Three Essays on the Impacts of Rules of Origin in Preferential Trading Arrangements

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A Dissertation submitted to

The Faculty of
the Columbian College of Arts and Sciences
of The George Washington University
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy

January 31, 2012

Dissertation directed by

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The Columbian College of Arts and Sciences of The George Washington University certifies that Christopher Blaha has passed the Final Examination for the degree of Doctor of Philosophy as of December 9, 2011. This is the final and approved form of the dissertation.

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Dedication

The author wishes to thank his beloved wife Leslie for her persistent support and encouragement along this journey.

Abstract of Dissertation

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This dissertation examines the effects of rules of origin (ROOs) on aspects of trade policy and preferential trade performance. In the past few decades, there has been a dramatic increase in the number of bi- or pluri-lateral preferential trading agreements that provide preferential tariff treatment on eligible products from partner countries. These preferential agreements, which by nature are discriminatory, raise concerns about inefficiencies generated by the agreements' trade motivations. A key component to understanding how such agreements affect trade lies in the details of how trade qualifies for preferential treatment in the first place, which is defined by preferential rules of origin (ROOs).

Since ROOs can require that inputs be sourced from within the preferential area, my first essay analyzes whether restrictive ROOs influence most favored nation (MFN) tariff rates. The incentive of a large preferential margin for the final good may be necessary to induce final goods producers to adhere to the ROOs and source potentially higher-cost inputs from the partner providing the margin. In my second essay, I propose to examine how ROOs in two different U.S. preferential regimes – unilateral preference programs and FTAs – affect preferential trade and utilization. Since preferential tariffs are generally identical under these two regimes, this analysis better isolates the effect of differences in ROOs restrictiveness. Finally, I examine exchange rates and preferential program utilization when ROOs require a share of value content. Unlike with other types of ROOs, the ability to meet value-content requirements is a function of the exchange rate between the currencies in which inputs are denominated. I investigate the possibility

that while a depreciated domestic currency can improve export competitiveness, it may also make value content ROOs more difficult to meet, since foreign inputs then make up a higher share of total production costs.

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Chapter 1: Introduction

In the past few decades, there has been a dramatic increase in the number of bi- or pluri-lateral preferential trading agreements that provide preferential tariff treatment on eligible products from partner countries. As of May 2011, the World Trade Organization (WTO) had received notification of 380 such regional trade agreements (RTAs), and all countries except Mongolia are party to at least one preferential agreement. These include customs unions, partial scope agreements, and free trade agreements (FTAs), with the latter two making up the vast majority. The WTO's 2011 World Trade Report indicates that participation in these agreements has not just increased but accelerated over time (WTO, 2011). This increase of RTAs has motivated an intense study of how they interact with the multilateral trading system set up by the General Agreements on Tariffs and Trade, and its successor, the WTO. These preferential agreements, which by nature are discriminatory, raise concerns about inefficiencies generated by the agreements' incentives to distort trade.

A key component to understanding how RTAs alter trade patterns lies in the details of how trade qualifies for preferential treatment in the first place. In a world of increasingly complex global supply chains, the basis upon which an import is identified as eligible for preferential treatment, or not, is of crucial and far-reaching importance in determining the effect of such preferences.

Preferential rules of origin (ROOs) fulfill this role of identifying imports that are preference-eligible 'originating' products, and those that are not. ROOs embody a set of criteria that specify certain types or levels of processing that must take place in a partner country in order for the product to be deemed as originating in that country, and thus be eligible for zero or reduced tariff. Therefore, ROOs effectively define the potential scope of preferential trade and are a necessary component of any type of agreement that provides preferential treatment.[1]

Thus, the structure of a preferential agreement's ROOs can have a significant impact on the practical effect of such agreements. By governing the level and/or types of production that confers origin, ROOs influence how liberalizing preferential agreements are even between the member parties. Indeed, as I will highlight later in this dissertation, ROOs may be set so restrictively such that compliance with them exceeds the preferential tariff benefit. In such a case producers will not utilize the preferential agreement at all; the ROOs having effectively eliminated its utility. Alternatively, if a firm's existing production does confer origin under less restrictive ROOs, then they gain preferential tariff access at no additional cost, leading to robust preferential trade. Between these extremes, ROOs may motivate firms to adjust their input supply chains in order to gain preferential tariff access.

[1] While the focus of my dissertation is on ROOs that apply to trade under preferential trading arrangements, non-preferential ROOs also exist. While preferential rules establish origin for purposes of assigning tariff treatment, non-preferential ROOs exist simply to establish the product's origin. Thus, they generally do not have the effect of providing adjusted tariff treatment, as preferential ROOs do. However, in some cases, such as trade remedies (e.g. dumping, countervailing duties, and safeguards), non-preferential ROOs can be used to identify goods subject to remedy, and thus may also have an impact on tariff treatment.

While ROOs have long been a component of RTAs, they only attracted significant academic attention within the last 20 years, over which time they have also increased in complexity. Much of the literature on ROOs has focused on either the political economy motives behind their creation or upon their effect on preferential trade. In this dissertation, I expand upon this work by examining how ROOs affect not just trade, but whether they influence multilateral tariff rates or interact with macroeconomic trade effect of exchange rates.

Since ROOs can require that inputs be sourced from within the preferential area, my first essay analyzes whether restrictive ROOs influence most favored nation (MFN) tariff rates. The incentive of a large preferential margin for the final good may be necessary to induce final goods producers to adhere to the ROOs and source potentially higher-cost inputs from the partner providing the margin. Thus, my analysis seeks to shed light on whether the ROOs component of RTAs plays a role in the interaction between preferential and multilateral liberalization.

The issue of whether, and to what extent, ROOs influence preferential trade patterns has been examined. However, I investigate how ROOs in two different U.S. preferential regimes – unilateral preference programs and FTAs – affect preferential trade and utilization. While previous studies have found a significant effect between ROOs and preferential trade, examining the effect of ROOs across the transition of these two regimes will provide a unique and useful perspective, as the ROO is often the only major aspect of the preference that changes. Because it isolates this switch in applicable ROOs, this analysis also serves to examine how ROO restrictiveness is ranked.

Finally, I examine exchange rates and preferential program utilization when ROOs require a share of value content. Unlike with other types of ROOs, the ability to meet value-content requirements is a function of the exchange rate between the currencies in which inputs are denominated. Thus, while a depreciated domestic currency makes domestic products relatively less expensive, it may also make value content ROOs more difficult to meet, since foreign inputs that do not contribute to meeting the origin requirement are now relatively more valuable. Such a result would be significant to questions of how exchange rate policy would affect preferential trade in the presence of value content ROOs, as opposed to other types.

1.1 Purpose of Preferential Rules of Origin

The core purpose of ROOs in preferential agreements is to limit the benefits of the RTA (i.e. preferential tariff treatment) to signatory members, and restrict the extent to which non-parties are also able to take advantage of them via direct transshipment. The most extreme case in which non-parties could benefit from the agreement is if they're able to simply transship goods through one member country to the rest of the RTA partners with minimal or no further processing. Such transshipment, called trade deflection, could allow non-parties to free ride off the agreement's benefits – taking advantage of the RTA tariff preferences without themselves being required to provide preferential tariff access.

Absent ROOs to prevent it, trade deflection would occur when transportation costs between the RTA members are less than the difference in their external tariff rates. In such a circumstance, it would thus be cost effective for a non-party exporter to ship goods to RTA members through their lowest-tariff agreement partner.[2] Indeed, without ROOs entirely, world trade to all agreement members would simply flow through the member with the lowest external tariff, taking into account shipment costs. This would result in the complete elimination of tariff revenue in all RTA members save the transshipment hub. While such a scenario could be highly liberalizing from the perspective of effective applied tariffs, it would be an extreme divergence from the stated intent of RTAs.

It is necessary to point out that implicit in scenarios of trade deflection is the assumption that the non-party represents a lower-cost source than the RTA members. As with the issue of trade diversion, if the RTA partner itself is the lowest-cost producer, then concern regarding trade deflection is eliminated, since trade patterns do not change. In such circumstances, the ROO is said to be 'non-binding,' as it does not act as a constraint on trade. Only in cases in which meeting the ROO requires changes to the RTA exporter's production process (i.e. the ROO 'binds') do ROOs become a trade policy of interest. The assumption of binding ROOs is made for virtually all of the analyses outlined here.

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[2] This assumes that members of the preferential agreement have differing external tariff rates. Thus, this particular concern is not present with respect to a customs union, for instance, where the uniform nature of all members' external tariffs obviates the incentive to funnel trade through the lowest-tariff member. Kreuger (1993) first pointed out how ROOs created this important distinction between trade deflection incentives in FTAs and customs unions.

Another issue related to the long-term effect of ROOs is the encouragement, through the aforementioned intra-RTA sourcing requirements, to invest in intermediate goods production within the RTA members. By increasing the value of originating inputs, ROOs could induce final goods producers to start or expand production facilities with members, such that their products may claim tariff preference. Anecdotes of Japanese and other companies expanding production in Mexico after NAFTA so as to gain access to the U.S. market are in line with this theory of the long-term effect of ROOs.

1.2 Types of Rules of Origin

If domestic or intra-RTA inputs and processing alone are used in the production of a good, then the good is said to be 'wholly obtained' in the territory of an RTA member, and meets origin requirements perforce. It is only when foreign inputs are used that the details of ROOs become pertinent. Given the increasing globalization of production processes and increased trade in manufactured or semi-manufactured goods, however, ROOs are becoming increasing relevant. Wholly obtained goods are generally raw or primary materials such as unprocessed agriculture products or minerals. Other goods are required to be substantially transformed according to the criteria laid out in the ROO provisions in order to be considered originating.

There are three main types of criteria used to determine whether products have been substantially transformed according to the RTA ROOs. These are tariff shift, value content, and technical requirements. Within these three general criteria types, individual

ROOs could take a variety of specific forms. Thus, while these types describe the general rubrics of how ROOs identify origin, considerable variability exists in terms of ROO restrictiveness, both between and within type.

Tariff shift ROOs require that the classification of a manufactured product must differ from that of its inputs, according to the Harmonized Tariff System (HS). The HS is the international standard nomenclature by which trade is classified. The HS is hierarchical, and groups products into increasingly specific categories at the chapter (2-digit), heading (4-digit) and subheading (6-digit) level.[3] Additionally, while the HS is harmonized among countries up to the 6-digit subheading level, countries often create even more disaggregated levels of specificity at the 8- or 10-digit level, which would be unique to the country.[4] Satisfying a tariff shift ROO requires that a product and its non-originating inputs be classified in different HS categories. This could mean that product would only be originating if its non-originating inputs were classified in a completely different HS chapter, different heading, different subheading, or different product code. For example, assume that a wooden doorframe, classified in HS 441820, is produced using non-originating oak lumber classified in 440791. If the imported doorframe is subject to a tariff shift ROO requiring a change in heading, then it would be originating since the input was from heading 4407 and the finished product in 4418. However, if the ROO

[3] For example, fertilizers are classified in HS chapter 31. Nitrogeneous chemical fertilizers are more specifically classified in heading 3102, and even more specifically ammonium nitrate is classified in subheading 310230.

[4] As an example, while tuna in airtight containers would be classified in HS 160414 for all countries, the United States further specifies that tuna in oil be classified in 16041410. However, another country may also use the number 16041410, but it need not represent tuna in oil.

instead required a change in chapter, then the doorframe would not be originating, since both it and the non-originating input are classified in chapter 44.

Additionally, tariff shift ROOs can also incorporate exceptions and additions to the general requirement. Exceptions might specify particular HS classifications from which non-originating inputs could not be used, even if they lie outside the scope of the general tariff shift requirement. Using the previous example, an RTA could specify an exception that if the tariff shift ROO for the oak doorframe was a change in heading from any other heading except 4407, then the frame would this time not meet the ROO. Alternatively, additions could specify HS classifications from which non-originating inputs could be sourced even if they would otherwise not meet the tariff shift ROO. For instance, if the aforementioned ROO required that in order to be originating, non-originating inputs into the oak doorframe must come from any other chapter or subheading besides 440791, then the doorframe would meet the ROO. Exceptions and additions are often selected specifically because of their role in the production process, and can play important roles in the effects of ROOs.

