For example, they find that a rule consisting of a change in heading plus a value test is *more costly* than a rule consisting of a change in *chapter* alone. This is consistent with the proposed methodology of considering the different elements of a specified rule and adding their restrictiveness point values. As Estevadeordal's index does not take

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<sup>49</sup> Multiplying each element by a constant would not change the final ordering, while adding a constant to each element would.

<sup>50</sup> Here "utilization rates" refers to the fraction of imports of a good that, *ex post*, receive the negotiated tariff preference by virtue of showing that they fulfill the rules of origin requirements.

exceptions into account, Carrère and de Melo do not produce cost estimates for these elements.

While the current analysis does not attempt an exercise similar to Carrère and de Melo, the implications of their results are very important for the argument that the proposed methodology is superior to that of Estevadeordal (2000). Despite this index's aim to capture the restrictiveness as defined by what the rule permits and not its effects on costs, it is still important that there be a meaningful correlation between the two. The differences between the order implied by Carrère and de Melo's cost ordering and Estevadeordal's ordering are most likely due to the lexicographic primacy given to the change of classification in the latter, as well, one suspects, as to the omission of important elements.

We argue that the new index proposed here is superior to Estevadeordal's methodology based on its completeness, and on its greater consistency with the results in subsequent empirical work. We also consider our methodology to be superior to the modifications included in Cadot et. al. (2005) as we account for variation within exceptions and additions, as well as the effects of providing alternative rules. The next question, then, is whether the differences in measurement methodology lead to different conclusions as to the determinants of restrictiveness of the PSRO.



### 2.8 Does this methodology change the results of Estevadeordal (2000)?

Because the index methodology in Estevadeordal (2000) is the only one of its kind in the literature<sup>51</sup>, it is useful to examine how the results of our new approach compare with his. To make the scale of the indices comparable, we group the 22 observed outcomes in the case of NAFTA into seven categories. Although this aggregation sacrifices some of the variation that the new methodology is designed to reveal, the fundamental differences in the restrictiveness ordering of the products is retained, and allows for a simpler direct comparison of the indices<sup>52</sup>.

Another function of this grouping into fewer categories is to address the criticism that the restrictive effect of a rule is not additive in the six elements considered in the index (Classification change, exceptions, additions, value tests, technical requirements, and alternatives). It is fair to say that the marginal increase in restrictiveness of adding a value test to a classification change requirement is less than the total effect of the same value test as the sole requirement. If a product meets the classification change requirement, then some fraction of the value added is domestic already by virtue of the processing involved in the transformation that results in the change in classification, and the marginal increase in restrictiveness of a domestic value added requirement is probably less onerous. The aggregation of the 22 point values obtained in NAFTA into 7 broader categories should reduce any bias derived from this non-linearity.

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<sup>51</sup> Although Cadot et. al. (2005) do present a variation on it.

<sup>52</sup> The cut points used in the aggregation were set to leave 3 outcomes (one 7<sup>th</sup> of the outcomes) in each of the seven categories.

The criteria for assigning rules to Estevadeordal's Index (EI) categories are given in Appendix 2.D. While these criteria take all three rule forms into account, they acknowledge within-form variation only for change of classification criteria, and even then do not account for exceptions or additions.

First, the simple correlation coefficient between EI and our new index (HI) is 0.27, which though positive, is indicative of significant differences. Second, the mean of EI is 5.16, as compared to 3.92 for HI. Chart 2.C.1 in Appendix 2.C compares the distribution of rules across the seven categories. EI has large spikes at 4 and 6. HI also has something of a bimodal distribution (spiking at 3 and 5), but with fatter tails. Chart 2.C.2 compares the patterns of restrictiveness over stages of production for the two measures. While EI indicates that restrictiveness falls as we move from primary to finished goods, HI shows a clear inverted-U pattern, with intermediate goods subject to more restrictive rules, on average, than primary or finished goods. Table 2.C.1 breaks down these differences by section of the HS. The new index differs most from EI in footwear, textiles, agricultural goods, and miscellaneous manufactures.

In order to find out if there are qualitative differences between the index proposed above and the index used in the literature to date, we test it in the same environment in which Estevadeordal's index was originally conceived. Using data kindly provided by him, we repeat his regressions replacing his index with ours. The specification of the two-stage econometric model is given in Appendix D. The results are presented in Tables 2.1 and 2.2 below.

The most important difference in the results is the effect of the MFN tariff differential on restrictiveness of the rules in Table 2.1. The results obtained using Estevadeordal's Index (EI) showed a positive relationship, with higher MFN differentials associated with more restrictive rules. When the dependent variable is the new index (HI), however, the sign is reversed, the absolute value of the coefficient increases, and the standard error falls. This is particularly important because the result for the MFN differential has the clearest theoretical interpretation in his results: larger differences in MFN tariffs create greater incentives for trade deflection, which presumably countries would resist with more restrictive rules. This new result implies a very different interpretation of the way in which rules of origin are used in PTA's, or at least the way in which they were used in NAFTA.

Although the scope of the present chapter is meant to be methodological, given these results an alternate hypothesis that would be consistent with these different results is of interest. The most obvious explanation is export promotion. For products with sufficiently low MFN tariffs in the home country (without loss of generality), the restrictiveness of the rule is less important to exporters in the partner country, because even if the ex post utilization rate is low due to restrictive rules, there will still be little restriction of market access for non-originating goods. For products where the home country has relatively high MFN tariffs, the effect of restrictive rules on the level of market access for the partner country's exports will be significant, because the alternative to complying with the PSRO is a high tariff. As such, the country whose exports are prejudiced will have an incentive to negotiate less restrictive PSRO. In the case of

NAFTA, the Mexican base rate is almost everywhere higher than the US base rate. This results in an MFN\_DIF variable that serves as a proxy for US interests in less restrictive PSRO. It is reasonable to expect that the US had proportionately more bargaining power than Mexico in the NAFTA negotiations, and so a negative relationship between PSRO restrictiveness and MFN\_DIF should not be terribly surprising in this case. Note also that this result is not a statistical anomaly. Sanguinetti et. al. (2006) gets a similar result on the MFN tariff differential in a study of Mercosur PSRO.

Table 2.1: Step 1<sup>53</sup>

Odd Columns: Dependent Variable is EI, Even Columns Dependent Variable is HI

Ordered Probit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var.	EI	HI	EI	HI	EI	HI	EI	HI
MFN_Differential	0.016 (5.06)**	-0.045 (15.37)**	0.02 (5.78)**	-0.033 (9.85)**	0.016 (5.06)**	-0.045 (15.41)**	0.021 (5.90)**	-0.033 (9.80)**
IIT_MEX-RoW	1.28 (20.73)**	1.081 (18.50)**	1.279 (20.54)**	1.098 (18.62)**	1.273 (20.59)**	1.077 (18.41)**	1.27 (20.38)**	1.091 (18.49)**
IIT_MEX-USA	0.172 (2.39)*	-0.623 (9.06)**	0.165 (2.28)*	-0.651 (9.43)**	0.182 (2.51)*	-0.597 (8.63)**	0.175 (2.40)*	-0.625 (9.01)**
IIT_USA-RoW	-1.641 (22.88)**	-1.359 (20.02)**	-1.649 (22.96)**	-1.38 (20.31)**	-1.616 (22.44)**	-1.343 (19.71)**	-1.622 (22.51)**	-1.362 (19.96)**
Import Ratio_MEX					-0.214 (4.00)**	-0.147 (2.93)**	-0.228 (4.26)**	-0.177 (3.51)**
Import Ratio_USA					-0.402 (1.80)	-0.865 (4.10)**	-0.407 (1.82)	-0.876 (4.15)**
Pref. Margin-MEX			-0.009 (2.92)**	-0.021 (7.07)**			-0.01 (3.27)**	-0.022 (7.31)**
Pref. Margin-USA			0.008 (1.50)	0.029 (5.56)**			0.008 (1.53)	0.029 (5.60)**
Observations	5,005	5,005	5,005	5,005	5,005	5,005	5,005	5,005

Absolute value of z statistics in parentheses

\* significant at 5%; \*\* significant at 1%

While in general there is certain to be an incentive to prevent trade deflection, the combination of transport costs and a minimally restrictive PSRO will generally prevent the gross types of trade deflection associated with simple transshipment or repackaging. This minimal level of restrictiveness is likely to be below the observed range of variation in restrictiveness of PSRO in NAFTA-style PTA's, and NAFTA in particular.

The dramatic difference in the results leads one to wonder what aspect of the new methodology is responsible for the reversal of the sign on MFN\_DIF. Table 2.C.2 in

<sup>53</sup> Observations are for HS subheadings. MFN\_Differential is the absolute value of the difference between USA and Mexican MFN tariffs. Intra-Industry Trade (IIT) variables are calculated at the 4 digit ISIC (Rev. 3) level. Import Ratio gives the share of Mexican (USA) imports of goods of each subheading from the USA (Mexico). The Pref. Margin-MEX(-USA) is the difference between the MFN and NAFTA preferential tariff rates in Mexico (USA) in the first year after entry into force of the agreement.

Appendix C repeats the core of the regression presented in Table 2.1 for alternate formulations of HI that progressively exclude the different elements added to the bare-bones approach of Estevadeordal (2000). It is the accounting for exceptions and additions, and to lesser extent alternative rules, that generates the different results<sup>54</sup>.

Of the other control variables, the only other reversal of results occurs for the intra-industry trade measure of US-Mexican trade. Using EI, this variable had a positive coefficient with marginal significance. Using HI, the coefficient is negative and highly significant. Estevadeordal does not hazard an interpretation of this variable's impact on restrictiveness and none is immediately obvious.

The differences in results carry into the second stage of Estevadeordal's (2000) regressions. The original results, as seen in the odd-numbered columns, showed a positive relationship between rules of origin and the length of the tariff phase-out periods across goods, for both the Mexican and US phase-out schedules. In the even numbered columns, where the Harris Index (HI) is used, the results are more significant both economically and statistically. For the US tariff phase-out schedule, the positive relationship still holds. For the Mexican phase-out schedule, however, the result is the opposite. The control variables behave largely the same under both indices.

Table 2.2: Step 2<sup>55</sup>

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<sup>54</sup> Carrère and de Melo (2006) also note the problem that Estevadeordal's index does not take exceptions into account.

<sup>55</sup> ROHAT is the linear predicted value of restrictiveness from Step 1 using the specification in columns (1) and (2) of Step 1. The Pref. Margin is the difference between the MFN and NAFTA preferential tariff rates in Mexico for columns (1)-(4) and for USA) in columns (4)-(8) in the first year after entry into force of the

Dependent Variable: Years to Full Liberalization

Odd Columns: Explanatory Variable is EI, Even Columns Explanatory Variable is HI

OLS	(1) mexEI	(2) mexHI	(3) mexEI	(4) mexHI	(5) usaEI	(6) usaHI	(7) usaEI	(8) usaHI
Constant	7.764 (73.75)**	6.625 (54.00)**	7.019 (60.81)**	5.191 (38.50)**	2.425 (42.88)**	4.534 (43.69)**	1.279 (18.05)**	3.377 (31.78)**
ROHAT	0.481 (6.77)**	-1.173 (15.96)**	0.28 (3.94)**	-1.605 (21.94)**	0.97 (12.83)**	1.862 (24.97)**	0.88 (12.31)**	1.874 (26.87)**
Pref. Margin	-0.461 (71.85)**	-0.481 (74.96)**	-0.433 (65.80)**	-0.449 (70.90)**	-0.101 (8.38)**	-0.14 (12.22)**	-0.078 (6.86)**	-0.116 (10.74)**
Import Ratio	0.413 (3.08)**	0.135 (1.02)	0.573 (4.34)**	0.317 (2.51)*	-0.508 (1.01)	-0.073 (0.15)	-0.393 (0.82)	0.032 (0.07)
Export Ratio	0.808 (4.77)**	0.711 (4.28)**	0.904 (5.44)**	0.762 (4.79)**	1.331 (3.19)**	0.968 (2.43)*	0.374 (0.95)	0.021 (0.05)
RECIP			0.199 (14.66)**	0.289 (21.82)**			0.246 (24.60)**	0.253 (26.78)**
Observations	5012	5012	4992	4992	4997	4997	4994	4994
R-squared	0.51	0.53	0.53	0.57	0.05	0.13	0.15	0.24

Absolute value of t statistics in parentheses

\* significant at 5%; \*\* significant at 1%

The most meaningful difference in the results in the second stage is that the estimated coefficient on the fitted restrictiveness variable from the first stage is negative in the regressions for the Mexican tariff elimination schedule. This is consistent with the interpretation given above for the negative sign on MFN\_DIF in the first stage.