Value content ROOs require that a certain share of the value of the good that must be produced within the member country. As an example, a 35 percent value content ROO is used by the United States in its unilateral preference programs and several of its FTAs. This type of ROO can vary in terms of both how the threshold and underlying product value is defined. In determining the threshold itself, ROOs could take either a positive or negative approach. A positive approach would require that the share of content sourced within the member country be at least as high as the threshold (for example, the cost of domestic inputs must be at least 40 percent of the final value of the product). Alternatively, a negative approach could specify that the share of content from non-originating sources be no more than the threshold (for example, non-originating non-party inputs can be no more than 60 percent of the final value of the good). Additionally, whether the value of the inputs and final product are specified in prices or costs[5] can also impact the ROO's effect on a product's ability to qualify for origin.

Unlike the previous two types of ROOs, technical requirement ROOs relate specifically to the production process of the product itself, requiring that certain component inputs be originating or that particular processes take place in a member country in order for the manufactured product to be originating. Technical ROOs, most commonly used in the textile and apparel sector, might explicitly require that the yarn or fabric used in the production of a garment be originating in order for the garment itself be originating. Alternatively, they might require that certain chemical transformations occur within a member country in order for the resultant product to meet the ROO.

The ROOs used for any particular product or agreement may include one or more of these criteria. For instance, a product might require only a tariff shift, or both a tariff shift and a technical requirement. Alternatively, some ROOs allow for any of multiple

[5] While a cost relates only to a specific component of production, a price incorporates the full costs of production and transport as well as any markup. Thus, ROOs may treat the origin of these additional components of production differently depending on whether they're defined according to prices or costs. For example, a ROO that requires a certain share of production costs be domestic could be easier to meet than a ROO that requires that same share of total price, since prices are higher due to its additional components.

alternative criteria be used. For example, an importer could establish that a product is originating using either a change in tariff heading ROO or a 40 percent value content ROO.

An additional aspect of ROOs that should be mentioned is cumulation. Cumulation is a provision that allows originating-inputs of multiple members to contribute to meeting the ROO. With cumulation, a member that must substantially transform a product to meet the origin requirement need not provide all of the input required to do so itself. Insofar as it can import such inputs from countries with which cumulation is allowed, then they are also used to establish origin. Cumulation becomes an increasing important aspect of ROOs as additional trade agreements, particularly agreements with three or more members, are enacted.

There are three types of cumulation: bilateral, diagonal, and full. Bilateral cumulation allows only originating inputs from the exporting and importing member countries to contribute to origin. Thus, if NAFTA allowed only bilateral cumulation, then an export from Canada to the United States could use Canadian and U.S. inputs to meet the ROO, but not that of Mexico. Diagonal cumulation, on the other hand, allows for originating inputs from three or more member countries to contribute to origin. Assuming that the inputs themselves meet their applicable ROO, inputs from all three NAFTA parties could be used to meet the ROO under a NAFTA with diagonal cumulation. Finally, full cumulation allows for *value added* from member countries to contribute to origin, even if the input itself does not qualify as originating. Therefore, while an entire input from

Mexico may not be deemed originating, and thus would not contribute to meeting the ROO for the Canadian export to the United States under diagonal cumulation, any originating value added within said Mexican input would contribute to satisfying the ROO under full cumulation. In practice, bilateral and diagonal cumulation are the types most often used in preferential agreements, depending on the number of parties to the agreement.

As the number of RTAs increase, an expansion of diagonal or full cumulation has been noted as a means of broadening the benefits of the RTA expansion and reducing distortions (WTO, 2011). If RTA partners were to agree that all inputs from countries with which both have preferential agreements could contribute to meeting the RTA origin requirements, then trade distortions in the input markets would be reduced. This broadening of cumulation to cover multiple bilateral agreements would thereby simplify production chains and increase the value of RTA preferences themselves.

Another general aspect of ROOs is *de minimus*. *De minimus* specifies that if non-originating content is less that a certain percentage share of the value of the final product, then the product may still qualify as originating, assuming that all other ROO requirements are met. *De minimus* values are typically low (7-10 percent for many U.S. FTAs), and thus are most relevant if the substantial transformation ROO requires a tariff shift or technical change. For example, suppose that all non-originating inputs except one are in sufficiently different HS categories from the final good so as to meet the ROO. If the value of the non-originating input that doesn't meet the tariff shift ROO is below the *de minimus* value, then the final good is originating despite that input not meeting the ROO. Thus, an increase in the *de minimus* level makes ROOs generally less difficult to meet. *De minimus* levels generally apply to all goods under the preferential arrangement, even if the substantial transformation ROO differs for specific products.[6]

Finally, the enforcement of ROOs is something that could vary across agreements and countries, but the United States employs a self-selection and verification system. An import must have a Certificate of Origin, which identifies the product or shipment and attests that it has met the applicable ROOs for the preference that it is claiming. If customs offices have reason to question the satisfaction of the ROO, they investigate through the issuance of additional questionnaires and requests for additional documentation or visits to the exporter/producer of the product. Denials of origin certification may also be appealed. Thus, the time and cost of obtaining origin certification can vary depending on customs officers' satisfaction that the original declaration correctly describes the product as meeting the relevant ROO.

1.3 Use of Preferential ROOs

Apart from the criteria used, the manner in which a preferential agreement utilizes ROOs can also differ. This relates to the extent to which a uniform ROO is applied to products covered by the agreement. In the case of some preferential agreements, only a single ROO is applied to all products. This is the case for earlier U.S. FTAs such as with Israel

[6] U.S. FTAs often incorporate alternative *de minimus* level for certain agriculture and textiles and apparel goods.

and Jordan, the United States' Generalized System of Preferences regime for developing countries, and older South-South FTAs in South America, Asia, and Africa. Often, the uniform ROO utilized in such agreements is a value content one. Alternatively, ROOs in an agreement may vary considerably across products. These product-specific ROOs allow for greater tailoring of the ROO to the product and its production process, but can greatly complicate the ROOs schedule. Product-specific ROOs have become increasingly common, used in most EU agreements, U.S. agreements since NAFTA, and many South-South agreements throughout the world. Additionally, the ROO regime could encompass a compromise between these two types, with a single ROO for most products, and product-specific ROOs only for a small set of products, often those of a particularly sensitive sector. The United States FTAs with Bahrain and Morocco utilize such a ROO regime, as does the U.S. unilateral preferential programs created by the Caribbean Basin Trade Partnership Act, Andean Trade Promotion and Drug Eradication Act, and African Growth and Opportunity Act.

Finally, it is worth pointing out that while ROOs must be met in order to qualify for preferential access under an RTA, producers continue to have the option of ignoring the ROOs and subjecting their exports to a recipient country's general tariff barriers. This decision on whether or not to participate in the preferential system – ROOs and tariff preferences – versus not, is a significant feature of analysis on the trade and welfare effect of ROOs.

Chapter 2: Literature Review

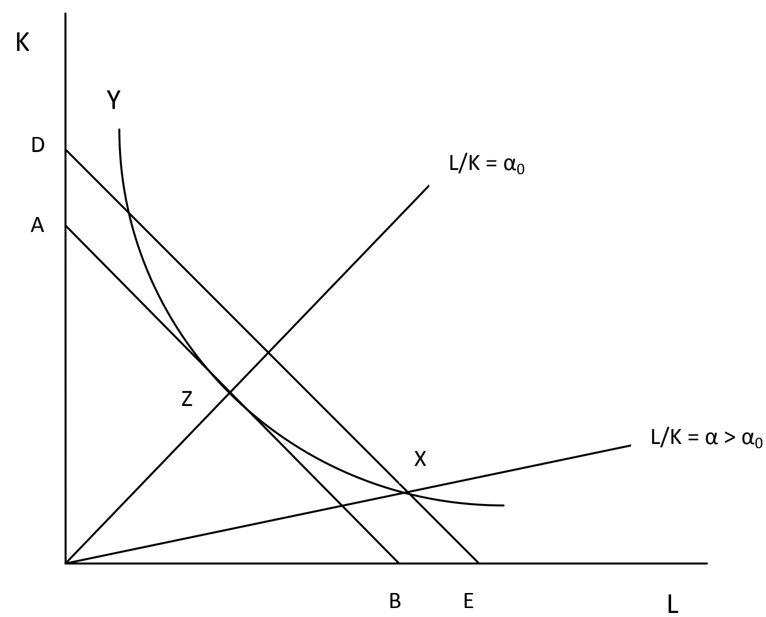
Much of the literature concerning ROOs is relatively recent, and has attracted increasing attention as RTAs become commonplace and the importance of their ROOs gains recognition. The literature has dealt with the theoretical implications of ROOs on preferential trade regimes and welfare, the factors that determine how they are set and level of restrictiveness they represent, and empirically how they have impacted trade and investment patterns. In this chapter, I summarize the body of literature concerning ROOs and indicate how my dissertation builds upon this work to broaden economic analysis of the impact of ROOs.

2.1 Theoretical Implications of Rules of Origin

As mentioned, the ostensible purpose of ROOs is to prevent trade deflection by defining required levels or types of domestic production necessary to secure RTA benefits. A probable result of satisfying ROOs requirements is to increase the costs of production for originating goods, however. Cost-minimizing producers utilize inputs from the lowest-cost source, net of any transaction costs, including sources outside the RTA. However, in order for the producers' goods to qualify for RTA preferences, they must meet the ROO which, if binding, would require that they substitute RTA inputs for previously used external inputs. By assumption (of cost minimization), these intra-RTA inputs are higher cost, thus raising the overall cost of producing the originating good. This is a key aspect of binding ROOs, and underlies virtually all analysis of ROOs.

Figure 1 represents the oft-cited graphic example from Krishna (2005a) that illustrates the effect of ROOs on production costs. Using the inputs labor (L) and capital (K), an RTA country's isoquant is displayed by the curve Y. The cost-minimizing level of output prior to the RTA would be represented by point Z, which would incur costs represented by line AB. The ratio of L to K used to produce at point Z is given by α_0. However, assume that the RTA ROO required that labor represent a greater share of production,[7] such that any originating good must have a L/K ratio of at least $\alpha > \alpha_0$. In this case, only production on Y on or below α belongs to the feasible set that would qualify for origin. The producer would then produce at point X. At constant input prices, production at this L/K ratio would entail an increase in costs.

Figure 1.1: Physical Content ROOs and Costs (Krishna, 2005a)



[7] For instance, if capital represented non-party inputs.

The potential of ROOs to increase costs could make it a useful tool for other trade policy goals, however. Indeed, this ability to increase costs, potentially to uncompetitive levels, has led to a general consensus that ROOs can be used to mitigate the tariff liberalization provided by RTAs. The potential use of origin requirements as protection devices in preference regimes was first mentioned in the context of content protection regimes by Grossman (1981) and more specifically with respect to ROOs by Krueger (1993) and Krishna and Krueger (1995). In principle, ROOs could be set so as to completely eliminate the potential for preferential trade by requiring a transformation or input which is not available within the RTA, thus foreclosing the possibility that any production would qualify as originating, and eliminating any benefit of an RTA on such a product. Indeed, relatively low level of preferential trade have been observed by several authors, who raise restrictive ROOs as a likely cause of such under-performance (Brenton, 2003; Brenton and Ikezuki, 2004; Brenton and Manchin, 2003; WTO, 2011).

Krueger (1993) also highlights how ROOs on final goods could serve to expand protection not just on the final good, but on its inputs as well. Krueger calls this the 'exporting protection' and it refers to the incentive to source inputs from an RTA partner even if that partner maintains greater tariff protection on such inputs. For instance, suppose one RTA member (A) consumes a good that is produced by another member (B), using an input that Member A itself produces. To meet the ROO, Member B must use Member A's inputs.[8] Thus, the level of tariff protection that Member A applied to the input good is reflected in the price paid by Member B on those inputs. Member B's

[8] I assume in this example that the benefit of meeting the ROO on the final good (higher producer prices due to being exempt from tariffs) outweighs the additional input cost.

tariff on the input good could be zero, and it may still be optimal to use the more expensive intra-RTA input. In this manner, the ROO has the effect of expanding Member A's level of protection on the input good to its RTA partner, Member B. Thus, apart from the general possibility of trade diversions in RTAs, ROOs could serve to divert trade in upstream inputs as well.

The general effect of ROOs' restrictiveness on preferential trade flow is presented in Krishna and Krueger (1995). If ROOs are non-binding, then the exporting country need not alter its production in order to qualify for RTA preferences and there will thus be robust preferential trade. When ROOs bind, then they require an increase in production costs no greater than the benefit from qualifying for preferential access. If ROOs bind such that the increased cost required to satisfy them is just equal to the benefit from doing so, then firms are indifferent to trading preferentially versus maintaining lower-cost production and paying the external tariff. Finally, with prohibitively strict ROOs, no preferential trade will take place, and any trade that does take place will be subject to the external tariff rates.

Ju and Krishna (2005) further expand the issue of non-monotonicity of preferential trade along variable levels of ROO restrictiveness. They examine the effects of ROOs on trade in intermediate and final goods in the FTA area using a framework of firms that are heterogeneous in the composition of their production (i.e. the extent to which meeting a ROO raises cost varies across firms). They find that the response of intermediate and final good imports into the FTA region generally is non-monotonic as the level of ROOs restrictiveness rises, and also moves in opposite directions. Specifically, even as ROOs increase in restrictiveness, if it remains profitable to comply with them and gain the tariff advantage, then more intra-FTA intermediates are used in production of the final goods, and thus intermediate imports from the rest of the world declines. Alternatively, imports of the final good into the FTA region increase with ROOs restrictiveness, as long as utilization of the FTA remains profitable, since intra-FTA production (at higher cost) is diverted to the FTA partner and necessitates greater imports from the world to satisfy demand. However, as ROO restrictiveness continues to increase and compliance becomes unprofitable for some firms, they cease utilizing the FTA regime and revert to pre-FTA production. Thus, intermediate imports from the world increase and final good imports from the world decrease as trade reverts back to pre-FTA patterns. In addition to the impact ROOs have on trade into the FTA region, Rodriguez (2001) uses a model of multi-stage production to demonstrate that ROOs can also lead to distortions in production within the FTA region itself.

Krishna and Krueger (1995) also highlight how the specific definition of the ROO can also play an important role. Their discussion primarily focuses on how value content ROOs are defined, specifically with respect to comparisons between cost- and price-based value content ROOs and whether domestic capital costs are included. They point out that in the long run these ROO definitions are equivalent in restrictiveness, as capital can adjust to incentives created by the FTA preferences and ROOs. However, in the short run with capacity constraints, the exact definition matters. Cost-based ROOs that exclude domestic capital (i.e. the ROO is defined as a share of domestic versus all input costs) are harder to meet than price-based ones (i.e. the ROO allows that non-originating inputs be only a certain share of the final price) that tend to include such value.

In this manner, Krishna and Krueger (1995) also touch on another long-run implication of ROOs, namely that they serve to incentivize investment in the RTA region. Increases in domestic processing through capital investment make ROOs easier to satisfy, thus providing greater access to RTA benefits. The desire to attract capital investment into the RTA region as a whole is another argument put forth in favor of restrictive ROOs. Krishna (2005b) examines conditional policies (i.e. ROOs) in a general equilibrium setting and highlights situations in which ROOs could affect returns to capital and labor, thereby influencing investment.

Cadot, Estevadeordal, & Suwa-Eisenmann (2004) posit that preferential ROOs can function as an export subsidy, which would otherwise be banned by WTO rules. The authors use a political economy model to demonstrate that the ROOs and preferential tariff margin can be set so as to transfer the RTA tariff rents to input product exporters. In such a circumstance, an RTA partner that produces an input good and consumes a final consumption good negotiates ROOs that require final good producers to utilize as much of its inputs as possible while still maintaining incentives to utilize the RTA (i.e. driving producers to their participation constraint). By doing so, input exporters secure a captive market and obtain the full tariff rent. The authors also provide some empirical support for this theory by examining U.S.-Mexican trade flows and NAFTA ROOs. Chapter 3 of this dissertation builds off of this theory of upstream rent capture to examine if its logic applies when external tariffs themselves are variable.

A few authors have also explored the welfare implications of ROOs. Falvey and Reed (2002) analyze ROOs as general policy instruments for enhancing welfare. They examine just binding ROOs and optimal tariffs to determine how they jointly interact, and find that under certain circumstances they are complementarily welfare enhancing. This result is driven by the ROO altering input sourcing among third party producers towards a lower-cost input combination.

Duttagupta and Panagariya (2007) examine the political economy of FTAs with and without binding ROOs. Specifically, they analyze the impacts of an FTA with and without ROOs on the welfare and political acceptability of such an agreement. Through the use of a general equilibrium model that incorporates both input and final goods, they determine that binding ROOs can make otherwise unacceptable FTAs acceptable due to increased revenue to the owners of input good production. However, the authors also find that the conversion to binding ROOs may result in otherwise welfare enhancing FTAs having lower welfare than the non-FTA case.

2.2 Determinants of Rules of Origin

As noted, the ostensible purpose of ROOs is to prevent trade deflection and ensure that only originating products obtain the benefits of RTA provisions. However, while wholesale trade deflection represents an obvious circumvention of RTA benefits by non-parties, agreement members might also use ROOs to exclude even products with substantial intra-RTA processing,   if they consider such processing non-originating. For example, turning raw lumber into a wooden door frame requires a level of process beyond simple repackaging or other minimal procedure that might be done during transshipment. Nevertheless, a ROO for wooden doors could be set such that even this level of processing is insufficient to confer origin (a change in HS chapter, for instance). ROOs can thus be calibrated so as require whatever level of processing is preferred, even beyond what is necessary to prevent transshipment. The previous section highlights how the flexibility afforded by ROOs in defining the scope of preferential trade can also be used to further alternative objectives, most namely to restrict preferential trade for protectionist purposes.

Harris (2007) examines whether the core purpose of ROOs – to prevent trade deflection – sufficiently explains the levels of restrictiveness found across ROOs schedules in multiple agreements. Harris analyzed the level of ROO restrictiveness, defined according to the index further discussed below, with respect to the MFN tariff differential between FTA members (e.g. an incentive to deflect trade) and intra-member transport costs (e.g. a disincentive to deflect trade). He finds that these two factors do not adequately explain the variation in the level of ROOs restrictiveness, thus supporting the notion that factors beyond the prevention of trade deflection also influence countries' choice of ROOs.

Whether a ROO has the effect of making utilization of the RTA regime unprofitable, and thus eliminating preferential trade, depends directly on the relative cost of ROO compliance versus the tariff benefit afforded by the RTA. Kreuger (1993) and Krishna and Krueger (1995) demonstrate that the RTA preferences will be utilized only when $C^M \leq C^U (1 + t)$, where C^M are production costs that satisfy the ROO, C^U represents costs when the ROO is unmet, and t is the preferential tariff margin (generally the MFN tariff in FTAs). This makes clear that if the ROO is not intended to foreclose preferential trade, then its level of restrictiveness can only increase costs (C^M - C^U) up to the level of the tariff factor. In general, this would imply a ROOs schedule that is positively related with countries' tariff schedules. This positive correlation has been empirically identified by Anson et al (2005) and Cadot et al (2002).

Examinations of the drivers of ROO-setting have been undertaken by Estevadeordal (2000) and Harris (2007). Estevadeordal generated an index that ranks ROOs restrictiveness based upon a logical extrapolation of the written ROOs requirements. This index, called the r-index, primarily uses the relative sizes of the sets of 'originating' inputs under tariff shift ROOs,[9] along with values for value content and technical change, to order ROOs types into seven levels of restrictiveness. The index is thus a rank order of ROO restrictiveness, with 1 representing the least restrictive ROOs and 7 the most. Using this index, Estevadeordal investigates the interdependence of the level of ROOs restrictiveness and the rapidity of tariff elimination in NAFTA. Using the r-index as well

[9] For instance, a change in chapter ROO would be more restrictive than a change in heading ROO, as it allows for a smaller subset of non-originating inputs (products from every other HS chapter) than does the heading change (products from every other HS chapter plus every other heading within the same chapter).

as tariff differentials, trade, and trade concentration variables, Estevadeordal generated predicted values for ROOs restrictiveness, which he then uses in an estimation of U.S. and Mexican tariff phase-outs. The result provides evidence of the dependence between the two negotiated aspects of NAFTA market access – more restrictive origin ROOs are related to slower tariff elimination.

While the original r-index developed by Estevadeordal was based upon NAFTA ROOs and did not take full account of the range of ROO type combinations used in additional agreements. Cadot et al (2005a) expands upon the index to further account for ROO exceptions, additions, and wholly obtained criteria more commonly used in EU ROO regimes. These adjustments generally entail increasing the index by a unit value in cases where there are exceptions to the ROO, decreasing it in the case of additions, and assigning low index values to wholly obtained ROOs. These modifications to the r-index take better account of the details in ROOs.

Harris (2007) builds upon Estevadeordal's work by conducting an even more detailed investigation of the drivers of negotiated ROOs by first greatly expanding the r-index to take into account the degree of restrictiveness in the various exceptions and additions within ROOs, and calibrating index values based upon equivalency of alternate ROOs specifications. More specifically, while Harris's h-index builds upon the general theory behind Estevadeordal's r-index, it increases the restrictiveness ranking of ROOs according to increasingly broad exceptions, while decreasing it for ROOs with increasingly broad additions or if alternative ROOs are available. As noted, these exceptions and additions were largely omitted from the original r-index, and Harris verifies that their presence is highly significant. Overall, the h-index offers the most detailed and complete ranking of ROOs restrictiveness. A more detailed summary of the r- and h-indices are provided in Appendix 1, and a correlation of the two indices by HS section as applied to multiple U.S. FTAs is provided in Appendix 2.

Using the h-index of a number of FTAs, Harris takes each ROO's difference from the multi-agreement mode[10] to investigate ROO-setting with respect to potential negotiating goals, including preservation of tariff revenue, protectionism, and export promotion. His results are generally supportive of the notion that the objective of ensuring access for exports on behalf of RTA parties, rather than a desire for additional protection, motivates ROOs negotiations. Harris does note, however, that this result may reflect a procedure of setting overly restrictive ROOs generally (i.e. the modal ROO is 'protectionist'), and then negotiating down the restrictiveness of ROOs on those products of export interest to the parties.

2.3 Empirical Effects of Rules of Origin

A central aspect in the study of the effect of ROOs has primarily been their effects on preferential trade, examining the extent to which they act as protectionism. The broadest examination was done by Estevadeordal and Suominen (2008). They used a gravity

[10] By taking the difference from the modal value, Harris better controls for nuances of the HS system in determining the "political" component of ROOs – that is the extent to which the ROO is more or less restrictive than the level necessary simply to prevent trade deflection.

model to examine bilateral country trade flows between a large number of RTA partners. Utilizing a version of the r-index to incorporate the average level of ROOs restrictiveness, they found that greater ROOs restrictiveness did discourage overall trade, but encouraged trade in intermediates.

A number of studies have also examined the extent to which ROOs have negatively affected FTA trade flows at the product level. Cadot et al (2002) analyzed Mexican exports to the United States under NAFTA using both a derivative of the r-index and indicator variables for ROO types and found that ROOs did indeed dampen Mexican exports under NAFTA. Indeed, the relative sizes of the tariff preference and ROOs variables indicate that the negative effect of the latter largely offset the positive effect of the former. They further estimate the *ad valorem* cost of ROOs compliance at around 2 percent with the revealed preference criterion. Anson et al (2005) also run a simple regression suggesting that tariff preferences and ROOs had offsetting effects in NAFTA, with deeper tariff preferences increasing preferential trade, and more restrictive ROOs decreasing it. Cadot et al (2005a) analyze the effect of ROOs on the extent to which both the NAFTA and EU's PANEURO preference schemes are utilized by recipients. Their results conform to those of previous studies that examined simple trade preferential trade flows, indicating a negative effect of ROOs on preference utilization rates.