While these results do not contradict Estevadeordal's (2000) conclusion that rules of origin are a primary policy instrument in market access negotiations, it is clear that the more detailed methodology proposed here allows us to see greater variation in way this instrument is used, and that this variation leads to important questions as to the determinants of restrictiveness that are only barely addressed in the empirical

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agreement. Import (Export) Ratio is the share of imports from (exports to) the partner of product *i* in total imports (exports) of product *i*. RECIP is the length of the partners tariff elimination period for product *i*.

specification explored here. Chapter 3 of this dissertation explores these questions in greater detail.

It is worth noting that these regressions have been run using different calibrations of the point system described in Section 2.6. The results are not highly sensitive to the calibration, but *are* sensitive to the methodology (see the results of changing the included elements in Table 2.C.2). It is the consideration of all elements of the rules of origin that is important, especially the exceptions and additions to the classification change criteria.

### 2.9 Conclusions

Optimally, the measure of restrictiveness would be the value of the LaGrangian multiplier in the restricted optimization problem of the firm, or rather the average of this multiplier across relevant firms. This measure would capture the underlying technological constraints and would not be distorted by considerations of a classification system not designed for administration of rules of origin (the HS). Data restrictions, however, require the development of a measure derived exclusively from the structure of the rules themselves. This is what we have attempted to do in the construction of this index.

One might argue that measures of restrictiveness derived from ex post utilization rates and MFN tariffs, *a la* Carrère and de Melo (2006) would be a better measure of the restrictiveness of PSRO. This depends, however, on what you want to use the measure for. If the purpose is to study the trade effects of PSRO, then perhaps an endogenous



measure of restrictiveness derived from ex post trade data is preferable. The question then is, how does it make sense to use trade data to derive a PSRO restrictiveness index, which you want to use to explain the trade data it is derived from? If, on the other hand, what you want to analyze is the negotiating process and the political economy of the formation of PTA's, it is less clear that measures based on ex post data are appropriate. Unless you want to assume perfect foresight on the part of negotiators, which is a strong but not absurd assumption, you have to limit yourself to data that represents the information available to the negotiators at the time of the negotiations. Furthermore, if the goal is to explain policy (in this case the structure of the PTA (PSRO and TES)) based on the existing pattern of trade and protection, the endogenous variable needs to reflect the policy, not the policy outcomes, again unless you want to assume that actual outcomes correspond perfectly to intended outcomes.

The results of applying the new index show that including the elements that were previously ignored makes an important qualitative difference in the interpretation of the way in which PSRO are used in PTA's.

## Chapter 3: Determinants of the Restrictiveness of Product Specific Rules of Origin

### 3.1 Introduction

We make two broad assertions in this Chapter. First, although there are several studies in the literature that present models of the determinants of rule restrictiveness, there is no empirical analysis that takes the standard explanation for the rules' necessity (prevention of pure trade deflection) at face value and puts it to the test. In keeping with the existence of these other models, we find that this "standard explanation" can not be rejected but is not the full story. In several different specifications we reject any contention that these two variables (MFN differential and transport costs) are the only relevant ones.

Second, the vast majority of studies in the literature on the determinants of rule restrictiveness are developed and tested in the context of NAFTA<sup>56</sup>, which is the best known North-South PTA, because there is relatively good availability of data for the three member countries. NAFTA is not, however, the only or the most recent North-South agreement. Indeed, NAFTA was the first agreement of its sort for the United States, certainly insofar as the rules of origin regime is concerned. The U.S. has since signed more than nine similar agreements with other countries including Chile, Singapore, Australia, and Central America. These agreements contain origin regimes similar to NAFTA's in structure but varied in many important details. It is thus an open

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<sup>56</sup> Estevadeordal (2000), Carrère and de Melo (2006), Cadot et. al. (2006), Anson et. al. (2003), and Portugal-Perez (2006). Cadot et. al. (2005) base their analysis on NAFTA and the EU Single List. Indeed only Sanguinetti and Bianchi (2006) base their analysis on agreements other than NAFTA and the EU.

question as to whether generalizations based on analysis of NAFTA are valid for other agreements, even holding constant the U.S. as a party to the agreement.

Since NAFTA, Canada has signed agreements with Chile and Costa Rica, and Mexico has signed agreements with nine other countries in Latin America plus Japan and the EU. All of these agreements also have origin regimes very similar in structure to NAFTA, but again, a great deal of variance in the details of the product specific rules. Whether or not all of these may be considered “North-South” agreements, it is still an important question which aspects of PTA origin regime determination can be supported by a broader sample of agreements than just NAFTA, and what the motives are revealed by the determinants. In this paper we find that in general governments are more focused on assuring access to PTA-partner markets than on maintaining ex ante protection.

We first test the hypothesis that the restrictiveness of the product level rules of origin is determined by structural variables limited to the existing MFN tariff structure of the PTA member countries and the costs of transporting goods between them, a simple hypothesis that has not been fully examined empirically before. In addition to these two “standard” variables, we then examine three non-exclusive alternative hypotheses regarding determinants of the restrictiveness: preservation of tariff revenues, protection of domestic industry, and export promotion. The empirical specification employed does not allow for a definitive rejection of any one of these hypotheses, but does allow for a determination of whether the export promotion dominates fiscal and protectionist motives. Additionally we are able to conclude that while there may be asymmetric bargaining power in the

negotiation of these rules, there is evidence that the rules of origin are not significantly more responsive to the preferences of the more powerful country.

Section 3.2 presents an analysis of the “standard explanation” of rules of origin as simply a mechanism for the prevention of trade deflection. Section 3.3 sets out the three alternative potential drivers of the restrictiveness of rules of origin: fiscal concerns, protection of industry, and export promotion. Section 3.4 sets out the empirical specification to be explored, while Section 3.5 gives the results and Section 3.6 concludes.

### 3.2 Deflection: the “Standard Explanation”

As discussed in Chapter 1, the principal explicit purpose of the rules of origin is to prevent goods from non-member countries entering the free trade zone through the lower-tariff country and trans-shipping from there to supply the other member of the PTA, thereby avoiding the higher tariff in the destination market. We shall henceforward refer to this mechanism as the “standard explanation”. Trade deflection generates a series of problems for the member countries. First, the purposes for the tariffs in the higher-tariff country are subverted by this activity. Depending on the underlying tariff generation model, these purposes may be the promotion of a particular income distribution through protection of domestic production or perhaps generation of fiscal revenue.

Regardless of the underlying tariff-generating mechanism, the PTA is ostensibly designed to eliminate these tariffs on goods originating in the agreement partners only, not to be a unilateral reduction vis-à-vis the rest of the world. At the same time the

greater the difference in MFN tariffs between PTA members, the greater the incentive for producers in non-member countries to triangulate through the low-tariff country, as this implies a greater tariff savings. A higher MFN differential thus implies a greater need to ensure that only originating products benefit from the negotiated tariff preference. The absolute value of the difference is used because in principle it does not matter which member country has the higher tariff, and indeed it is possible that this will vary across products.

These observations lead to an expected positive correlation between origin restrictiveness and the absolute difference between the MFN tariffs of the parties to the agreement<sup>57</sup>. Whereas a minimally restrictive rule (say, a rule that could be satisfied by repackaging the product) would essentially legitimize the triangulation, more restrictive rules would serve as an impediment to this process.

Counterbalancing any MFN differential is the increase in transport costs derived from the transshipment involved in trade deflection. If the cost increase due to shipping the good through the low-tariff country instead of directly to the higher-tariff country exceeds the tariff savings, then there is no incentive to triangulate, and consequently no need for a rule of origin at all, much less a restrictive rule. We thus would expect a negative correlation between the added cost of shipping the product between the members and the observed restrictiveness of the rule.

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<sup>57</sup> Most clearly put forward in Estevadeordal (2000)

One can imagine then that for any given pair of countries with bilateral transport costs determined by geography and infrastructure in place<sup>58</sup> (presumably fixed in the short- to medium-term) and a given MFN tariff structure, one could calculate a minimum “structural” rule of origin that would be sufficient to prevent pure trade deflection of the simple transshipment sort. If prevention of deflection is the only purpose for which rules of origin are employed, then the two variables discussed should together determine some minimal level of restrictiveness necessary to prevent this gross deflection – and any restrictiveness beyond this level must be for another purpose.

As a preliminary investigation, Table 3.1 gives the results of an ordered probit regression of rule restrictiveness (as measured under the methodology set forth in Chapter 2) on the MFN tariff differential and a measure of transport costs for a sample of five PTA’s<sup>59</sup>. Column (1) gives the basic outcome, which is not supportive of the “standard explanation” being a sufficient explanation. While the MFN-differential obtains the expected positive coefficient, the positive coefficient on the transport cost variable is the opposite of the negative sign predicted by the deflection-preventing nature of transport costs. One suspects omitted variables, potentially due to the transport cost variable serving as a proxy for industry characteristics, which in turn could be correlated with political factors.

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<sup>58</sup> See Limão and Venables (2000)

<sup>59</sup> See section 3.5 below for a full discussion of the data used.

Column (4) takes a first pass at controlling for cross-industry variation in the omitted variables by including dummy variables by Section of the Harmonized System<sup>60</sup>. This control for industry-specific variation is sufficient to reverse the sign of the transport cost coefficient. It is however not a solution that sheds much light on the underlying mechanisms that determine the restrictiveness of these rules of origin.

Furthermore, columns (7) through (11) of Table 3.1 give the outcomes of this regression repeated for each agreement individually. Only for NAFTA is the transport cost coefficient negative and significant, and in that case the coefficient on the MFN differential is negative<sup>61</sup> as well. Of the remaining four PTA's, for only two of them is the MFN differential coefficient significantly positive. Much of the variation underlying the outcome in column (4) then must be cross-agreement rather than cross product. These features must be taken into account in any further exploration of the determinants of rule restrictiveness.

### 3.3. What else might it be?

Both the economic literature and popular accounts have addressed the standard explanation with minimal attention at best. In most cases these accounts reference the prevention of trade deflection as a pretext for establishing the rules that then promote more important objectives. We explore three non-exclusive alternative explanations under the broad headings of Fiscal Concerns, Protection, and Export Promotion.

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<sup>60</sup> The Harmonized System (HS) is divided into 21 Sections.

<sup>61</sup> This is consistent with the results in Chapter 2 using the new restrictiveness index in Estevedeordal's (2000) data and specification.

We assume that in the negotiation of the rules of origin the governments seek to maximize a weighted social welfare function as described in Grossman and Helpman (1994), wherein for example extra weight is given to the welfare of groups represented by industry-specific lobbies. Thus the governments are expected to negotiate for rules of origin that maximize total welfare of their respective countries, but will be willing to trade off general welfare for the welfare of a particular industry at a rate proportional to that industry's weight in the government's objective function.

This model of the government's behavior is consistent with observations of governments' behavior in origin negotiations, with significant consultation of industry groups the norm throughout the negotiation process. Colombian and Peruvian origin negotiators would spend nearly as much time briefing and consulting private sector representatives during negotiating rounds with the U.S. in 2005-2006 as they did in actual negotiating sessions.

With no reliable data on the presence and potency of lobbies at the product level for the member countries of the agreements in our sample, we rely instead on the tariff and trade structures of the countries during the negotiating period to determine which producers stand to gain from more or less restrictive rules of origin under the alternative hypotheses.