Further studies have examined the impact of ROOs not just on FTAs, but in unilateral preference regimes offered by developed to developing countries. These regimes have their own ROOs, which can vary according to the country offering the regime. The literature has often focused on regional programs, and has highlighted the performance of the textiles and apparel sector.

Mattoo, Roy, and Subramanian (2003) model expected apparel export increases from Mauritius and Madagascar due to the U.S. African Growth and Opportunities Act (AGOA), with and without restrictive ROOs. Using constructed estimates for costs, tariff-equivalents, and elasticities, they estimate that Mauritius's apparel export growth would be over 30 percentage points higher if it could utilize liberal ROOs, and that both countries' export growth would be negative without unrestrictive AGOA ROOs on apparel. AGOA ROOs allow for some least-developed African countries (LDCs) to globally source fabrics (e.g. fairly unrestrictive ROOs), which resulted in better AGOA preference utilization. Brenton and Ikezuki (2004) examine export performance under AGOA more generally, and also argue that ROOs have a strong impact on preference utilization, particularly in apparel. They similarly posit that loose ROOs for LDC apparel products have had a substantial positive effect on AGOA utilization.

With respect to EU preference regimes, Brenton (2003) evaluates trade and utilization in the first years of the Everything But Arms (EBA) program. He finds an underutilization of EBA relative to other EU regimes (e.g. Cotonou Agreement), and implies that the more restrictive EBA ROOs, coupled with recipients' ability to continue utilizing Cotonou preferences, are the cause. Brenton and Manchin (2003) similarly argue that restrictive ROOs hamper utilization of unilateral EU preferences and association agreements. Finally, Manchin (2006) empirically examined the determinants of non-least developed country utilization of EU preferences. While the author found that the size of the preferential margin was significant, she also determined the existence of a minimum margin below which recipients' incentive to seek preferential access is lower. The requirement to meet RTA ROOs, as well as other compliance costs is a likely driver of such a minimum margin of preference.

Augier, Gasiorek, and Lai-Tong (2004, 2005) conducted a unique examination of the impact of ROOs on trade through a different mechanism – a broadening of cumulation (i.e. allowing inputs from multiple countries to contribute to the origin requirement) among EU Association or Interim Agreement countries. In 1997, the EU expanded these countries' ability to cumulate their inputs in order to satisfy the EU's preference regime ROOs. The authors found that this loosening of ROOs increased trade among recipients for a number of product sectors.

Finally, Cadot et al (2002, 2005a) utilizes a 'revealed preference' criteria to estimate the *ad valorem* cost of compliance with ROOs in NAFTA and the EU PANEURO preferences, respectively. This criteria examines trade in three categories of products: those that have 100 percent utilization (i.e. all imports enter under the preferential regime, those with 0 percent utilization, and those with utilization rates between 0 and 100 percent. By examining the tariff preference of products with a 100 percent utilization rate, the authors generate an upper bound for the cost of complying with preference requirements, including ROOs. The logic for this is that the ROO could not have increased costs more the preference, else preferences would not have been (fully) utilized. The inverse is true for products with 0 percent utilization. The average tariff preference on these products generates a lower bound for the compliance costs, as increased costs from ROOs compliance must have been higher than the benefit in order to completely foreclose utilization. The weighted average of those products with utilization rates between 0 and 100 percent provide a simple estimate of *ad valorem* compliance costs, including those associated with ROOs. The authors then use the r-index to further decompose the figure into ROOs costs and administration costs. They estimate that the additional cost to comply with NAFTA ROOs at over 4 percent, slightly higher than for PANEURO.

Carrère and de Melo (2004) employ a similar revealed preference mechanism to generate cost estimates for each ROO type using NAFTA trade and utilization rates. These cost estimates are then compared to the r-index ranking. The results provide general support for Estevadeordal's ranking criteria, though some differences do exist, particularly with respect to restrictiveness ranking for final versus intermediate goods.

Chapter 3: Do Preferential Rules of Origin Influence External Tariffs?

3.1 Introduction

A positive theoretical and empirical relationship between ROOs and external tariffs has been observed with respect to some preferential regimes. If ROOs are negotiated in part as protectionist devices, then political or economic factors that drove that outcome are likely to motivate high tariff barriers as well. Additionally, high external tariffs may induce, or at least be a necessary condition for, more restrictive ROOs either to fulfill their basic roll of preventing trade deflection, or to further domestic exports of input products. Once set, however, the extent to which preferential ROOs interact with or otherwise influence external tariff setting is not one that has been directly addressed.

There is reason to believe that ROOs could indeed influence external tariff rates. Should ROOs function as a device designed to create a captive market for 'domestic' inputs, then the external tariff (i.e. the maximum margin of preference – assuming the preferential tariffs are taken to zero, then the external rate defines the size of the preference margin) serves as an upper bound on the level of ROO restrictiveness that would still make preferential trade profitable. By implication, therefore, the reverse should be true as well. If a preferential ROO is set at a restrictive level so as to obtain a captive input market via a RTA, then any subsequent reduction in the external tariff might make the utilization of the preferential regime unprofitable and abrogate the incentive to purchase domestic inputs in the first place. Thus, a country that has secured a market in its RTA partner for input products via restrictive ROOs on the manufactured output product might be more inclined to maintain or extend high external tariffs on such products.

There is anecdotal evidence to support such a view of preferential ROOs' purpose, at least with respect to certain sectors. Parts of the U.S. textile industry have indicated that ROOs that require specific or high proportions of intra-FTA textile inputs serve to create and expand markets for U.S. textile exports.[11] It is noteworthy both that the United States maintains MFN tariffs upon imports of apparel, some at relatively high levels, and often eliminates these tariffs immediately upon implementation of its FTAs with most Western Hemisphere countries. This suggests that, at least for textiles and apparel, the combination of strict ROOs and the rapid provision of maximum tariff preferences is consistent with a desire to generate a captured market for U.S. textile production.

Finally, there is evidence that the existence of preferential trade agreements themselves actually do affect external tariffs. The more general question of whether preferential trade agreements act to promote or impede multilateral trade liberalization has generated considerable scrutiny. Theoretic arguments have been made on both sides, and empirical work has found evidence that countries' external tariffs are influenced by the level of preferential access they give to preferential trade agreement partners. Given this result, it would not be exceptional if ROOs contribute to these agreements' impact on external tariffs.

[11] See the Textile and Apparel Industry Trade Advisory Committee (ITAC) report concerning the CAFTA-DR. http://ustraderep.gov/assets/Trade_Agreements/Regional/CAFTA/CAFTA_Reports/asset_upload_file409_5961.pdf

In this essay, I examine the issue of whether preferential FTA ROOs influence countries' choice of external tariff rate. As mentioned, the current literature has found that the level of external tariffs is a factor influencing the level of ROOs negotiated in trade agreements. External tariffs themselves have generally been considered exogenous, however. A common political economy theme with respect to ROOs is that relatively large countries may be interested in maintaining captive markets for their input producers, which would necessitate a large tariff margin in order to entice trade partners to adhere to the ROO. Therefore, an analytic question is whether restrictive ROOs in FTAs make it more likely that the agreement would retard multilateral tariff liberalization, or alternatively whether weak ROOs make liberalization more likely.

The essay is organized in the following manner. Section 3.2 briefly outlines previous literature that specifically deals with the connection between ROOs and external tariffs and the impact of preferential regimes on external tariff changes. In Section 3.3, I use a theoretic model to establish a basis by which preferential ROOs would motivate changes in external tariffs. Section 3.4 empirically tests this result by examining changes to U.S. external tariffs before and after NAFTA and the Uruguay Round of multilateral tariff negotiations. Section 3.5 concludes.

3.2 Literature

Chapter 2 describes previous literature concerning the role of external tariffs as an important factor in the development and functioning of preferential ROOs themselves. That work serves to demonstrate the theoretical and empirical connection between external tariffs and ROOs. The most salient aspect of this connection is the concept of a participation constraint, whereby the cost-increasing restrictiveness of ROOs cannot exceed the preferential tariff margin, which itself is highly correlated with countries' external tariffs.

Another relevant body of trade literature deals with the broader issue of whether preferential arrangements, most particularly bilateral FTAs, act as incentives towards or obstacles to multilateral tariff liberalization. This literature rarely deals with ROOs specifically, but given that ROOs are a component of such arrangements, the general effects of the FTA remain applicable to this analysis. Much of this literature has been theoretic in nature, dealing both with preferential arrangements' effects on multilateral trade barriers and trade creation/diversion questions. I summarize several of the works most relevant to this dissertation.

Richardson (1995) examines external tariffs under preferential arrangements from the perspective of tariff revenue competition between FTA partners when both are symmetric. He concludes that, in such cases, the only pure-strategy Nash equilibrium in tariff setting is zero external tariffs. However, Richardson further postulates that positive external tariffs may be an equilibrium outcome in the case where the partners are asymmetric. Furusawa and Jinji (2007) build upon Richardson's work by explicitly modeling a scenario of asymmetric FTA partner countries. They find that both countries will maintain positive external tariffs, assuming that the difference in their sizes is substantial. This is driven by the result that it is still beneficial for the larger economy to exploit terms of trade advantages by raising its external tariff, but the smaller country may still be able to undercut it and capture tariff revenue. Levy (1997) uses a political economy models to examine whether countries' entry into bilateral agreements reduces the likelihood of subsequent multilateral liberalization. By adjusting utility from multilateral liberalization in a differentiated product model, bilateral agreements between countries with similar capital-labor ratios can make such liberalization politically infeasible.

Empirically, there is relatively little work on the effects of preferential arrangements on external tariffs. Limao (2006) examines whether or not U.S. preferential arrangements prior to the Uruguay Round had an effect on U.S. liberalization of its MFN tariffs in the Round. Limao found that MFN tariff reductions were smaller for products that the U.S. imported under a preference regime prior to the Round. This represents the first empirical evidence that bilateral preferences can affect external tariffs, though it does not empirically identify which aspect(s) of the preference regime generate these effects.

More recently, Estevadeordal, Freund, and Ornelas (2008) examine whether preferential tariff reduction has an effect on MFN tariff reduction among developing countries in

Latin America, and find a positive relationship for most specifications. They also find that this relationship is smaller for products with non-negligible preference margins, as a deeper preference is more likely to induce compliance with ROOs (i.e. they are more likely to bind and affect production decisions). Interestingly, this result is the inverse of that identified by Limao for the United States. The difference in size and economic activity between the United States and Latin American countries is given as a possible reason for this.

3.3 A theoretic model of tariff-setting with ROOs

In this section, I lay out a theoretical basis by which preferential ROOs may influence decisions concerning a country's external applied tariffs. To do so, I construct a welfare maximization model of endogenous tariff-setting, in the spirit of Grossman and Helpman (1994). This type of model has been used as the foundation for several other theoretical examinations of the impact of PTAs, including ROOs, and external tariffs.[12]

As mentioned, industry-level sensitivities may motivate both higher tariffs and more restrictive ROOs. Such straightforward protectionism, where the motivation is simply to prevent imports (preferential or not) would result in complimentary external tariff and ROO profiles without linking them. The theoretic model here specifically uses the motivation of preferential trade to identify an effect of ROOs on external tariffs.

[12] See Cadot, Estevadeordal, & Suwa-Eisenmann (2004); Limao (2006); and Duttagupta and Panagariya (2007)

3.3.1 The general framework

The model consists of three regions and three products. Two of the regions, which I label 'Home' and 'Foreign,' represent countries between which preferential trading will occur. The remaining region represents the rest of the world. Both the Home and Foreign countries are economically small,[13] and thus have no impact on world prices. However, while both countries are small, I assume that the Home country is relatively larger, with commensurately greater bargaining power in any bilateral negotiations.

Two of the products in the model are final consumption products, labeled Goods 1 and 2, and the third an input product, Good 3. Good 1 is a numeraire good, while Good 3 is used in the production of Good 2. The markets for all goods are perfectly competitive. For simplifying purposes, I assume that the Home country does not produce Good 2 and the Foreign country does not produce Good 3. Thus, the relationship between the two countries is similar to that of the basic export platform, whereby Foreign is an assembler of final consumption goods that it has little need of itself, but exports completely to Home.