## **Fiscal concerns**

Central governments in many countries depend significantly on tariffs on imports for fiscal revenues. This is especially true in smaller, less developed countries. The simple, unweighted average across countries in the western hemisphere results in a 12% share of government revenues derived from taxes on international trade. Signing a PTA that eliminates tariffs on imports from a major trading partner will then have a meaningful negative effect on fiscal revenues. Indeed, subsequent to signing several PTA's including the one with the USA, Chile raised their domestic tax on value added to compensate for tariff revenues that were expected to be lost as a result. In some countries it may be difficult to replace tariff revenue with revenue from other sources as Chile did.

One can then hypothesize that insofar as rules of origin can restrict access to the preferential tariff under a PTA, governments might seek to use this mechanism to preserve revenue flows, setting more restrictive rules for products whose import tariffs generate significant fiscal income. Products that ex-ante generate higher tariff revenues due either to high bilateral import volumes, high MFN tariffs, or both, would present incentives to apply more restrictive rules of origin to reduce the set of products eligible for preferential treatment.

## **Protection**

Perhaps the simplest and most obvious reason that a rule of origin would be set more restrictive than is necessary just to prevent deflection is to preserve some of the protection of domestic producers that was previously derived from the tariffs that are

eliminated under the PTA. If domestic producers had achieved protection in the context of the MFN tariff, the elimination of this tariff on imports from the PTA partner could generate unwanted competition. Again, restrictive rules of origin can serve as a mechanism to limit the application of the preferential tariff rate, and so in these cases the government could seek to maintain some degree of protection by setting particularly restrictive rules. As discussed in the example of trade in coffee in Chapter 1, what is given with one hand in terms of tariff elimination can be taken back with the other using restrictive rules of origin.

A more indirect mechanism by which the protection can be granted through rules of origin is the “exporting of protection” of intermediate goods described by Krueger (1993). In this scenario, intermediate goods produced in one country are protected from global competition in the partner’s market because the rules of origin, combined with elevated MFN tariffs on final goods, make it optimal for final goods producers in the partner country to use originating intermediates at a price above the world price. This mechanism is explored theoretically and empirically in CES (2006). Unfortunately, there is no reliable input output table that can be used to link intermediates to final goods that would permit a detailed empirical analysis of this sort. However, as discussed in Chapter 1 (Section 1.6) and shown in Appendix 1, the level of MFN tariff in the home country needed to support a significant degree of protection exported to the partner country exceeds the average tariff in most “North” countries except in very localized industries, and it is unlikely that “South” countries would be able to exploit such a mechanism.

## **Export Promotion**

On the flip side of protection is the desire of producers in one PTA country to ensure preferential access to the market of the other. The incentives are particularly strong when the consequence of failing to qualify as originating (i.e. not meeting the rule of origin) is the payment of a high MFN tariff. For example, officials that participated in the negotiation of a recent PTA with the U.S. report being persistently lobbied for more lax rules of origin by producers of some steel products despite the fact that the U.S. MFN tariff on the products in question is zero. Industries that face more significant barriers to non-originating products were even more insistent, and consequently taken more seriously by the negotiators.

Thus, whereas in the case of maintaining protection previously derived from the MFN tariff we could expect a positive correlation between the MFN tariff and rule restrictiveness, in this case of governments working to ensure that their exporters are able to access the PTA partner's market we would expect a negative correlation between these two variables.

Another manifestation of export promotion concerns driving the determination of rules of origin would be observable in a negative outcome for the fiscal variable discussed above. For products whose bilateral trade generates significant revenue for the importing country, that country would prefer to limit the effects of the tariff elimination. This very fact indicates that the revenue transfer effect discussed in Chapter 1 (Section 1.4) would

give incentive for the exporting country to seek to ensure that their exporters have full access to the preferential tariff. The exporters would then be able to sell at the tariff-protected price in the importing country's market and collect the tariff-generated surplus. Whether the importing country's fiscal concerns or the exporting country's revenue transfer interests dominate in the negotiations will determine the sign of the coefficient on the fiscal variable in the regressions.

### 3.4 Empirical Specification

#### Small vs. Large countries

Rules of origin are designed to apply to everybody within an agreement. Any given PTA will have only one rule of origin for each product that applies to all trade between the members<sup>62</sup>. This rule therefore will depend on the preferences of each member country, and the agreed rule will have to be the outcome of some bargaining mechanism. In this paper we do not propose any specific model of this bargaining process. Instead, we simply include the test variables from both countries in the regression. By observing which country's variables have significant effects on the level of restrictiveness, we can draw some conclusions about the nature of this process.

In a panel data set this approach requires some decision as to how to assign the identities of country A and country B. If one were to expect some regularity in the unspecified

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<sup>62</sup> There are several agreements in South America where slightly less strict rules apply to exports of relatively less developed countries. Among the agreements included in the sample here there is no differential treatment.

bargaining process, what would it be? In this analysis, we choose to divide the countries by relative size. There are a number of possible justifications for this decision:

- Bargaining power: the agreement is of greater benefit for the smaller country (more opportunity to take advantage of economies of scale as the proportional increase in market size is greater for the small country), and thus the larger country can extract greater concessions.
- Negotiating experience: Larger countries have more experience and thus better information regarding their own interests. While this is not necessarily true generally, it is likely true for this sample.
- CES (2006) cite “ample anecdotal evidence from US-Mexico and EU-Eastern Europe negotiations” as justification of their assumption that the South country is held to its participation constraint.
- “Imperialism”: The larger country is able to extract a favorable agreement using leverage on issues outside the context of the agreement.

Any or all of these mechanisms can lead one to expect systematic asymmetric responsiveness of the negotiated rules of origin to the variables of the two countries. On the other hand, it is difficult to imagine mechanisms by which a smaller country would have greater leverage. No other method for assigning countries to either A or B (geographic, lexicographic, etc) is very compelling.

Sorting by size does beg the question of how to measure size. Based on the justifications for this ordering mentioned, for the agreements in the sample there is no compelling reason to reject using GDP as the relative size metric. In two of the agreements (NAFTA

and CHLUSA), the U.S. is taken as the large country. In an additional two (MEXBOL and MEXCRI) we take Mexico as the large country, and finally in the last agreement (CANCRI) we take Canada. Using population or GDP per capita would generate the same orderings.

The estimation is an ordered probit of the following equation:

$$R_i = f(MFNDIF_i, TXC_i, FISC_{i,L/S}, MFN_{i,L/S}, ExRat_{i,L/S}, ExRoW_{i,L/S}, Agreement)$$

where the variables are as described below.

On the left hand side,  $R_i$  is a measure of the restrictiveness of the rule of origin for product  $i$ , based on the methodology developed in Chapter 2. As comparability with the Estevadeordal (2000) index is not a goal here, we do not aggregate the 24 observed outcomes into fewer categories, taking advantage of all of the variation of the new index. To focus on political determinants of restrictiveness, instead of using the raw value of the index we subtract from each observation the mode value of the index for each product in a sample of 13 PTAs in the western hemisphere, including those included in the sample.

If the restrictiveness of a rule of origin can be divided into two components, “structural” and “political”, then one would expect the products of political interest to vary across countries more than the standard deflection-prevention needs. The idea then is to use the mode value across these multiple agreements to capture the “structural” level of restrictiveness that prevents deflection. Variation in the mode level of restrictiveness should then capture variations due to the structure of the HS and the cross-country

average effect of transport costs on the restrictiveness necessary to prevent deflection<sup>63</sup>. By subtracting out the mode restrictiveness, we are left with the “political” component. In other words, the mode value is expected to capture the much of the variance due to the “standard explanation” as described above, certainly insofar as the cross-country average cross-product variance in transport costs is concerned.

The deviation from the mode, then, is expected to capture the degree to which the rule has been modified to accommodate interests specific to the bilateral trade in question. The political factors that we have classified as fiscal revenue conservation, protection, and export promotion are expected to affect the rule only for products that are either actively traded or actively protected by the member countries. For goods that are neither produced nor traded in the participating countries, there is no reason to deviate from the mode. The “standard explanation” variables are included in these regressions because their variation in the PTA-specific context is expected to influence the deviation from the mode as well, but the political variables are the ones of interest.

This use of the deviation from the mode also helps to control for product-specific variance due to the structure of the HS. As even superficial examination of the HS will reveal, a change of classification at the heading level in chapter 01 implies changing horses into cow or monkeys – in other words, physically impossible transformations. A change of heading in chapter 84 on the other hand can imply nothing more than assembly of an electronic device from its prefabricated parts. These differences in effective

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<sup>63</sup> The cross-country average effect of transport costs is not expected to eliminate country-specific elements of transport costs, which will still be present in the restrictiveness measure net of the mode value.

restrictiveness across products of the same requirement were controlled for in the regressions in Table 3.1 with dummy variables for Section of the HS. By using the deviation from the mode, on the other hand, this control is not necessary as the observations have already been adjusted to account for these differences because the mode levels of restrictiveness are derived from multiple PTA negotiations where the structure of the HS was considered in the definition of the rules. By using the deviation from the mode we are able to better focus on the political economy determinants of restrictiveness as well as better measure the restrictiveness.

$MFNDIF_i$  is the absolute value of the difference in the two countries' MFN tariffs for product  $i$ , that is, the tariffs applied to imports from non-member countries. The PTAs in the sample all adopt the same method of specifying their tariff elimination schedules. This consists of establishing "base tariffs" to which the progressive elimination applies. For example, if a tariff elimination is specified as a linear reduction over 5 years, with a base tariff of 10%, the preferential tariff will fall by 2% per year, reaching full liberalization in five years<sup>64</sup>.

$MFNDIF$  is calculated from these base tariffs as published in the agreement annexes. These tariffs are determined by the countries coming to an agreement as to the point in time prior to the entry into force of the agreement (usually prior to the commencement of negotiations) from which to adopt the applied tariffs as the base tariffs. Thus, the base

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<sup>64</sup> Some agreements, instead of establishing base tariffs, establish margins of preference that approach 100%. If the applied MFN tariff is constant over the tariff elimination period, there is no difference between the two methods. However, with the margin of preference method if the applied tariff is increased, the preferential tariff can increase as well (until the margin of preference reaches 100%).



tariffs are generally equal to the MFN tariffs. Goods with non-ad valorem base tariffs are excluded from the sample.

Once the agreement's preferences are fully phased in, MFNDIF gives the ad valorem return to deflecting trade through the low-tariff country. The higher the MFNDIF, the higher the incentive to deflect. It has been supposed in the literature<sup>65</sup> that higher MFN differentials lead countries to negotiate more restrictive rules of origin in order to prevent or minimize this sort of deflection. This interpretation would be supported by a positive coefficient.

$TXC_i$  is the ad valorem transport cost for product  $i$  between the two countries. It is measured based on data from the USITC as the difference between the CIF and the FOB values of imports of a given good from a given country partner as a fraction of the FOB value ( $[(CIF-FOB)/FOB]$ ). There is a substantial literature on transport costs<sup>66</sup> that has shown that these costs vary significantly across products and across ordered country pairs for a given product, as well as over time<sup>67</sup>. Due to data restrictions, not all of the variables are direct measures of the desired variable, but rather proxies. For NAFTA, this is relatively straightforward, as the USA is party to the agreement, and among the three

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<sup>65</sup> By Estevadeordal (2000) most prominently.

<sup>66</sup> Limão and Venables (1999) estimate the determinants of transport costs, measured both as shipping costs of a container from Baltimore, and by the FOB/CIF ratio of total (unilateral) trade. Special attention is paid to landlocked countries, sea vs. land distance, country infrastructure, and total distance. They find that infrastructure matters, and that estimated transport costs (fitted values) have a negative impact on trade in a gravity specification. Clark, Dollar, and Micco (2002) undertake a similar analysis based on more disaggregated trade flows (6 digit HS categories) but using cost per unit of weight.