I assume that both countries export the entire quantity of their uniquely produced good (Good 3 for the Home country, Good 2 for the Foreign country) to each other. However, neither countries' supply of their respectively produced goods is sufficient to fully satisfy the other's demand; both countries import their non-produced good from the world as

[13] I make this assumption initially to simplify both countries' tariff optimization (zero tariffs) absent an FTA, thereby simplifying the comparison to the optimal tariff under the FTA.

well. The Home country representative consumer's utility is linearly additive in the consumption of Goods 1 and 2 (c_i, signified by subscripts), which is maximized according to:

$$U^H = c^H{}_1 + u(c^H{}_2) \qquad \text{s.t.} \qquad c^H{}_1 + p^H{}_2 c^H{}_2 \leq I^H \tag{3.1}$$

where $c^H{}_i$ and $p^H{}_i$ represents consumption in and domestic price of the respective good i in the Home country, and the sub-utility function $u(.)$ is differentiable, increasing, and strictly concave. This yields an indirect utility function composed of income and consumer surplus:

$$V^H = I^H + [u(c^H{}_2(p^H{}_2)) - p^H{}_2 c^H{}_2(p^H{}_2)] \tag{3.2}$$

The numeraire Good 1 is produced using labor as the only input under constant returns to scale (CRS). Production of Good 2 follows a Leontief formulation in which the factors of production include an input of domestic value-added and units of Good 3, modified by the input-output coefficient α_3. I use this form of production function so as to avoid substitution between primary and secondary factors of production and fix input demand for Good 3 with respect to Good 2. Domestic value added is itself produced using labor and sector-specific capital under CRS. Finally, Good 3 is also produced using CRS technology using labor and sector-specific capital. Thus, letting x_i represent good i, and l_i, k_i, and c_i respectively represent labor, capital, and input consumption used in production of good i, the model's production functions are:

$$x_1 = f(l_1) \tag{3.3}$$

$$x^F_2 = \min\{f(l_2,k_2);c^F_3/\alpha_3\} \tag{3.4}$$

$$x^H_3 = f(l_3,k_3) \tag{3.5}$$

I assume that the input-output coefficients for both Goods 1 and 3 are one. Given that Good 1 is freely traded and produced in both countries, wage rates also equal one. Finally, the markets for all goods clear.

Thus, the Home country produces only Good 3, which it singularly exports to the Foreign country, and imports Good 2 from the Foreign country and the world to satisfy its own consumption. The Foreign country imports Good 3 from both the Home country and the world in order to produce Good 2, which it exports entirely to the Home country.

3.3.2 Home-Foreign tariff-eliminating FTA and ROO regime

I now examine the interaction between ROOs and external tariffs in the presence of a FTA that has eliminated all bilateral tariffs between the Home and Foreign countries. Both countries can continue to apply *ad valorem* tariffs to imports from the rest of the world.

Since both countries are economically small and Foreign country exports of Good 2 are not sufficient to completely satisfy Home demand, Foreign exporters can obtain the tariff-ridden price, p^H_2, in that market should they qualify for preferential treatment. In order to do so, however, they must satisfy the FTA ROOs.

I operationalize the ROO by requiring that the cost of input Good 3 sourced within the PTA region make up at least a certain percentage of the total value of the manufactured Good 2 in order to qualify for tariff-free treatment. This formulation is similar to the one used in Cadot, Estevadeordal, & Suwa-Eisenmann (2004), but with a slight difference. Cadot, Estevadeordal, & Suwa-Eisenmann specified their ROO as requiring a certain physical share of the input good be intra-PTA sourced. This allows the ROO to be met if the proportion of input from the Home country meets the ROO percentage requirement. The ROOs mechanism I use is based upon value, which is a function not only of the physical quantities of inputs from Home or the world, but also of their prices and the price of the final produced good.

I chose this form of ROO specification in order to better reflect the actual requirements of most value content ROOs. In practice, a country cannot effectively measure the share of physical inputs in an imported product on a percentage basis, and so specifies the ROO in value-added terms.[14] The United States, for instance, specifies value content ROO

[14] The value added from labor and sector specific capital also contribute to origin under actual value content ROOs. I disregard this additional provision in the model to simplify its calculation. However, the ability of the costs of labor and capital to contribute to meeting ROOs can have significant impact on their effects. See Krishna & Kreuger's (1995) discussion of the impact of price versus cost based ROOs.

requirements based upon ratios of originating (or non-originating) inputs to the goods overall value.[15]

Since Good 3 is produced using only labor and capital in the Home country, it meets any ROO perforce. I assume that Foreign producers of Good 2 source some share *b* of the input Good 3 from the Home country, and share (1-*b*) from the rest from the world. Since only the Home country is a regional producer of the input good in the model, the ROO can be conceptualized as:

$$rx^{F}{}_{2}p^{H}{}_{2} \leq x^{H}{}_{3}p^{H}{}_{3} \tag{3.6}$$

where *r* is the ROO percentage requirement and $p^{H}{}_{3}$ is the price of the input Good 3 sourced from the Home country. Substituting in the production structure of Good 2 and simplifying reduces the ROO condition to:

$$rp^{H}{}_{2} \leq \alpha_3 b p^{H}{}_{3} \tag{3.7}$$

Thus, the right hand side of the ROO condition is the total value of intra-FTA input goods, per unit of output, while the left side is the share of total (tariff-ridden) customs value of Good 2 in the Home market required by the ROO. Assuming that this ROO

[15] Several different types of value content ROOs are specified within U.S. FTAs, most particularly in the automotive sector. Distinctions between them relate to the specific values used in the ROO calculation. For instance, methods differ in terms of which costs or profits they allow to contribute to origin. Alternate ROO calculation methodologies often have their own unique percentage threshold requirements, with methods that allow for a more expansive definition of originating value (to include for example, profits) often having higher ROO thresholds.

condition is met, the Foreign exporter obtains the tariff-ridden price in the Home market for its exports of Good 2. If the ROO is not met, then Foreign exports obtain the world price.

Thus, Foreign export prices are: $$\begin{cases} p_2^H = p_2^*(1 + t_2^H) \ if \ \alpha_3 b p_3^H \geq r p_2^H \\ p_2^* \ if \ \alpha_3 b p_3^H < r p_2^H \end{cases} \tag{3.8}$$

As is apparent in this formulation of the ROO, the price paid for Home country inputs and the share of those inputs both contribute to meeting the origin requirement. Indeed, they are effective substitutes in this purpose; a Foreign producer who sought to just satisfy the ROO could adjust the share (*b*) of Home input used in response to changes in its price. Under the ROO, the price for the Home country's Good 3 export to the Foreign country, p^H_3, is now unique from the general tariff-ridden Good 3 price in the Foreign market, p^F_3. Given the small country assumption, Home country exports would obtain the tariff-ridden Foreign price for Good 3 simply due to the FTA preferences generally. However, by requiring that a certain share of Good 2 value be effectively sourced from Home, the ROO generates an additional demand for Home's Good 3 exports, driving up their price. Since Good 3 exports from the Home country would be priced no lower than the tariff-ridden price, and an additional demand is generated by an FTA with binding ROOs, the market clearing condition should yield a price such that $p^H_3 > p^F_3$. Thus, the Home input producers obtain a share of the rents generated by the Home country tariff on Good 2.

Alternatively, if the ROOs do not bind, then there is no incentive for Foreign producers to source additional inputs from the Home country. Thus, there is no increase in demand of said inputs, and $p^H_3 = p^F_3$. I ignore such a case of non-binding ROOs in my analysis, as it would make the Foreign producers' decision on whether to source intra-FTA inputs trivial, rendering the origin regime incidental to trade flows in such a scenario.

However, in order for the Foreign country to have the incentive to meet the binding ROO, it must be able to obtain profits on its exports to the Home country via the FTA at least equal to what it could get by disregarding the ROO and paying the MFN tariff. This Foreign country participation constraint takes the form:

$$p^H_2 - \alpha_3[bp^H_3 + (1-b)p^F_3] \geq p^*_2 - \alpha_3 p^F_3 \qquad (3.9)$$

Simplifying yields a more intuitive expression, which indicates that in order for preferential trade to be profitable to the Foreign exporter, the preferential tariff margin must be at least equal to the additional production costs due to the ROO requirement.

$$p^*_2 t^H_2 \geq \alpha_3 b(p^H_3 - p^F_3) \qquad (3.10)$$

It is clear from this expression that the tariff is positive under the condition of a binding ROO (which induces $p^H_3 > p^F_3$). Substituting the binding ROO condition ($rp^H_2 = \alpha_3 bp^H_3$) back into this expression and rearranging yields an alternate expression for the tariff level necessary to induce Foreign participation. The derivative of this expression demonstrates that the necessary tariff level increases with the level of ROOs restrictiveness.

$$t_2^H \geq \frac{r\left(1-\frac{p_3^F}{p_3^H}\right)}{1-r\left(1-\frac{p_3^F}{p_3^H}\right)} \tag{3.11}$$

$$\frac{\partial t_2^H}{\partial r} = \frac{\left[1-r\left(1-\frac{p_3^F}{p_3^H}\right)\right]\left[1-\frac{p_3^F}{p_3^H}\right]+\left[r\left(1-\frac{p_3^F}{p_3^H}\right)\right]\left[1-\frac{p_3^F}{p_3^H}\right]}{\left[1-r\left(1-\frac{p_3^F}{p_3^H}\right)\right]^2} > 0 \tag{3.12}$$

Thus, in order to encourage preferential trade under binding ROOs at all, the Foreign country's participation constraint requires a positive Home country tariff, and that tariff is positively correlated with the level of ROOs restrictiveness. This basically mirrors the theory of the relationship between tariffs and ROOs out-lined by Krueger (1993) and Krishna and Krueger (1995), and observed also by Cadot, Estevadeordal, and Suwa-Eisenmann (2004).

Since the basis of my analysis is the effect of existing ROOs on external tariffs, I assume that the ROO has already been set during FTA negotiation. As this illustrates, however, there are constraints on how restrictive the ROO could be and still result in preferential trade. I therefore assume that the FTA ROO was set such that it binds, but is not so restrictive as to make preferential trade unprofitable under the feasible set of input prices.

3.3.3 Optimal Home tariff response

The previous section outlines the general FTA environment and establishes the positive relationship between external tariffs and ROOs that must be present in order for preferential trade to exist and be distinct from non-preferential trade. However, examining the unconditional Home country tariff problem is relevant, as it reveals information about how ROOs impact the conditions under which the Home country might wish to actually partake in preferential trade itself.[16] I thus analyze the Home country's optimal tariff under a welfare maximization scenario of preferential trade but unrestricted tariff levels.

Given the Foreign country's sourcing options, its price of the composite Good 3 input becomes $p_3 = bp^H{}_3 + (1\text{-}b)p^F{}_3$. Assuming that the ROO is met, the monetary profits (i.e. returns to sector specific capital) of the producers in the respective countries are:

$$\pi^F{}_2 = x^F{}_2 p^H{}_2 - x^F{}_2 \alpha_3[bp^H{}_3 + (1\text{-}b)p^F{}_3] - x^F{}_2 w^F \qquad (3.13)$$

$$\pi^H{}_3 = x^H{}_3 p^H{}_3 - x^H{}_3 w^H \qquad (3.14)$$

where $x^j{}_i$ represents production of the respective good i in country j, w^j represents wages in the respective country, $p^j{}_i$ represents domestic prices, and $p^*{}_i$ represents world prices.

[16] If, for instance, a restrictive ROO required a similarly restrictive tariff in order to induce preferential trade, the Home country welfare analysis might suggest that tariff elimination was the optimal response, essentially opting out of FTA trade on that product.

Domestic prices are tariff (t^j_i) inclusive: $p^F_2 = p^*_2(1 + t^F_2)$; $p^F_3 = p^*_3(1 + t^F_3)$; $p^H_2 = p^*_2(1+t^H_2)$.