<sup>67</sup> While it is also necessary to account for the transport cost due to the average distance from the rest of the world, this among other factors is controlled with the agreement dummies. There is no reason to expect different cross-product variation in transport costs from the rest of the world to the low-tariff country as compared to the intra-PTA costs.

countries nearly all of the 6-digit HS products are traded (4853). For the Chile-USA agreement, the USA is still a party to the agreement, but even taking the 1996-2004 time period, only about 40% of the products are actually imported by the USA from Chile (2076 products out of 5200). For the remaining three agreements under analysis here (Mexico-Costa Rica, Canada-Costa Rica, and Mexico-Bolivia), USA imports from Costa Rica and Bolivia in the 1996-2004 time period were used, covering 701 codes from Bolivia and 1830 codes from Costa Rica. For goods that are not imported by the USA from each of these countries, we use the unweighted average for USA imports across all countries from which there are imports.<sup>68</sup>

Trade data is taken from DATAINTAL, which is a database maintained by the Inter-American Development Bank. Calculated variables are based on two- or three-year averages for the years preceding the signing of the PTA<sup>69</sup>. The fiscal variable,  $FISC_{i,L/S}$ , is calculated as  $MFN_{i,L/S} * M_{i,L/S}$ . This product of the MFN tariff and the bilateral imports, is thus equal to the tariff revenue derived from imports of product  $i$  from the PTA partner country, and thus the amount of revenue that the importing country can expect to lose as a result of the PTA. This is also proportional to the amount to be gained in producer surplus by the exporter under the assumption that the importing country continues to import good  $i$  from the rest of the world after the implementation of the

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<sup>68</sup> We do test separately in the “standard explanation” regressions presented in Table 3.1 for the set of products where there is trade and the full set (compare columns (1) and (3)). There is quantitative but not qualitative difference in the outcomes between these two sets. There is no way of knowing based on the available data if the quantitative difference is due to sample-selection or measurement error in the proxy values.

<sup>69</sup> Two-year averages were used in cases where there were problems of data availability in a constant version of the Harmonized System.

PTA<sup>70</sup>. Even if this assumption is relaxed and the tariff-protected price in the importing country is allowed to fall<sup>71</sup>, this measure would still serve as a reasonable proxy for the magnitude of the revenue transfer. If protection of fiscal revenue is a motive for setting stricter rules of origin, then one would expect a positive coefficient on this variable. Alternatively, if the exporting country's government is expected to be successful in negotiating less strict rules of origin on products with higher potential producer surplus to be captured, then we would expect a negative coefficient.

$ExRat_{i,L/S}$  is the fraction of total exports of product  $i$  destined to the partner country, calculated as  $X_{i,L/S,S/L} / X_{i,L/S}$  which serves as a measure of the importance of the partner market for exports of product  $i$ , as well as a measure of the competitiveness of the home country's production of good  $i$ . One would expect products with a higher value for this variable to present an incentive for the exporting country to negotiate less restrictive rules of origin in keeping with the export promotion hypothesis. Protectionist motives in the importing country work in the opposite direction.

$ExRoW_{i,L/S}$  is the fraction of a country's total exports represented by exports of product  $i$  destined to the rest of the world, calculated as  $X_{i,L/S,ROW} / X_{L/S,ROW}$ . This is used as a (crude) measure of comparative advantage, capturing the importance of product  $i$  in the respective country's exports. Because exports to the partner country will be affected by the ex ante tariffs, products that would be competitive but for the partner's tariffs will not be identified by the  $ExRat_{i,L/S}$  variable, but could be captured by this one.

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<sup>70</sup> See discussion of the revenue transfer effect in Chapter 1.

<sup>71</sup> For example, if the world supply curve is not perfectly elastic from the importing country's point of view, and the exporter's supply is expected to more than fully displace imports from the rest of the world.

Agreement is a set of dummy variables to control for factors specific to the relevant country pair. As discussed in Chapter 1, there are many factors that can lead to variation in the restrictiveness of rules of origin across agreements. These include structural factors such as the size of the economies involved (positively correlated with restrictiveness) and the average distance from the rest of the world of the participating countries (negatively correlated). Other factors could include the trade related aspects of the participant countries development strategies, (i.e. whether they seek growth through export promotion or import substitution). Even if all of these could be quantified, many of them will not vary across products, and so could not be included as separate variables in the regression. We therefore include four agreement dummies to control for the combined effect of all of them.

#### A note on timing

Tariff and trade measures are based on data for the years immediately preceding the signing of the agreements. What we seek to capture is the information set available to governments during the negotiating process. While post-implementation data would capture the actual effects of the agreements, we do not assume perfect foresight on the part of negotiators. Furthermore, the hypotheses that governments would be inclined to use rules of origin to preserve existing tariff revenues, to maintain protection of protected industries, or to promote currently successful industries should be evaluated against the contemporaneous data.

### Endogeneity Issues

It has been shown that a country's MFN tariff can be endogenous as a certain level of the tariff preferences is needed in order for agreements to be self-enforcing<sup>72</sup>. While this could distort the results of our analysis of rules of origin, the options for instruments are quite limited. The average MFN tariff would be one option, but like the other country-specific variables discussed this would not vary across products and would become redundant with agreement dummies.

Additionally, product level trade flows are endogenous to MFN tariffs, preferential tariffs, and expected tariff preferences, and the  $FISC_{i,L/S}$ ,  $ExRat_{i,L/S}$ , and  $ExRoW_{i,L/S}$  variables are all derived from data on trade flows. Unfortunately, no good instrument is available. This potential distortion will be present in the results.

### 3.5 Results

Table 3.2 presents the regression results. The MFN differential has a positive sign (as expected under the “standard explanation”), though only at the 5% level of significance, and is dependent on controlling for the Fiscal and MFN variables (not significant in columns 3 and 4).

The fiscal variable is negative for small countries, indicating that there is a tendency for the large countries to negotiate for less restrictive rules when there is greater tariff revenue to be transferred to producer surplus in the large partner country. This outcome

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<sup>72</sup> Limão (2006)

is consistent with a motivation driven by assuring market access, and would reject the hypothesis that governments are seeking to preserve tariff revenues through more restrictive rules of origin. This result does reveal noticeable asymmetry in the responsiveness of the rules of origin to the large versus small countries' interests, though not a great deal as the coefficients on the large-country fiscal variable are insignificant. Furthermore, the asymmetry might be explained by the fact that the small countries in the sample have higher tariffs on average than the large countries (9% vs. 6%), indicating that there tends to be more revenue to be captured in the small countries.

While one might expect to need to control for import demand elasticity when testing the effects of the fiscal variable, it happens that this does not have a meaningful impact on the behavior of the fiscal or any other variables, as is demonstrated in Table 3.3. Furthermore, import demand elasticity estimates<sup>73</sup> are available only for goods actively traded by each country, and thus their inclusion results in a significant loss of observations. As these variables do not change the other results in the restricted sample, they are excluded from the analysis.

The responsiveness of rule restrictiveness to the MFN tariff structure is the opposite of that predicted by a hypothesis that rules of origin are used to maintain tariff protection within the PTA. The coefficients are negative for both the large and small country MFN tariffs, but significant only for the small country. The difference in magnitude of the coefficients and in their significance could be attributable to greater bargaining power of the large country or to the fact that in this sample the smaller countries on average have

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<sup>73</sup> Taken from Olareaga and Nicita (2006).

higher tariffs. The coefficients and their statistical significance is stable across the various specifications that include agreement dummies.

This is an important result. The CES paper discussed in Chapter 1 is based on the idea that larger tariff preferences can be combined with more restrictive rules of origin to thus function as an export subsidy for intermediate inputs. Such a setup would then predict that higher tariffs would be associated with more restrictive rules of origin, because in keeping the partner country on their participation constraint, the higher tariffs allow a greater margin of preference with which to compensate the more restrictive rules.

The empirical result here is precisely the opposite. Instead of more restrictive rules being used to capture the surplus available under higher tariff protection, we find systematically less restrictive rules. This is most likely driven by governments working to ensure that their exporters are able take advantage of the preferential access to the PTA partner's market, especially in goods that are more highly protected.

If the asymmetry between the large and small countries in the MFN tariff coefficients is due to differences in bargaining power, then clearly larger country tends to be more successful in reducing the restrictiveness of rules for products that have greater tariff protection in the smaller country. However, this interpretation must be tempered by the results for the export ratio variables, where the greater economic and statistical significance of the small country's variable indicates that the small country is generally successful in obtaining less restrictive rules for its principle export products in the

bilateral trade relationship. If asymmetric bargaining power is the reason for the smaller significance of the coefficients on the large-country MFN tariffs (note that while less significant statistically, the coefficient is still consistently negative), this bargaining power is not systematically employed to negotiate stricter rules for the products in which the small country already depends on the large as an export market.

Like the MFN tariff variables, the large-country's bilateral export ratio is consistently negative as well, but not statistically significant. While this particular result might indicate less bargaining power, it is more likely due to the fact that this variable is generally very small for the large country (a mean of 3% as compared to a mean of 13% for the small country) and consequently is not likely to capture significant variation.

The share of exports variable is consistently negative for the large country and consistently positive for the small country, but is not statistically significant for either. This is most likely due to insufficient variation in the data series than a lack of consideration by the governments of the comparative advantages and principal exports of the countries.

Column (8) gives the results without controls for the between-agreement variation provided by the dummies. There are significant differences in the results for nearly all of the variables except transport costs. Clearly there are country- or agreement-specific factors that have important effects on the negotiated PSRO. These may include the size of the combined economies of the PTA partners as well as institutional factors such as the



individual countries' trade-related development strategies (export-promotion versus import substitution) and even level of PTA negotiating experience. This sample of 5 agreements is too small to be able to explore these sorts of factors in any detail.

### 3.6 Conclusions

While the analysis in this chapter is not derived from a fully developed political economy model of the determination of rule restrictiveness, but rather an attempt to systematically explore the level of empirical support for several broad hypotheses, there are several important conclusions to be drawn from this analysis. First, the “standard explanation” of the determinants of the restrictiveness of rules of origin is only part of the story. While the MFN differential is significantly positively correlated with restrictiveness, this correlation is derived more from variation across agreements than from variation across products and as such is most likely capturing variation due to factors other than just tariffs. At the same time, transport costs are positively correlated with restrictiveness (the opposite of the expected outcome) unless industry-specific factors are controlled for, indicating that there is likely a strong political component to the determination of rule restrictiveness. An analysis of these political factors is thus necessary.

Using the structure of trade and tariffs existing during the PTA's negotiating period to capture these political factors, we find that restrictiveness responds to these variables in a manner consistent with export promotion motives dominating fiscal or protectionist ones. Ex ante MFN tariff rates and tariff revenues are consistently negatively correlated with

restrictiveness of the rules of origin (where significant), as is the importance of the partner country as an export market.

To the extent that there is evidence of asymmetric responsiveness of restrictiveness to large versus small country variables, this is present in the case of the fiscal and MFN variables. Rule restrictiveness responds more, and more significantly, to the small country's variables, which for these variables implies greater responsiveness to the large country's export promotion interests. However, when measured by the importance of the partner's market to exporters, restrictiveness is more responsive to the small country's interests. This is most likely due to the fact that small countries' exports tend to be more concentrated in fewer products than large countries' exports, and consequently there are a larger number of products of particular interest to the large country. The products that are of particular interest to the small country, better captured by the export ratio variable, receive systematically less restrictive rules. It is reasonable to conclude from the totality of these results that there asymmetric bargaining power does not result in strongly asymmetric responsiveness of restrictiveness to country interests.

One might say, then, that rules of origin are set to a conservative (high) level of restrictiveness to be sure to prevent trade deflection, but that then their restrictiveness is adjusted upward for high MFN differentials or downward for products where a member country has a particular interest in securing access to the partner's market unrestricted by the rules of origin. Note that there is a high concentration of observations with the dependent variable (measured as the deviation from the 13-agreement mode value) at

zero. Some have argued that the invariance of the rules of origin is due to the existence of a rules of origin “template” that is pushed by the U.S. in all of its negotiations. The fact that the mode value is calculated from a set of agreements that in their majority do not include the U.S. is an initial argument against this assertion. The fact that a large number of observations present deviations from this mode is a second argument. A more accurate interpretation of the frequency of the mode rules across agreements is that they have been found adequate to the task of preventing deflection, and there is no pressure to adjust their restrictiveness for PTA-specific interests.

Additionally, the negative signs on all of the significant political variables (except the MFN differential) indicate that instead of being a tool for extra protection, taking back access granted in the tariff reductions, the rules of origin generally have their restrictiveness modified downward for products of interest to a participating country, egregious examples to the contrary notwithstanding.

Table 3.1: Standard Explanation

Ordered Probit

Dependent Variable: Rule of Origin Restrictiveness Cols. (1)-(4), (7)-(11) HI, (5) EI, (6) HI Deviation from 13 agreement mode.

	(1) Avg	(2) Min	(3) NoProxy	(4) HI	(5) EI	(6) DevMode	(7) NAFTA	(8) CHLUSA	(9) MEXBOL	(10) MEXCRI	(11) CANCRI
MFN Differential	0.025 (24.36)**	0.024 (23.11)**	0.021 (14.07)**	0.019 (16.99)**	0.017 (14.35)**	0.019 (16.99)**	-0.031 (8.98)**	0.003 (0.79)	0.002 (0.37)	0.043 (17.68)**	0.009 (3.10)**
Transport Cost (Avg.)	0.797 (14.97)**		0.375 (6.28)**	-0.279 (4.89)**	-0.269 (4.36)**	-0.279 (4.89)**	-0.585 (2.07)*	0.018 (0.20)	-0.116 (0.61)	-0.057 (0.42)	-0.129 (0.95)
Transport Cost (Min.)		0.501 (7.01)**									
HS Section Dummies	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24167	24167	11092	24167	24087	24167	4578	5111	4832	4959	4687

Absolute value of z statistics in parentheses

\* significant at 5%; \*\* significant at 1%

-MFN Differential is the absolute value of the difference between the tariffs of the PTA members applicable to goods from non-members.

-Transport Cost is calculated as (CIF-FOB)/FOB based on HS 6-digit bilateral US imports from USITC, using the average (Avg.) and minimum (Min.) values over the available time period.

**Table 3.2: Determinants of Rule of Origin Restrictiveness**

Ordered Probit; Dependent Variable: Restrictiveness Index (Deviation from 13-agreement mode)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MFN Differential	0.005 (2.25)*		0.004 (1.89)	-0.001 (1.02)	0.004 (2.12)*	0.004 (2.09)*	0.005 (2.27)*	-0.013 (7.67)**
Transport Cost	-0.158 (2.62)**		-0.154 (2.56)*	-0.157 (2.61)**	-0.143 (2.37)*	-0.143 (2.38)*	-0.158 (2.62)**	-0.271 (4.60)**
Fiscal-S	-0.012 (3.79)**	-0.011 (3.56)**		-0.012 (3.97)**	-0.017 (5.49)**	-0.017 (5.49)**	-0.012 (3.78)**	0.029 (11.22)**
Fiscal-L	0.011 (0.33)	0.004 (0.12)		0.001 (0.03)	-0.023 (0.69)	-0.022 (0.67)	0.01 (0.31)	-0.027 (0.82)
MFN-S	-0.006 (3.61)**	-0.003 (2.92)**	-0.007 (3.87)**		-0.006 (3.54)**	-0.006 (3.52)**	-0.007 (3.63)**	0.014 (9.42)**
MFN-L	-0.001 (1.25)	-0.001 (0.80)	-0.001 (1.01)		-0.001 (1.10)	-0.001 (1.09)	-0.001 (1.26)	0.004 (4.43)**
Export Ratio-S	-0.347 (9.56)**	-0.343 (9.44)**	-0.369 (10.36)**	-0.345 (9.49)**			-0.349 (9.61)**	-0.033 (0.98)
Export Ratio-L	-0.105 (1.04)	-0.116 (1.16)	-0.121 (1.21)	-0.112 (1.12)			-0.101 (1.00)	0.564 (5.94)**
ExRoW-S	-2.064 (1.22)	-2.119 (1.25)	-1.958 (1.15)	-2.169 (1.28)		-2.077 (1.22)		-2.032 (1.21)
ExRoW-L	-5.38 (1.43)	-5.39 (1.43)	-5.486 (1.46)	-5.355 (1.42)		-6.314 (1.68)		-5.97 (1.60)
CHLUSA	0.484 (20.86)**	0.483 (20.80)**	0.475 (20.57)**	0.486 (20.93)**	0.462 (20.00)**	0.462 (20.00)**	0.484 (20.86)**	
MEXBOL	0.756 (26.47)**	0.726 (28.99)**	0.753 (26.42)**	0.702 (28.90)**	0.753 (26.36)**	0.752 (26.35)**	0.757 (26.48)**	
MEXCRI	0.783 (29.42)**	0.765 (30.17)**	0.782 (29.41)**	0.739 (31.05)**	0.779 (29.30)**	0.778 (29.29)**	0.783 (29.42)**	
NAFTA	1.251 (30.72)**	1.267 (31.35)**	1.17 (33.78)**	1.256 (30.99)**	1.1 (30.15)**	1.1 (30.16)**	1.251 (30.72)**	
Observations	24079	24079	24079	24079	24079	24079	24079	24079
Absolute value of z statistics in parentheses								
* significant at 5%; ** significant at 1%								

**Table 3.3 Effects of inclusion of the import demand elasticities.**

Ordered Probit; Dependent Variable: Restrictiveness Index (Deviation from 13-agreement mode)

	(1)	(2)	(3)	(4)	(5)
MFN Differential	0.005 (1.84)	0.005 (1.87)	0.006 (2.79)**	0.006 (2.82)**	0.005 (2.25)*
Transport Cost	-0.043 (0.49)	-0.064 (0.72)	-0.079 (1.04)	-0.096 (1.27)	-0.158 (2.62)**
Fiscal-S	-0.023 (5.94)**	-0.023 (6.00)**	-0.014 (4.13)**	-0.014 (4.16)**	-0.012 (3.79)**
Fiscal-L	0.02 (0.52)	0.017 (0.42)	0.024 (0.71)	0.022 (0.65)	0.011 (0.33)
MFN-S	-0.008 (3.62)**	-0.008 (3.70)**	-0.009 (4.52)**	-0.009 (4.61)**	-0.006 (3.61)**
MFN-L	-0.003 (2.07)*	-0.003 (2.14)*	-0.002 (1.34)	-0.002 (1.44)	-0.001 (1.25)
Export Ratio-S	-0.419 (9.43)**	-0.415 (9.32)**	-0.411 (10.59)**	-0.406 (10.47)**	-0.347 (9.56)**
Export Ratio-L	-0.177 (1.42)	-0.185 (1.49)	-0.1 (0.94)	-0.106 (1.00)	-0.105 (1.04)
ExRoW-S	0.514 (0.09)	0.814 (0.14)	-1.68 (0.71)	-1.62 (0.68)	-2.064 (1.22)
ExRoW-L	-1.408 (0.24)	-1.125 (0.19)	-7.657 (1.44)	-7.454 (1.41)	-5.38 (1.43)
CHLUSA	0.497 (15.56)**	0.488 (15.33)**	0.488 (19.11)**	0.483 (18.97)**	0.484 (20.86)**
MEXBOL	0.706 (18.01)**	0.708 (18.09)**	0.756 (24.67)**	0.758 (24.74)**	0.756 (26.47)**
MEXCRI	0.75 (21.51)**	0.753 (21.59)**	0.777 (27.30)**	0.779 (27.38)**	0.783 (29.42)**
NAFTA	1.467 (27.87)**	1.459 (27.75)**	1.319 (29.64)**	1.313 (29.54)**	1.251 (30.72)**
Inverse Elasticity-L	-0.066 (2.63)**		-0.049 (1.97)*		
Inverse Elasticity-S	-0.025 (0.77)		-0.012 (0.42)		
Observations	13766	13766	20825	20825	24079

Absolute value of z statistics in parentheses

\* significant at 5%; \*\* significant at 1%

Estimates of import demand elasticities are taken from Olarreaga and Nicita (2006).

Within the sample where the elasticity estimates are most reliable (columns (1) and

(2)), the inclusion of the inverse elasticity does not significantly affect the behavior of the other variables. Even for a broader sample where a proxy is available<sup>74</sup>, the inclusion of the inverse elasticity does not meaningfully affect the other variables. Rules of origin are specified for all products liberalized within a PTA, whether they tend to be traded by the partners or not. The determinants of these rules is therefore of interest. We therefore choose to make use of the full sample with no expectation that the omission of import demand elasticities affects the results.

While the omission of the elasticities is not important for the results, the expansion of the sample does make a difference, primarily for the transport cost coefficient, which becomes significant only for the full sample (column (5) as well as column (1) of Table 3.2) This is logical as increased transport costs, in addition to making rules of origin less necessary for the prevention of trade deflection, also reduce trade, making elasticity estimates impossible. Notice also that the magnitude of the coefficient on Fiscal-S in the sample of actively traded goods (columns (1)-(2)) is nearly twice as large as compared to the full sample (column (5)). This also makes sense as non-traded items can not generate tariff revenue.

Finally, in the limited sample of actively traded products, the coefficient on the large-country MFN tariff becomes significant. This weakens any argument for asymmetry of responsiveness to large- versus small-country interests, as one expects the smaller countries to trade, and therefore have interest in, as smaller set of products.

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<sup>74</sup> We use the large-country value as a proxy for the small country where the small country estimate is not available, and vice versa. The lower level of significance indicates that the proxy is less than perfect, but possibly adequate.

## Appendix 1: How big can PSRO “export subsidies” be?

CES (2006) title their paper “Rules of Origin as Export Subsidies”. The argument is that although export subsidies are specifically prohibited under the GATT/WTO, governments have discovered that rules of origin in a PTA can provide a similar effect, at least for intermediate goods producers. The mechanism is as follows: the developed/capital abundant country (henceforward “North”) produces capital intensive intermediate goods (parts) which are sold to producers in the developing/labor abundant PTA member country (henceforward “South”) where the parts are assembled into final goods which are then sold back to the North. While between North and South, North has the comparative advantage in the production of parts, there may exist other capital abundant countries that are even more efficient in the production of parts. Therefore, to protect the local parts producers, North includes in the PTA with South a rule of origin that requires that a certain fraction of the value of the parts used in the production of the final good originate in North in order to take advantage of the PTA’s tariff preference. Thus, the assemblers in South are required to incorporate parts from North that are less efficiently produced, and therefore more expensive, than parts available on world markets.

This analysis is internally consistent, and it is easy to recognize “North” and “South” in a number of real-world PTA’s that have been signed in recent years by the United States, Canada, the EU, Japan, and Australia with a number of developing countries. What is less certain, however, is whether the levels of the important parameters



support the conclusion that this analysis is the most likely mechanism for the determination of rules of origin. That is what we seek to examine here.

We begin by describing a very simple model that captures the bare essentials of the suggested mechanism. We then numerically calculate the possible magnitudes of the parameters. Finally, we compare these calculations to the data from the United States to see how large the “export subsidy” may be for various goods under various agreements.

### **The Model**

The restriction imposed by the rule of origin can be described as:

$$\frac{P_R Q_R}{(1+M)(P_R Q_R + P_N Q_N)} \geq x \quad x, Q_R, Q_N \in [0,1] \quad (1)$$

where  $x$  is the fraction of the price of the final good that the value of originating materials used must represent,  $P_R$  is the price of regional (originating) inputs/parts,  $Q_R$  is the fractional quantity of total parts that are originating,  $P_N$  and  $Q_N$  are the respective values for non-originating price and quantity, and  $M$  is the proportional markup added by the assembler in South. The markup includes production costs (in pure assembly, this will be labor plus average fixed costs) as well as any rents to the assembler. We assume that originating parts and non-originating parts are perfect substitutes and infinitely divisible (all variables are continuous).