I use c^j_i to represent consumption, as well as m^j_i to represent imports from the respective partner country and m^*_i to represent imports from the rest of the world. Thus, the market clearing conditions are identified below, with country exports of Good 2 as functions of the tariff-ridden price in the Home market under the FTA. Home country exports of Good 3 now obtain a unique price in the Foreign market.

$$c^H_2(p^H_2) = m^F_2(p^H_2) + m^*_2(p^H_2) \tag{3.15}$$

$$c^F_3 = m^H_3(p^H_3) + m^*_3(p^F_3);\ bc^F_3 = m^H_3(p^H_3);\ (1-b)c^F_3 = m^*_3(p^F_3) \tag{3.16}$$

$$m^H_3(p^H_3) = x^H_3(p^H_3);\ m^F_2(p^H_2) = x^F_2(p^H_2) \tag{3.17}$$

Using the fact that compliance with the ROO dictates that some share *b* of Good 3 be sourced from the Home country, along with Good 2's production function, I adjust the market clearing condition for Good 3 to obtain:

$$\alpha_3 b x^F_2(p^H_2) = x^H_3(p^H_3) \tag{3.18}$$

The Home country welfare is composed of the wage bill ($w^Hx^H_3 + w^Hx^H_1$), profits (π^H_3), tariff revenue ($m^*_2p^*_2t^H_2$), and consumer surplus [$u(c^H_2) - p^H_2c^H_2$].

$$W^H_{FTA} = w^Hx^H_3 + w^Hx^H_1 + \pi^H_3 + m^*_2p^*_2t^H_2 + [u(c^H_2) - p^H_2c^H_2] \tag{3.19}$$

Leaving aside for a moment the Foreign country's incentives to also trade preferentially, the Home country government sets it optimal tariff under an FTA with ROOs according to the maximization of W^H_{FTA} (3.19) subject to the binding ROO (3.7) and the adjusted market clearing condition for Good 3 (3.18):

$$\max \quad W^H_{FTA} = x^H_3 p^H_3 + w^H x^H_1 + m^*_2 p^*_2 t^H_2 + [u(c^H_2) - p^H_2 c^H_2]$$

$$\text{s.t.} \quad r p^H_2 = \alpha_3 b p^H_3$$

$$\alpha_3 b x^F_2(p^H_2) = x^H_3(p^H_3)$$

Substituting the conditions into the objective function yields:

$$\max_{t_2^H} \mathrm{W}_{\mathrm{FTA}}^{\mathrm{H}} = r x_2^F p_2^H + m_2^* p_2^* t_2^H + u(c_2^H) - c_2^H p_2^H \tag{3.20}$$

Differentiating this expression with respect to t^H_2 yields the following first order condition:

$$\frac{dW}{dt_2^H} = r p_2^H \frac{\partial x_2^F}{\partial t_2^H} + r x_2^F \frac{\partial p_2^H}{\partial t_2^H} + m_2^* p_2^* + m_2^* t_2^H \frac{\partial p_2^*}{\partial t_2^H} + p_2^* t_2^H \frac{\partial m_2^*}{\partial t_2^H} + u' \left(\frac{\partial c_2^H}{\partial t_2^H}\right) - p_2^H \frac{\partial c_2^H}{\partial t_2^H} - c_2^H \frac{\partial p_2^H}{\partial t_2^H} \tag{3.21}$$

The second order condition confirms that the optimal tariff is a maximum:

$$\frac{d^2W}{\left(dt_2^H\right)^2} = 2 r p_2^* \frac{\partial x_2^F}{\partial t_2^H} - p_2^* \frac{\partial x_2^F}{\partial t_2^H} + p_2^* \frac{\partial m_2^*}{\partial t_2^H} < 0 \tag{3.22}$$

Considering again the small country assumption, consumer's utility optimization,[17] and price composition,[18] the FOC can be rearranged into an adjusted expression for the Home country's optimal Good 2 tariff.

$$t_2^H = \frac{m_2^F(1-r) - r\frac{\partial x_2^F}{\partial t_2^H}}{r\frac{\partial x_2^F}{\partial t_2^H} + \frac{\partial m_2^*}{\partial t_2^H}} \tag{3.23}$$

With respect to the denominator of the expression, assuming that Good 2 is normal, with standard export supply and import demand functions, then $\frac{\partial x_2^F}{\partial t_2^H}$ is positive, as an increase in the producer price obtained by Foreign producers increases the amount supplied. Similarly, $\frac{\partial m_2^*}{\partial t_2^H}$ is negative, as a higher tariff raises the price on imports of Good 2 from the world. Under the same assumptions, it must also be the case that $\left|\frac{\partial m_2^*}{\partial t_2^H}\right| > \left|\frac{\partial x_2^F}{\partial t_2^H}\right|$, whereby imports from the Foreign country do not fully compensate for the decline in imports from the rest of the world in the case of Home country tariff increases. Thus, the denominator of the expression is negative.

The first term in the numerator represents the net loss in tariff revenue from the FTA. Given that $0 \leq r \leq 1$, this expression is positive – tariff revenue decreases under an FTA

[17] The equilibrium condition for utility ($u' = p^H_2$) simplifies the expression.

[18] Which implies $\frac{\partial p_2^H}{\partial t_2^H} = p_2^* + \frac{\partial p_2^*}{\partial t_2^H}(1+t_2^H)$

with any preferential trade diversion in Good 2. The second term in the numerator represents the weighted growth in export revenue in Good 3 from the trade diversion itself.

The numerator cannot be strictly determined, but depends on the relative sizes of the lost tariff revenue and profits associated with exports of Good 3. If insufficient tariff revenue is returned to the Home country through preferential exports of Good 3, then optimal tariff would be negative. Alternatively, if the increased Good 3 profits are larger, then the Home country has an incentive to stimulate preferential trade via a positive tariff on Good 2. Thus, the sign of the optimal tariff is determined according to:

$$t^H_{2\,opt} \begin{cases} > 0 \; if \; m^F_2(1-r) < r\frac{\partial x^F_2}{\partial t^H_2} \\ \leq 0 \; if \; m^F_2(1-r) \geq r\frac{\partial x^F_2}{\partial t^H_2} \end{cases} \qquad (3.24)$$

It's clear from this comparison that the probability of a positive optimal tariff (i.e. the left side of the conditional expression is less than the right) increases with the level of ROO restrictiveness, *r*. This is logical, as more restrictive ROOs allow Home country Good 3 producers to increase the value of their exports to the Foreign country, either through higher prices or greater quantity (i.e. larger p^H_3 or larger b). In the extreme case of the ROO being equal to one, then these profits more than compensate for welfare losses, and the optimal tariff is strictly positive. Alternatively, if the ROOs are completely liberalizing and equal to zero, then all preferential rents on exports of Good 3 are eliminated as well as eliminating any tariff revenue, as all Home imports of Good 2 are diverted through the Foreign country. Between these extremes, the optimal tariff increases with ROOs restrictiveness monotonically. This is verified by the derivative of the optimal tariff with respect to r:

$$\frac{\partial t_2^H}{\partial r} = \frac{\left[r\frac{\partial x_2^F}{\partial t_2^H}+\frac{\partial m_2^*}{\partial t_2^H}\right][-m_2^F]-\left[m_2^F(1-r)-r\frac{\partial x_2^F}{\partial t_2^H}\right]\left[\frac{\partial x_2^F}{\partial t_2^H}\right]}{\left(r\frac{\partial x_2^F}{\partial t_2^H}+\frac{\partial m_2^*}{\partial t_2^H}\right)^2} \qquad (3.25)$$

Which simplifies to:

$$\frac{\partial t_2^H}{\partial r} = \frac{r\left(\frac{\partial x_2^F}{\partial t_2^H}\right)^2-m_2^F\left(\frac{\partial m_2^*}{\partial t_2^H}+\frac{\partial x_2^F}{\partial t_2^H}\right)}{\left(r\frac{\partial x_2^F}{\partial t_2^H}+\frac{\partial m_2^*}{\partial t_2^H}\right)^2} \qquad (3.26)$$

Assuming, as before, that Good 2 is normal, the derivative of the optimal tariff with respect to the level of ROO restrictiveness is uniformly positive. Therefore, higher levels of ROO restrictiveness would motivate relatively higher tariffs. Since I assume in this model that a ROO has been set during FTA negotiations that comported with the Foreign country's participation constraint, I likewise assume an existing external tariff. A prospective reduction in that tariff would thus have differing effects based upon the ROO it was subject to.

3.3.5 Implications for tariff reduction

As a final example of the relationship between tariffs and ROOs, I briefly examine the Home country's incentives in the face of existing positive tariffs. I assume that the Home country maintains positive external tariffs on a schedule of goods with production structures similar to that of Good 2 in the theoretic framework. I further assume that under the FTA negotiations, the ROOs for these products are set with varying levels of restrictiveness, but in no case are ROOs set so restrictively such that it prevents preferential trade (i.e. the Foreign country participation constraint is satisfied; $r \leq \frac{p_2^* t_2^H + \alpha_3 b p_3^F}{p_2^H}$). Therefore, the Home country may have some flexibility to adjust tariffs without eliminating preferential trade.[19] Given this opportunity to adjust its tariffs, the Home country may choose products to do so depending on their applicable ROOs. To highlight this, observe again the derivative of the Home country's welfare equation under the FTA, considering the small-country assumption and consumer utility maximization:

$$\frac{dW}{dt_2^H} = rp_2^H \frac{\partial x_2^F}{\partial t_2^H} + rx_2^F p_2^* - mx_2^F p_2^* + p_2^* t_2^H \frac{\partial m_2^*}{\partial t_2^H} \tag{3.27}$$

As before, this expression is not strictly determined. However, taking the second derivative with respect to the level of ROO restrictiveness, *r*, yields:

[19] It is worth noting that while the example used here, with the lack of Home country production of Good 2, is unsupportive of the use of ROOs as a purely trade protectionist device (i.e. preventing imports that compete with a domestic producer), which is a possible objective of ROOs generally, as previously noted. In such cases, any tariff adjustment is likely to similarly maximize protection for the affected product, and be incidental to the ROO.

$$\frac{\partial^2 W}{\partial t_2^H \partial r} = p_2^H \frac{\partial x_2^F}{\partial t_2^H} + x_2^F p_2^* > 0 \qquad (3.28)$$

This cross-partial derivative is uniformly positive. Therefore, in the instance that the Home country was reducing its tariffs on Good 2, it would incur greater welfare losses on those products with a higher level of ROO restrictiveness. These relatively higher losses may induce the Home country to reduce the tariffs on such products little or not at all, if possible.

This result lends itself to empirical testing. In reality, countries often maintain positive tariffs on products, and reduce them primarily through trade negotiations, as opposed to unilateral liberalization. Expanding the Good 2 example out to a variety of products with similar characteristics, if the Home government intended to reduce the level of its existing tariffs on consumption goods, its own utility considerations would lead it to cut tariffs more deeply on products with lax FTA ROOs. Thus, a country with an existing preferential ROOs relationship that is participating in negotiations to reduce its external tariff would be less likely to cut its tariffs on products subject to more restrictive ROOs.

3.4 An empirical investigation of ROOs' effect on tariffs

The previous section used a theoretic model to highlight how the ROOs mechanism can influence optimal tariff levels under simple welfare maximization. While this theoretic result conceptualizes countries' tariff-setting incentives in the presence of preferential

ROOs, whether or not such incentives manifest themselves in countries' actual trade regimes is an empirical question. Limao (2006) and Estevadeoral, Freund, and Ornelas (2008) provide empirical evidence that external tariffs have been affected by preferences in general, but the unique role of ROO restrictiveness has not been investigated.[20] An examination of tariff levels that incorporate ROOs explicitly is needed to determine whether level of ROOs restrictiveness actually influences countries' tariffs, and in particular whether restrictive ROOs lead to higher tariffs.

I provide such an analysis, using the theoretic result from the previous section to motivate an empirical analysis of whether such effects are realized in certain countries' external tariffs. To do so, I analyze bound tariff changes for the United States before and after NAFTA entered into effect, while controlling for NAFTA ROOs' restrictiveness and other motivators of external tariff change. Specifically, NAFTA and its ROOs were negotiated slightly prior to the conclusion of the Uruguay Round and U.S. negotiators may have considered the impact of those ROOs on preferential trade between the NAFTA partners. Thus, the anticipated impact of those ROOs on trade, such as through scenarios as highlighted in Section 3.3, may have further influenced the U.S. commitments to reduce its bound tariffs in the Uruguay Round.

[20] Estevadeoral, Freund, and Ornelas (2008) examine whether preferential tariff reduction has a greater or lesser effect on external liberalization when ROOs are likely to bind (non-negligible preference margin), but do not examine whether ROOs themselves affect external tariffs.

3.4.1 Empirical specification

Tariff setting in the theoretic model identified in the previous section is non-cooperative, as there is no bargaining element to the framework. While this simplifies the model, it is not always reflective of the reality of tariff setting decisions, and would be a poor representation of countries' tariff-setting decisions in trade negotiations. Thus, the theoretic result would not be a complete guide for an empirical investigation of external tariff determination in the presence of FTAs. Nevertheless, the theoretical result outlines a means by which ROOs may affect external tariffs. I build upon this relationship with additional variables designed to control for other factors in external tariffs, particularly in a bargaining scenario. Combining ROOs data with these further elements, I utilize a linear model of the following general form to examine tariff change due to NAFTA ROOs:

$$tariff\_chg_i = \alpha_0 + \alpha_1 roo\_index_i + \alpha_2 pref_i + \alpha_3 ad_i + \alpha_4 barg\_power_i + \alpha_5 share_i + \alpha_6 labor_k + \alpha_7 US\_RCA_k + \alpha_8 multi\_line_i + \alpha_9 zero\_sector_i + \alpha_{10} chem_i + \alpha_{11} tex_i + \beta industry_j + \varepsilon_i \quad (3.29)$$

The dependent variable $tariff\_chg_i$ represents the change in the natural log of the tariff factor of U.S. MFN bound tariffs for product i. Formally, these changes are calculated as $\{\ln[(1+T_{t+1})/(1+T_t)]\}\times 100$, where T_t is (for each product i) the base tariff and T_{t+1} is the final bound tariff. I use this methodology in order to account for the actual tariff levels. Alternatively, the use of simple percentage changes disregards absolute levels, and as an example would equivocate the elimination of a 2 percent tariff and a 100 percent tariff, despite the fact that they greatly differ in terms of the impact of these reductions on actual prices, and thus market access.

These bound tariff rates are set at the 8-digit level of the Harmonized System (HS), and were set during the various negotiating Rounds of the General Agreement on Tariffs and Trade (GATT). For the purposes of this analysis, I evaluate the change in U.S. bound rates set in the Tokyo and Uruguay Rounds, as the latter occurred after NAFTA ROOs negotiations took place. I measure the U.S. tariff response to ROOs using bound rates due to the fact that as a practical matter the United States has limited flexibility to adjust its MFN applied tariffs. The United States maintains its applied rates at a level similar or equal to its bound rates. Thus, the U.S. ability to adjust applied rates upwards in response to policies is severely constrained. Likewise, the United States has little incentive to adjust its applied rates downward unilaterally, particularly in response to NAFTA, which finalized in the midst of multilateral trade negotiations. However, such bound tariffs were subject to negotiation during the Uruguay Round. Thus, given the symmetry between U.S. bound and applied rates, Uruguay Round bound rate cuts provides for a reasonable representation of U.S. external tariff changes. While the Uruguay Round focused on reduction of U.S. bound tariffs, Limao (2006) noted that a comparison of the relative depth of these cuts can still reveal information on where the United States wished to maintain higher tariff barriers. Thus, the U.S. Uruguay Round tariff results would reflect any tariff policy responses to NAFTA.

The restrictiveness of the respective product's NAFTA ROO is captured by the variable roo_index_i, which represents either the h- or r-index values. These indices are constructed directly from the agreement, and are specified at the 6-digit level of the HS. As mentioned in Chapter 2, the indices provides a ranking of ROOs' restrictiveness based upon the level of HS at which any tariff shift is required, value content threshold, the presence and HS level of any exclusions or additions, technical requirements, and the ability to choose between alternate ROOs. While the h-index takes account of exceptions as part of its original framework, I adjust the r-index values to do so as well, using the same methodology as Cadot et al (2005a). Both indices are set such that higher values indicate more restrictive ROOs. Thus, the coefficient on this variable would be positive if more restrictive ROOs lead to smaller U.S. bound tariff cuts. Appendix 3 presents simple averages index values associated with NAFTA ROOs, by HS chapter. While the ROOs variables represent my main interest in the empirical estimation, I include further control variables to account for additional influences on U.S. tariff reduction in the Uruguay Round. These variables are not explicitly included in the theoretical framework of the previous section, but they are nonetheless relevant to the estimation. Thus, the regression model is ad hoc, but with a general structure built upon previous examinations by Limao (2006) and Estevadeordal, Freund, and Ornelas (2008).

I include a variable indicating the presence of U.S. preferential trade regimes generally. The United States may have been less inclined to reduce its external tariffs for products for which it provides preferential access through either unilateral programs such as the Generalized System of Preferences, Caribbean Basin Initiative, etc., or through FTAs.

These preferential regimes generate advantages to the recipient countries, which may lobby the United States to maintain their preference margins. While I am attempting to identify such an effect specifically via ROOs, the general presence of such preferences is also relevant to U.S. bound tariff reductions, as identified by Limao (2006). To control for this effect, I create an indicator variable that identifies preference-eligible products that were imported in 1992-93. A positive sign on the coefficient for $pref_i$ would indicate that U.S. tariff cuts were lower for imported products eligible for tariff preferences.

The presence of U.S. anti-dumping measures may also impact tariff reductions, though the direction of such impact is unclear. The presence of a dumping margin could make tariff reductions more likely, if the dumping margin represents the real barrier to importation that commensurately lessens the importance of the MFN tariff. In such cases, the United States may cut tariffs more deeply, even if import protection is a goal, as the product is already protected by the anti-dumping margin. Alternatively, the presence of a dumping margin could be indicative of a strong lobby in favor of protection that works to preserve all types of trade barriers on the product. In such a case, the presence of a dumping margin would be correlated with lower tariff cuts. I create the indicator variable ad_i, to identify those products in which the United States had an anti-dumping investigation or duty margin in place in 1993, according to the TRAINS database classification.

Presumably, greater export interest and bargaining power by major U.S. trading partners would induce deeper U.S. Uruguay Round tariff cuts, while greater U.S. bargaining power would temper them. The variable $barg\_power_i$ is the product-specific approximation of relative U.S. bargaining power. The variable is constructed using data on trade and GDP. I take the difference between the average 1992-1993 U.S. GDP (the years prior to which negotiations were finalized), and that of those trade partners with a significant export interest in each 8-digit product category. I then weight these differences by the relative importance of individual products to the trade partners' overall exports to the United States, and take the natural log. Specifically, I calculate the change in the difference between U.S. GDP and that of the top five sources of U.S. average 1992-1993 imports from GATT members[21] by product.[22] I then weight these differences by the product's share of each partner country's total exports to the United States, and then take the natural log of the aggregate weighted values across the five major partners. This creates a rough measure of relative U.S. trade negotiation leverage on each product during the Uruguay Round, with larger values for $barg\_power_i$ indicating relatively greater U.S. bargaining power vis-à-vis its major import sources. Thus, if stronger U.S. bargaining power leads to smaller U.S. MFN tariff cuts, then the coefficient on this variable would be positive. Limao (2006) uses a similar measure of bargaining power in his specification, but with the difference that instead of taking the simple difference between U.S. and partner country GDP in 1994, he uses the relative difference between U.S. and partner country GDP growth between the Uruguay and Tokyo Rounds. Since I am measuring U.S. cuts to its base rate, which often but not always corresponds to the U.S.

[21] In the Uruguay Round, the United States was negotiating only with fellow GATT signatories. However, I do include among the potential import sources those countries that joined the GATT in 1992 or early 1993.

[22] For purposes of identifying top U.S. import sources, I treat Czechoslovakia as a single country, though it separated in the Czech and Slovak Republics in 1993.

Tokyo Round final bound rates, I believe that differences in current GDP is more relevant to countries' ability to extract U.S. tariff cuts.

I use the variable $share_i$, to measure the relative importance of the impact of Uruguay Round tariff liberalization on U.S. tariff revenue. While tariffs are not a relatively large proportion of U.S. revenue collection, it is possible that its loss may have an impact on tariff reductions. Specifically, a low level of tariff revenue collection on a product may increase the United States' propensity to reduce it. Tariff revenue collection can be eroded through profligate use of preferential trade regimes, such as NAFTA. Thus, the extent to which imports already enter the United States duty-free under these regimes defines how much revenue would be lost through MFN tariff reduction. I thus use U.S. import data for both total and preferential imports to construct a measure of the share of U.S. imports on each 8-digit product that were subject to duty in 1994. A low value for $share_i$ may make tariff reduction more likely, as there is little revenue to be maintained through shallow tariff cuts.[23] Should such an effect be present, then the variable's coefficient would be positive.

I include two sector-specific political economy variables in the analysis, to better capture general protectionist motivations. The first, $labor_k$, is a measure of sector labor productivity, defined as the log of average 1992-93 gross output divided by full time equivalent employment. This data, from the Bureau of Economic Analysis, is at the Standard Industrial Classification (SIC) sector level, which I concord to the HS 6-digits

[23] The results of Estevadeordal, Freund, and Ornelas (2008) provide some indication of such an effect.

using a concordance from the World Bank World Integrated Trade Solutions (WITS) database. The impact of this variable on tariff reductions could be mixed. On one hand, greater labor productivity would likely indicate a more productive industry, which could be less opposed to tariff reduction. Alternatively, a high $labor_k$ value could reflect simply a large domestic industry and/or wage level that would be inclined and able to lobby for protectionism. The second political economy variable is an average 1992-93 U.S. global revealed comparative advantage, at the HS 6-digit level, which serves as a proxy for U.S. competitiveness. A higher value indicates greater U.S. export competitiveness, which is likely to be correlated with less protectionism. Thus, the coefficient on this variable is expected to be negative. The U.S. global RCA was constructed as outlined below:

$$US\_RCA_i = \frac{Avg.\,U.S.\,exports\ to\ the\ world\ of\ product\ i / Avg.\,total\ U.S.\,exports\ to\ the\ world}{Avg.\,world\ exports\ to\ the\ world\ of\ product\ i / Avg.\,total\ world\ exports\ to\ the\ world}$$

I include an indicator variable, $multi\_line_i$, specifying those lines for which there were U.S. tariff commitments at a level more detailed than the 8-digit HS. Such exceptions to the standard nomenclature are used most often in cases where there is interest in unique tariff treatment of an extremely specific product, or one destined for a particular end use. In the U.S. schedule products for use in civil aircraft are the most common application of this mechanism. While the specific rate allocated to these more detailed products may be either higher or lower than the broader category, the U.S. use of them for civil aircraft (a duty-free sector) suggests that U.S. cuts in such lines would be deeper, indicated by a negative sign on the $multi\_line_i$ variable.

As part of the Uruguay Round negotiations, the United States and other major trading countries negotiated a series of sector agreements, which provided for harmonized final tariff rates for included products. Several of these sectors were subject to complete tariff elimination among those countries that agreed to participate. These tariff-elimination sectors included agriculture equipment, beer, construction equipment, brown distilled spirits, furniture, medical equipment, paper, steel, toys, and pharmaceuticals. Thus, the U.S. final bound tariff rate for the products included in these sectors was a function not just of those factors affecting it directly, but also its presence in the sector itself. Therefore, I include an indicator variable, $sector_i$, which identifies products subject to these duty-free sectoral agreements. Since included products were subject to tariff elimination, I expect the coefficient on the variable to be negative.

Two additional sectors were also subject to unique treatment during the Uruguay Round. Tariffs on chemical products were harmonized, but not eliminated, among countries that participated in the plurilateral sector agreement, including the United States. Also, many textile and apparel products were still subject to quotas during the Round. While the Agreement on Textiles and Clothing (previous Multi Fiber Agreement) that covered most textile, fabric, and apparel products provided for the gradual elimination of the quota system, the presence of the system may well have influenced U.S. tariff reductions. I include individual indicator variables for both of these sectors, $chem_i$ and tex_i.