In what follows, we limit ourselves to the case where  $P_R \geq P_N$  so that the rule of origin will bind. If the reverse were the case, the assembler in South would want to source

exclusively in North, and there would be no case for the export subsidy we are seeking to quantify. By normalizing  $P_N=1$  (and assuming South's MFN tariff on parts is zero), we can define  $z$  as the proportion by which  $P_R$  exceeds  $P_N$  such that

$$P_R = (1 + z)P_N = 1 + z \quad z \geq 0$$

With the additional observation that  $Q_R+Q_N=1$ , equation (1) simplifies to

$$Q_R = \frac{x(1 + M)}{1 + z - zx - Mxz} \quad (2)$$

The next important consideration is that, for the rule of origin to function as an export subsidy to the parts producer, the assembler in South must be willing to participate in the final exchange. That is, the tariff preference must be high enough to compensate for the higher cost of inputs implied by the rule of origin. Otherwise, the assembler will simply prefer to use only parts from the rest of the world and pay the MFN tariff rate, ignoring the PTA regime altogether. The assembler's participation constraint is then

$$[(1 + z)Q_R + Q_N](1 + M) \leq 1 + y \quad M, y \geq 0 \quad (3)$$

where the world price of the final good is normalized to 1 and  $y$  is the ad valorem MFN tariff in North. In words, assuming a competitive final goods market in North, the price of the good produced in compliance with the rule of origin must be no greater than the tariff-ridden world price. When  $z \geq 0$  the constraint will bind as the assembler is free to set  $M$  up to that level. Indeed, an alternate assumption that produces the same effects would be that the parts producer is as efficient as producers in any other country, knows all of the parameters, and simply sets  $z$  so as to capture

all of the possible rents available under the regime. Whether  $z$  represents inefficiency or rent seeking is immaterial to the analysis. We therefore proceed assuming strict equality instead of the weak inequality.

By substituting (2) into (3) and rearranging, we obtain

$$M = \frac{y(1 + z - xz) - zx}{1 + z + xz + xyz} \quad (4)$$

This is a function that expresses the fractional markup that can be obtained by the producer in South in terms of North's MFN tariff, the rule of origin, and the price difference between originating and non-originating inputs.

#### How realistic is this model?

It is important to be certain that the model captures the fundamentals of rules of origin as applied in PTA's. There are a variety of accounting procedures described in the myriad PTA's currently in force. The recently approved Central American Free Trade Agreement, for example, specifies three different methods of calculation of regional value added that can apply to different products. The differences, however, respond largely to differences across products in the complexity of the required documentation. The fundamental mechanism for determining origin is the value of regional value added as a share of the transaction price on the customs invoice. This is what we capture in equation (1). This formulation corresponds most closely to what is called the "Build-up" method in the United States' most recent agreements.

An alternative calculation would specify the numerator of equation (1) as the difference between the market price (which is the denominator) and the value of non-originating inputs/parts. This would be meaningfully different in that the value of the assembler's markup would be included in the numerator as regional value added, which is not the case in equation (1). This specification corresponds to the "Build-down" method used in recent U.S. agreements, as well as the "transaction cost" method in NAFTA and more recent Canadian agreements. The agreements generally take this difference into account, though, as most rules allow the importer to choose between the two methods, and adjust the required level of regional value added according to the method chosen (the Build-up method usually requires 10% less value added than the Build-down method which includes the markup in the numerator). Keeping these facts in mind it is relatively straightforward to apply the model to the data contained in the agreements.

One possible concern is that only a minority of products in NAFTA-style agreements have the alternative of a value added test of the sort described by the model. Classification change rules predominate. The advantage of the model is that by boiling down the rules to a very simple value added tests one may work with continuous variables and thus identify the maximum possible "export subsidy". A rule that explicitly states that "parts" must be originating is not clearly reflected in the specifications of the model. Nonetheless, the purpose of the exercise below is to quantify the value of the implicit "export subsidy" that is generated by the rules. If the rule that requires that all parts must be originating results in costs to the assembler

that violate the participation constraint in equation (3), then the assembler will choose to use non-originating parts and pay the MFN rate. What the model allows is a calculation of the maximum value added requirement that can support the inefficiencies (or rent seeking) of the parts manufacturers in North while maintaining the participation of the assembler in South.

Comparative statics on equation (4) are quite straightforward and as expected:

$$\frac{\partial M}{\partial x} = \frac{-(z + yz)(1 + z + y + yz)}{(1 + z + xz + xyz)^2} < 0$$

$$\frac{\partial M}{\partial z} = < 0$$

$$\frac{\partial M}{\partial y} = > 0$$

M is decreasing in both x and z, and increasing in y. As expected, an increase in z for a given rule of origin, *ceteris paribus*, implies an increase in the cost of production and hence a decrease in the level of the markup that can be supported.

Of course, when z increases, as the situation is modeled here, the assembler would be able to simply reduce QR by the same proportion and the value of the originating components would be the same. While we are not modeling the entire political process here, we can assume that the North government would have negotiated the rule taking both price and quantity into account so as to maximize profit for the parts producer. Besides which, z is not necessarily a choice variable for the government or the parts producer, as producers are not expected to “choose” their level of

inefficiency. If  $z$  is derived from a rent-seeking activity then consideration of  $z$  as a choice variable is more reasonable, as parts producers would be able to choose a level of  $z$  that captures the rents available to assemblers in South under the tariff-protection of the final good in North. This choice would still be constrained by the nature of the market for parts produced in North.

The assumption earlier was that  $z > 0$  because of inefficiencies in production relative to parts producers in other northern countries. The significance of the partial of  $M$  with respect to  $z$  being negative is that, when these efficiencies are larger, there is less scope for a restrictive rule of origin (higher value of  $x$ ) because there is less “slack” in the assembler’s markup to be appropriated as “export subsidy”. That is, the more inefficient the producers in the North are, the more assemblers in South must be allowed to use non-originating parts if they are to be kept within their participation constraint for a given value of North’s MFN tariff ( $y$ )<sup>75</sup>.

Note, however, that by equation (4) if  $M > 0$ ,  $y$  must also be positive. Indeed, rearranging (4) to solve for  $y$  gives

$$y = \frac{M(1 + z + xz) + xz}{1 + z - xz - Mxz} \quad (5)$$

which reduces to  $y=M$  when  $z=0$ .

### Calculation of parameters

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<sup>75</sup> This is consistent with Krishna (2006) in that as rules are made more restrictive, producers of the good begin to switch to the MFN regime and the effects of the rule are reversed.

We now turn to an exploration of what levels of  $z$ , the “export subsidy”, are supported by different values of the other parameters in the model. Figures 1 through 3 depict the relationships among the variables. Chart 1 graphs the relationship between the assembler’s markup and the level of the “export subsidy” for different levels of North’s MFN tariff on the final good, setting the value added requirement at 50%. Recalling the assembler’s participation constraint in equation (3), the assembler will choose to ignore the PTA, source parts exclusively from world markets, and pay the MFN tariff when  $z$  rises to a level that forces the markup below zero. For an MFN tariff of 10%, this occurs at approximately  $z=20\%$ . A 15% MFN tariff can support an export subsidy of about 35%, and a 20% MFN tariff a subsidy of 50%.

Chart 2 depicts the converse relationship between the assembler’s markup and the MFN tariff on the final good in North for different values of the export subsidy, again holding the rule of origin constant at  $x=50\%$ . A subsidy of 20% becomes feasible at an MFN tariff of between 5% and 10%. A 50% subsidy requires a tariff of 20%, and a 100% subsidy needs a tariff of just under 35%.

Chart 3 lays out the relationship between the markup and the level of regional value added required by the rule of origin for three levels of North’s MFN tariff holding  $z$  constant at 20%.

## **Comparison of mutually consistent parameters with reality**

These estimates are all upper bounds.  $M=0$  is not the point at which the assembler is indifferent between the regimes, as  $M$  must include the marginal cost of assembly (wages) plus average fixed costs. However, as there is no data available regarding these costs,  $M=0$  serves as the absolute lower bound for  $M$  in the case where the assembler chooses to comply with the rule of origin.

A more appropriate rule of thumb might be to take a markup of 10% as the lower bound for assembler participation. As mentioned above the US's agreements with Central America, Chile, Singapore, and Australia all tend to give the importer a choice between the "build-up" and "build-down" calculations, with the requirement in latter exceeding the requirement in the former almost universally by 10% value added. The difference between the two calculation methods is basically the inclusion of the markup as regional value added in the numerator of equation (1). If we make the reasonable assumption that average restrictive effect of these two formulations is equivalent (across heterogeneous assemblers), we can deduce that a 10% markup is sufficient for assembler participation.

## **Conclusions**

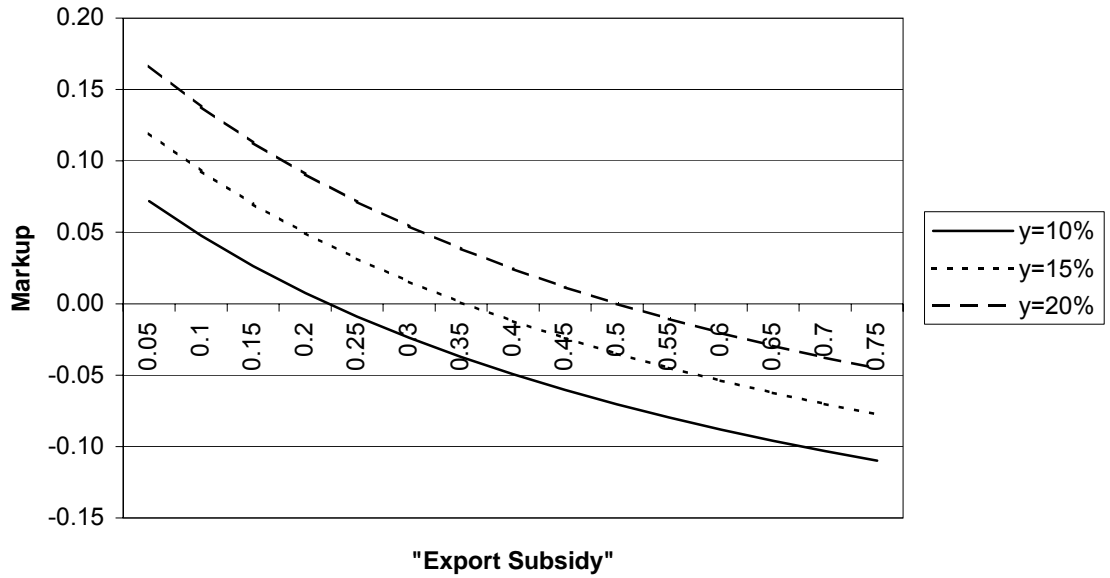
While this is a very back-of-the-envelope sort of model, it allows for a basic analysis of the levels of MFN tariff that would be necessary to sustain significant "export subsidies" as described in CES (2006). When comparing these levels with those



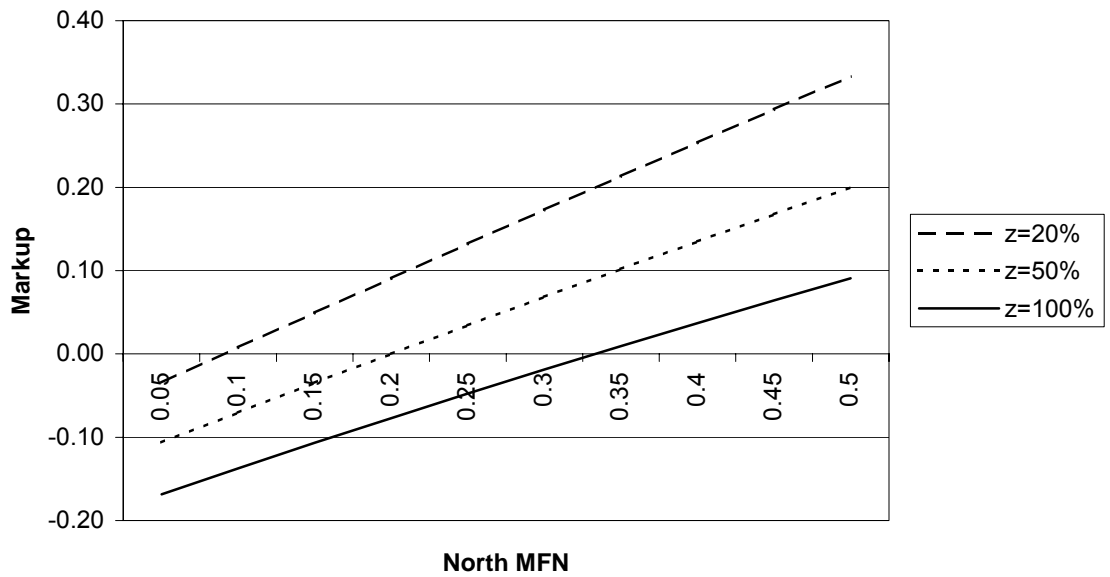
actually observed, at least in the U.S. tariff schedule, it seems unlikely that this model presents a full description of the determination of the restrictiveness of rules of origin.

Furthermore, it is unlikely that parts producers capture all of the rents from the PTA tariff preference/rule of origin regime. First, because the mechanisms for defining the rules of origin are not continuous variables as modeled here and in CES, the assembler is likely to be at least slightly inside his participation constraint. Second, there is evidence that rules vary detectably across agreements, indicating that there is meaningful negotiation between countries, such that some rents are retained by the South (see Chapter 3).

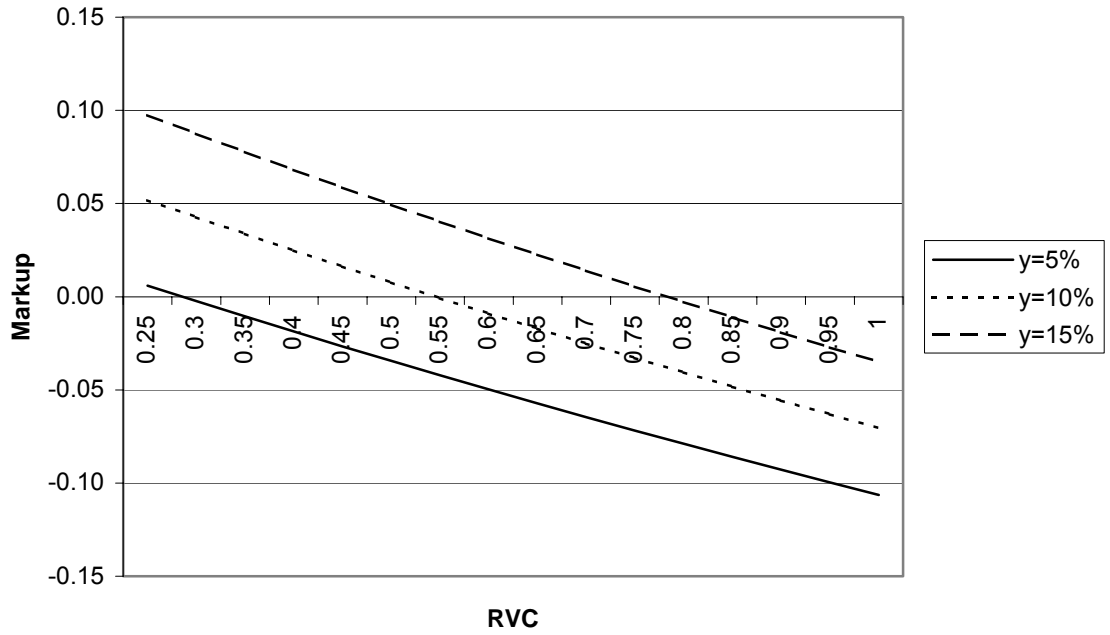
**Figure 1.A.1: Markup as a function of "Export Subsidy"**  
 $x=50\%$



**Figure 1.A.2: Markup as a function of MFN Tariff**  
 $x=50\%$



**Figure 1.A.3: Markup as a function of Value Added Requirement**  
**z=20%**



## Appendix 2.A: Equivalences across forms

The calibration analysis to determine rough equivalences across forms drew on a database of product specific rules from 13 NAFTA-style agreements: Central American Free Trade Agreement (CAFTA), Canada-Costa Rica, Chile-Canada, Chile-Central American Common Market (CACM), Chile-Mexico, Chile-USA, G3, CACM, Mexico-Bolivia, Mexico-Costa Rica, Mexico-Nicaragua, Mexico-Northern Triangle, and NAFTA itself. This combined database contains 64,760 product specific rules, of which 13,444 (21%) provide alternative criteria for origin qualification. Alternative rules are used in 72 different HS chapters (this falls to 60 different chapters when CHL-CACM is excluded), though they are fairly concentrated in chemicals, machinery, equipment, and manufactures.

Equivalences:

1)  $\Delta H \approx 50\%$  Value added requirement measured at transaction cost

This equivalence is inferred from rules of the following sort: “A change to subheading 8409.99 from any other heading; or No required change in tariff classification to subheading 8409.99, provided there is a regional value content of not less than: (a) 60 percent where the transaction value method is used, or (b) 50 percent where the net cost method is used.” This type of rule appears 1,760 times in the database of 13 agreements. Of these, 73% match a heading change as the first alternative with a 50% value added requirement measured at transaction cost as the second alternative. 14% match a subheading change with a 50% value added

requirement, and no other combination represents more than 3% of the rules of this type.

2) Requirement to measure value added at Net Cost  $\approx$  10% Value added measured at transaction cost

This equivalence is also seen in the example provided for (1) above. There are 5,527 rules in the database that provide the transaction value/net cost alternative value test, and in 99% of the cases the difference between the required levels is 10% (or 8.34% in the MEX-CRI agreement).

3) VT  $\approx$  -addS

This equivalence is inferred from rules like “A change to subheading 8417.10 through 8417.80 from any other heading; or A change to subheading 8417.10 through 8417.80 from subheading 8417.90, whether or not there is also a change from any other heading, provided there is a regional value content of not less than: (a) 60 percent where the transaction value method is used, or (b) 50 percent where the net cost method is used.” Both alternatives are based on a subheading change, but in the second rule, the addition of a permissible subheading is offset by a value test. The database provides 3,865 alternatives of this sort. Of these, 75% involve the addition of a subheading, and a further 17% the addition of a range of subheadings.

4) exH  $\approx$  VT

This equivalence is derived from this type of rule: “A change to heading 84.70 from any other heading, except from heading 84.73; or A change to heading 84.70 from heading 84.73, whether or not there is also a change from any other heading, provided there is a regional value content of not less than: (a) 60 percent where the transaction value method is used, or (b) 50 percent where the net cost method is used.” The removal of the excepted heading in the second rule is compensated for by a value test. There are 2,384 rules in the database where the first alternative is a classification change with excepted products, and the second is the same classification change with the exception replaced by a value test. In 45% of these the exception is a single heading, and in a further 18% the exception is a range of headings. In only 12% of the cases is the exception a subheading or an item.

##### 5) $(\Delta C - \Delta S) \approx \text{TECH}$

The clearest example is “A change to subheading 2009.90 from any other chapter; or A change to subheading 2009.90 from any other subheading within Chapter 20, whether or not there is also a change from any other chapter, provided that a single juice ingredient, or juice ingredients from a single non-Party, constitute in single strength form no more than 60 percent by volume of the good. Chapter”, from which we can infer equivalence (6). The first rule is a simple chapter change, while the second rule requires only a subheading change, compensated for by a technical requirement regarding the fractional origin of the juice ingredients. This equivalence is the most difficult to establish, and thus the least certain. In the database with 13 NAFTA-style agreements, there are only 334 alternative rule sets where there is a

technical requirement in one of the alternatives. This falls to 71 when excluding just one agreement (CHL-CACM). In the 263 from CHL-CACM, the most common combination (254 times) is a simple change of chapter versus the technical requirement, which would yield " $\Delta C \approx \text{TECH}$ ". However, this would be derived from a pattern that is seen only in one agreement, and there almost exclusively in agricultural goods. In the 71 remaining observations there is no clear pattern, but the mode is a chapter change paired with a subheading change and a technical requirement. This is the relation used to establish the calibration. The results in Section 2.8 are not sensitive to changes in this value.

## Appendix 2.B: Examples of application of the restrictiveness index

For purposes of illustration, we demonstrate the calculation of the index value for several rules.

1. “A change to subheading 8409.91 from any other heading; or No required change in tariff classification to subheading 8409.91, provided there is a regional value content of not less than: (a) 60 percent where the transaction value method is used, or (b) 50 percent where the net cost method is used.”

<u>Change of classification points:</u>	+6
<u>Exception Points:</u>	0
<u>Addition Points:</u>	0
<u>Value Test Points:</u>	0
<u>Technical Requirement Points:</u>	0
<u>Alternative Rule Points:</u>	-3

The rule requires a change of heading, and provides an alternative rule. No other elements are used. Index Value: 3

2. “A change to subheading 3004.10 through 3004.90 from any other heading, except from heading 30.03.”

<u>Change of classification points:</u>	+6
<u>Exception Points:</u>	+6
<u>Addition Points:</u>	0
<u>Value Test Points:</u>	0
<u>Technical Requirement Points:</u>	0
<u>Alternative Rule Points:</u>	0

The rule requires a change of heading, with one excepted heading. No other elements are used. Index Value: 12



3. “A change to Canadian tariff item 5407.60.10, U.S. tariff item 5407.60.05A, 5407.60.10A or 5407.60.20A or Mexican tariff item 5407.60.02 from Canadian tariff item 5402.43.10 or 5402.52.10, U.S. tariff item 5402.43.00A or 5402.52.00A, Mexican tariff item 5402.43.01 or 5402.52.02 or any other chapter, except from heading 51.06 through 51.10, 52.05 through 52.06 or 55.09 through 55.10.”

<u>Change of classification points:</u>	+8
<u>Exception Points:</u>	+7
<u>Addition Points:</u>	-5
<u>Value Test Points:</u>	0
<u>Technical Requirement Points:</u>	0
<u>Alternative Rule Points:</u>	0

The rule is based on a change of chapter, permits the addition of more than one Item, and excepts multiple headings. Index value: 10

## Appendix 2.C Comparison with Estevadeordal's (2000) Index

Chart C.1: Frequency by Category

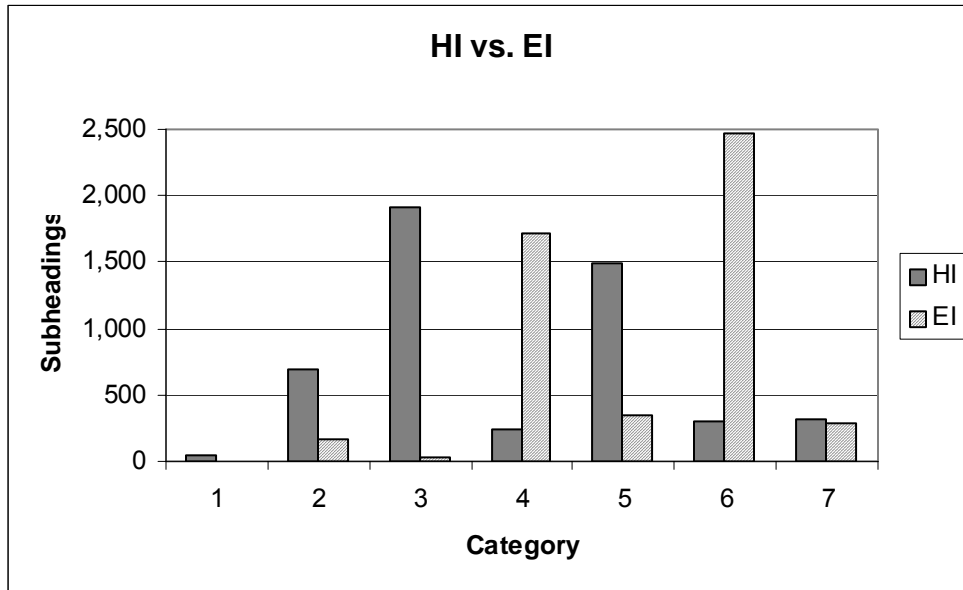


Chart C.2: Average Category by Stage of Production

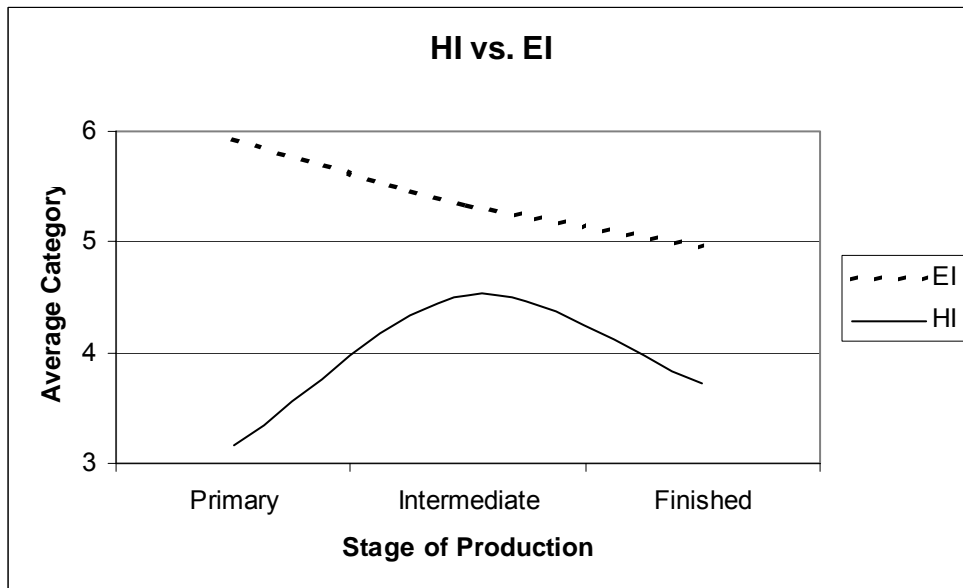


Table 2.C.1: Average EI and HI by HS Sections

Section	Description	Chapters	# of Subheadings	Average of HI	Average of EI	Dif	Dif-AvgDif
12	Footwear/Misc. Articles	64-67	194	5.31	4.84	-0.47	-1.71
11	Textiles	50-63	270	5.96	5.89	-0.07	-1.31
7	Plastics/Rubber	39-40	52	4.58	4.93	0.35	-0.89
17	Motor Vehicles/Vessels	86-89	759	3.43	4.27	0.84	-0.40
16	Machinery/Electrical Equip.	84-85	149	2.87	3.88	1.01	-0.23
15	Base Metals	72-83	181	3.73	4.77	1.04	-0.20
9	Wood/Wood Articles	44-46	74	3.10	4.18	1.08	-0.16
6	Chemical/Industrial Products	28-38	79	4.47	5.56	1.09	-0.15
13	Stone/Glassware	68-70	151	3.76	5.03	1.27	0.03
18	Precision Instruments	90-92	55	2.80	4.38	1.59	0.35
10	Paper/Cellulose Material	47-49	189	3.68	5.32	1.63	0.39
14	Precious/Semiprec. Mat.	71-71	809	3.58	5.42	1.85	0.61
8	Animal Hides/Skins	41-43	52	3.19	5.49	2.30	1.06
3	Animal/Vegetable Fats	15-15	138	3.15	5.62	2.47	1.23
4	Processed Foods/Tobacco	16-24	762	3.19	5.66	2.47	1.23
5	Mineral Products	25-27	587	3.24	5.74	2.50	1.26
1	Live Animals/Products	01-05	132	3.26	6.00	2.74	1.50
19	Arms/Munitions	93-93	131	2.59	5.53	2.94	1.70
2	Vegetable Products	06-14	230	3.00	6.00	3.00	1.76
21	Art/Antiques	97-97	17	3.00	6.00	3.00	1.76
20	Misc. Manufactured Articles	94-96	7	2.70	5.74	3.04	1.80

Table 2.C.2: Where does the difference lie?

	(1) EI	(2) HI	(3) HI w/o Alt's	(4) HI w/o Ex or Add	(5) HI w/o Ex or Add or Alt's
MFN_Differential	0.016 (5.06)**	-0.045 (15.37)**	-0.044 (14.17)**	0.007 (2.47)*	0.017 (5.65)**
IIT_ME_RoW	1.28 (20.73)**	1.081 (18.50)**	1.045 (17.26)**	0.669 (11.82)**	1.297 (21.06)**
IIT_ME_USA	0.172 (2.39)*	-0.623 (9.06)**	-0.945 (12.88)**	0.17 (2.52)*	-0.462 (6.44)**
IIT_US_RoW	-1.641 (22.88)**	-1.359 (20.02)**	-1.072 (15.25)**	-1.966 (28.80)**	-1.639 (23.19)**
Observations	5005	5005	5005	5005	5005

Absolute value of z statistics in parentheses

\* significant at 5%; \*\* significant at 1%

## Appendix 2.D Index and Model Specification in Estevadeordal (2000)

The restrictiveness index developed in Estevadeordal (2000) is as follows:

$y = 1$	if $y^* \leq \Delta I$
$y = 2$	if $\Delta I < y^* \leq \Delta S$
$y = 3$	if $\Delta S < y^* \leq \Delta S \& VT$
$y = 4$	if $\Delta S \& VT < y^* \leq \Delta H$
$y = 5$	if $\Delta H < y^* \leq \Delta H \& VT$
$y = 6$	if $\Delta H \& VT < y^* \leq \Delta C$
$y = 7$	if $\Delta C < y^* \leq \Delta C \& TR$

The empirical specification:

In the first stage of the two-stage estimation, the PSRO restrictiveness index is regressed on the MFN tariff differential and the three intra-industry trade indices (between PTA members, and of each member with the rest of the world). This requires an ordered probit specification. In the second stage, the linearly fitted values of the PSRO restrictiveness index are captured from the first stage and used as an explanatory variable for the speed of liberalization in the tariff elimination schedule (TES) for each participating country. The model may be expressed by the following two-equation system:

$$y_1^* = \beta_1' X_1 + v_1 \quad (\text{Eq.1})$$

$$y_{2i} = \gamma_i y_1^* + \beta_{2i}' X_{2i} + v_2 \quad (\text{Eq.2})$$

where  $y_1^*$  is the latent value of the PSRO's restrictiveness,  $y_{2i}$  is the speed of liberalization in the TES of country  $i$  (recall that each country has its own TES within each PTA), and  $X_1$  and  $X_2$  are matrices of explanatory variables independently distributed from the error terms  $v_1$  and  $v_2$ . These two error terms are assumed to be jointly normally distributed with mean zero and a positive definite variance matrix.

## Bibliography

- Amemiya, T. (1978) *The Estimation of a Simultaneous Equation Generalized Probit Model*, *Econometrica*, 46 (September): 1193-1205.
- Amemiya, T. (1979) *The Estimation of a Simultaneous Equation Tobit Model*, *International Economic Review*, 20 (February): 169-181.
- Anson, J., O. Cadot, A. Estevadeordal, J. de Melo, A. Suwa Eisenmann, B. Tumurchudur (2003) "Rules of Origin in North-South Preferential Trading Arrangements with an Application to NAFTA", mimeo, University of Lausanne.
- Bhagwati, J. and A. Panagariya (1996) "Preferential Trading Areas and Multilateralism: Strangers, Friends, or Foes?" in J. Bhagwati and A. Panagariya (Eds.) *The Economics of Preferential Trade Agreements* (Washington, D.C.:AEI Press).
- Cadot, O., Carrère, C., de Melo, J., and Tumurchudur, B. (2005) "Product Specific Rules of Origin in EU and US Preferential Trading Arrangements: An Assessment". Mimeo.
- Cadot, O., Estevadeordal, A., and Suwa-Eisenmann, A. (2006) "Rules of Origin as Export Subsidies" in Cadot, O., Estevadeordal, A., Suwa-Eisenmann, A., and Verdier, T. eds. *The Origin of Goods*. Oxford University Press. Oxford.
- Carrere, C. and de Melo, J. (2006) "Are rules of origin equally costly? Estimates from NAFTA" in Cadot, O., Estevadeordal, A., Suwa-Eisenmann, A., and Verdier, T. eds. *The Origin of Goods*. Oxford University Press. Oxford..
- Cornejo, R. and Harris, J. (2007) "Propuesta metodológica para la convergencia del Spaghetti Bowl de reglas de origen" Mimeo. IDB/INTAL Working Paper forthcoming.
- Clark, X., Dollar, D., and Micco, A. (2002) "Maritime Transport Costs and Port Efficiency", Policy Research Working Paper no. 2781, World Bank.
- Estevadeordal, A. (2000) *Negotiating Preferential Market Access – The North American Free Trade Agreement*. *Journal of World Trade*, 34 (February): 141-166.
- Estevadeordal, A. and Suominen, K. (2004) "Rules of Origin: A World Map and Trade Effects". Mimeo.

- Estevadeordal, A., López-Córdova, E. and Suominen, K. (2006) “How do Rules of Origin Affect Investment Flows? Some Hypotheses and the Case of Mexico” INTAL-ITD Working Paper 22. INTAL. Buenos Aires.
- Garay, J.L. and Cornejo, R. (2001) “Metodología para el análisis de regimenes de origen: Aplicación en el caso de las Américas”. INTAL-ITD-STA Documento de Trabajo 8. Inter-American Development Bank.
- Grossman, G. (1981) “The Theory of Domestic Content Protection and Content Preference”. *Quarterly Journal of Economics* 96, 583-603.
- Grossman, G. and E. Helpman (1994) *Protection for Sale*. *American Economic Review*, 84: 833-850.
- Harris, J. (2006) “Rules of Origin in the Once and Future FTAA” in Planck-Brumback ed. *The Once and Future FTAA*. Forthcoming.
- Herin, J. (1986) Rules of origin and Differences between Tariff Levels in EFTA and in the EC. EFTA Occasional Paper no. 13, Geneva (February).
- Ju, J. and Krishna, K. (1998) “Firm Behavior and Market Access in a Free Trade Area with Rules of Origin”, NBER Working Paper 6857, National Bureau of Economic Research (Cambridge, Massachusetts).
- Kowalczyk, C. and D. Davis (1998) “Tariff Phase-Outs: Theory and Evidence form GATT and NAFTA” in J. Frankel (Ed.) *Regionalization of the World Economy* (Chicago: Chicago University Press)
- Krishna, K. and Krueger, A. (1995) “Implementing Free Trade Areas: Rules of Origin and Hidden Protection” In *New Directions in Trade Theory*, A. Deardorff, J. Levinsohn and R. Stern (eds.) University of Michigan Press.
- Krishna, K. (2006) “Understanding Rules of Origin” in Cadot, O., Estevadeordal, A., Suwa-Eisenmann, A., and Verdier, T. eds. *The Origin of Goods*. Oxford University Press. Oxford.
- Krueger, A. (1993) “Free Trade Agreements as Protectionist Devices: Rules of Origin” NBER Working Paper 4352.
- Limão, N. (2006) “Are Preferential Trade Agreements with Non-trade Objectives a Stumbling Block for Multilateral Liberalization?” *Review of Economic Studies*. Forthcoming.
- Limão, N. and Venables, A. (1999) “Infrastructure, Geographical Disadvantage, and Transport Costs”, Policy Research Working Paper no. 2257, World Bank.

- Nelson, F. and L. Olsen (1978) Specification and Estimation of a Simultaneous Equation Model with Limited Dependent Variables, *International Economic Review*, 19 (October): 695-705.
- Nicita, A. and Olarreaga, M. (2006) "Trade, Production and Protection 1976-2004" World Bank Economic Review. Database from ([www.worldbank.org/trade](http://www.worldbank.org/trade)).
- Panagariya, A. (1999) *Regionalism in Trade Policy: Essays on Preferential Trading*. World Scientific. London.
- Panagariya, A. and Duttgupta, R. (2001) "Free Trade Areas and Rules of Origin: Economics and Politics". Mimeo.
- Portugal-Perez, A. (2006) "Disentangling the determinants of Rules of Origin in North-South Preferential Trade Agreements. Evidence for NAFTA" Mimeo. Université de Genève.
- Sanguinetti, P. and Bianchi, E. (2006) "Implementing PTA's in the Southern Cone Region of Latin America: Rules of Origin" in Cadot, O., Estevadeordal, A., Suwa-Eisenmann, A., and Verdier, T. eds. *The Origin of Goods*. Oxford University Press. Oxford.
- Suominen, K. (2004) "Rules of Origin as Determinants of Market Access Provisions in PTAs". Mimeo.
- Viner, J., 1950, *The Customs Union Issue* (Carnegie Endowment for International Peace, New York).