Finally, the variable *industry*$_j$ represents a full set of industry dummies at the chapter (2-digit) level of the Harmonized System, in order to control for industry-specific effects that might affect individual products.

Table 3.1: Summary Statistics

Variable	Description	Mean	Std. Dev.
lndiff	{ln[(1+final bound tariff)/(1+initial bound tariff)]}×100	-2.83	3.15
h_nafta	H-Index of NAFTA ROOs	11.41	6.25
r_nafta	R-Index of NAFTA ROOs	5.59	1.27
any_pref	Indicator of U.S. imports of preference-eligible products	0.93	0.25
can_imp	Indicator of U.S. imports from Canada	0.86	0.35
mex_imp	Indicator of U.S. imports from Mexico	0.61	0.49
ad	Indicator for products subject to U.S. anti-dumping	0.03	0.18
barg_pwr	Import share-weighted difference of U.S. & country GDP	21.63	2.41
share	Share of U.S. dutiable imports / all imports	0.83	0.25
labor	Ln(gross output / full-time-equivalent employment)	11.85	0.45
US_RCA	U.S. global RCA	0.90	0.84
multi_line	Indicator of U.S. tariff lines below 8-digit HS	0.08	0.27
zero-sector	Indicator of products subject to UR zero-for-zero sectoral	0.13	0.33
chem	Indicator of Chemical Harmonization products	0.19	0.39
tex	Indicator of Agreement on Textiles and Apparel products	0.19	0.39

Author's calculations based on described data

3.4.2 Data

I chose the United States as the subject of the empirical analysis based upon data availability, the opportunity afforded by the Uruguay Round tariff negotiations for the United States to change its tariffs subsequent to NAFTA, and the robust variance of NAFTA ROOs. Additionally, the U.S. trade position in NAFTA is generally considered to be not dissimilar to that of the Home country in the theoretic model, with the United States acting as an input producer and final consumer, and Mexico acting primarily as a manufacturer and export platform for the final goods. The extent of bilateral trade between the United States and Mexico would also further motivate incentives to alter tariffs based upon NAFTA, where as an FTA between countries that conduct relatively little trade may not.

The data of analysis are base and final U.S. bound tariff rates negotiated during the Uruguay Round of multilateral trade negotiations. These rates are sourced directly from the World Trade Organization (WTO), which provides countries' Uruguay Round tariff schedules online, including base and final bound rates. This, as well as other U.S. data, is available at the full 8-digit level of the HS. The Uruguay Round began in 1986, and the final agreement was signed in 1994. Trilateral NAFTA negotiations started in 1991 and the final agreement was signed in late 1992. Thus, while there was simultaneity in the agreements' negotiations, the outcome of NAFTA did have an opportunity to affect final U.S. tariff concessions in the Uruguay Round.

Tariffs on products for which the United States already maintained zero MFN tariffs prior to the Uruguay Round were generally not raised during the course of those negotiations. While there were a few exceptions, MFN tariffs are predisposed to remain at zero once the products are made duty-free. Given that duty-free base tariffs are inflexible or less flexible to change, I eliminate them from my analysis. This focuses the analysis on those products whose tariffs have reasonable policy space to potentially adjust in response to negotiation factors, or NAFTA ROOs.

Apart from U.S. bound tariff rates, most data is sourced from the U.S. International Trade Commission's Dataweb. Dataweb provides detailed 8-digit U.S. import figures, both for general trade as well as for trade that claimed preferential treatment under a U.S. preferential regime (GSP, CBI, etc.) or FTA. Additionally, GDP data is used in the construction of the bargaining power variable. This data (in constant U.S. dollars) comes from the World Bank's World Development Indicators (WDI) database.

3.4.3 Endogeneity

A concern with respect to this specification is that the NAFTA ROOs, treated here as exogenous, are actually endogenous to U.S. Uruguay Round tariff reductions. Although the NAFTA ROOs negotiations were finalized prior to the Uruguay Round's conclusion, it's possible that expectations concerning tariff reductions were a factor in the ROOs negotiations. I test for and verify this as a source of bias in my estimation.

In order to test for the endogeneity of NAFTA ROOs with respect to Uruguay Round tariff reductions, I conduct Durbin-Wu-Houseman tests of the NAFTA ROOS, as measured by both their r- and h-indices. NAFTA ROOs, as represented by both indices, were found to be endogenous at the 5 percent level of significance (test statistics noted in Table 3.2).

I instrument for the NAFTA ROOs using the respective index values of the ROOs negotiated in the U.S.-Canada FTA, as well as the average 1992-93 shares of U.S.

exports to Canada and Mexico for each HS 6-digit product. The ROOs utilized in the U.S.-Canada FTA bear many similarities to those later agreed to in NAFTA, but the agreement was finalized in 1987, significantly before the substantive stage of the Uruguay Round industrial tariff negotiations. Additionally, the United States is more likely to pursue more liberal NAFTA ROOs on products in which it exported large shares to Canada and Mexico, but such shares are less likely to drive U.S. domestic tariff cuts in a multilateral trade round.

3.4.4 Results

Overall, the results provide support for the theoretical effect of preferential ROOs upon external tariffs. More restrictive NAFTA ROOs had a tempering effect on U.S. Uruguay Round tariff reductions, though the effect is small in comparison to other influencing factors. The specific regression results of the empirical specification are listed in Table 3.2.

Columns 1-4 examine the effects of NAFTA ROOs on U.S. external tariff reduction using the h-index, while columns 5-8 do so using the adjusted r-index. Additionally, columns 1 and 5 provide the results for the basic OLS estimation as a point of comparison, while columns 2-4 and 6-8 utilize robust GMM IV estimates so as to account for endogeneity. Finally, while I examine the effect of NAFTA ROOs on U.S. tariff changes generally, it is also possible that a ROO's effect would be less relevant for those products not imported by the United States under the prospective NAFTA. If, for instance, the probability of importing cuckoo clocks from Canada or Mexico is low, then the relevance of the NAFTA ROO on them is similarly low, and less likely to influence external tariffs. To evaluate this, I interact the respective ROO index values with the indicators for U.S. imports from Canada and/or Mexico in 1992-93, *can_imp* and *mex_imp*. Finally, all estimates (both OLS and GMM IV) utilize robust standard errors, so as to control for heteroskedasticity.

Table 3.2: Estimated Effects of ROOs on U.S. Uruguay Round Bound Tariff Changes

	Expected sign	OLS (1)	GMM IV (2)	GMM IV (3)	GMM IV (4)	OLS (5)	GMM IV (6)	GMM IV (7)	GMM IV (8)
constant		-13.79**	-14.86**	-13.55**	-11.34**	-14.25**	-14.47**	-14.27**	-6.67*
		(2.03)	(2.16)	(2.19)	(2.22)	(2.01)	(2.16)	(2.18)	(3.11)
h_nafta	(+)	0.05**	-0.08	-0.08	-0.20**				
		(0.01)	(0.04)	(0.04)	(0.06)				
h_nafta*can_imp	(+)				0.10*				
					(0.04)				
h_nafta*mex_imp	(+)				0.07**				
					(0.02)				
r_nafta	(+)					0.36**	0.17	0.18	-1.48*
						(0.05)	(0.11)	(0.11)	(0.72)
r_nafta*can_imp	(+)								0.76*
									(0.39)
r_nafta*mex_imp	(+)								0.61**
									(0.15)
any_pref	(+)	0.67**	0.70**	0.18	-0.02	0.68**	0.69**	0.17	-0.07
		(0.23)	(0.23)	(0.28)	(0.29)	(0.23)	(0.23)	(0.28)	(0.30)
can_imp	(+)			0.54**	-0.63			0.53**	-3.96
				(0.18)	(0.46)			(0.18)	(2.24)
mex_imp	(+)			0.27**	-0.57**			0.28**	-3.18**
				(0.09)	(0.20)			(0.09)	(0.84)
ad	(?)	0.79**	0.83**	0.80**	0.82**	0.81**	0.81**	0.78**	0.82**
		(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
barg_pwr	(+)	0.20**	0.21**	0.19**	0.17**	0.21**	0.21**	0.18**	0.18**
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
share	(?)	1.92**	1.91**	1.89**	1.83**	1.88**	1.89**	1.88**	1.91**
		(0.19)	(0.19)	(0.19)	(0.19)	(0.19)	(0.19)	(0.19)	(0.20)
labor	(+)	0.49**	0.48**	0.49**	0.47**	0.37*	0.41*	0.43*	0.61*
		(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.29)
US_RCA	(+)	0.02	0.00	-0.01	0.00	0.02	0.02	0.00	0.02
		(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
multi_line	(?)	-0.98**	-0.99**	-0.99**	-0.90**	-0.99**	-0.98**	-0.99**	-0.90**
		(0.17)	(0.17)	(0.16)	(0.16)	(0.17)	(0.17)	(0.16)	(0.16)
zero_sector	(-)	-2.67**	-2.52**	-2.51**	-2.49**	-2.68**	-2.63**	-2.63**	-2.53**
		(0.17)	(0.17)	(0.17)	(0.16)	(0.16)	(0.16)	(0.16)	(0.19)
chem	(?)	2.46**	2.81**	1.67**	1.55**	3.23**	1.01**	0.89**	1.60
		(0.85)	(0.37)	(0.40)	(0.39)	(0.85)	(0.32)	(0.33)	(0.87)
tex	(?)	-2.95**	1.89*	0.89	0.47	-2.24**	-0.98*	-1.05*	-0.03
		(0.59)	(0.90)	(0.93)	(0.91)	(0.59)	(0.42)	(0.42)	(1.06)
chapter indicators		yes	yes	yes	yes	yes	yes	yes	yes
Observations		5,852	5,839	5,839	5,839	5,852	5,839	5,839	5,839
R-squared		0.24	0.23	0.24	0.25	0.25	0.25	0.25	0.21
Endog p		0.0013				0.0499			
Hansen's J p		.	0.208	0.389	0.463	.	0.167	0.336	0.153

Standard errors in parentheses
* Significant at 5%
** Significant at 1%

Beginning with the robust OLS regressions (columns 1 and 5), the coefficients of the ROOs index values are positive and significant, which would indicate that higher levels of ROOs restrictiveness resulted in relatively smaller tariff reductions. As noted, however, the index values are endogenous under this specification, as indicated by the low p-values of the endogeneity tests listed at the bottom of the table. Turning to the same specification using IV estimates (columns 2 and 6), the coefficients for the ROOs indices both turn negative and lose significance. A negative coefficient would indicate that U.S. Uruguay Round tariff cuts were actually deeper on lines with more restrictive ROOs, but the coefficients for neither the h- or r-index are significant at the 5 percent level. The introduction of indicators for the presence of U.S. imports from Canada or Mexico (columns 3 and 7) changes nothing with respect to the ROOs' effect. However, the interaction between the index values and said imports indicates (columns 4 and 8) that higher levels of NAFTA ROOs restrictiveness did lead to less profound U.S. Uruguay Round tariff cuts on products that were actually imported from NAFTA partners. The positive sign on both interaction terms reflect this. It is also worth noting that tests of the IV over-identification restrictions appear to be valid, as indicated by J-test p-values of at least 15 percent.

The coefficients of the ROO indices are sizable but difficult to interpret. Since they measure the effect of a one point increase in indices, which operationalize the actual ROOs and rank restrictiveness, economic interpretation of their marginal effect on relative tariff reductions is difficult. Nevertheless, their values are large enough to indicate that creating ROOs with more restrictive elements; such as high value content requirements, broad tariff shift requirements, or widespread exceptions; clearly appears to motivate higher external tariffs. Additionally, the size of the h-index coefficients is smaller than those of the r-index, which is logical since a one point increase in the h-index represents a smaller marginal increase in ROO restrictiveness than does a point increase in the r-index.

Results of the other variables are generally consistent with conventional theory. As identified by Limao, U.S. tariffs on products in which the United States provided tariff preferences and imported were generally reduced less in the Uruguay Round. This result becomes insignificant, however, when lines with imports from Canada and Mexico are individually included in the model, which would indicate that prospective NAFTA imports were a strong driver of this effect. Also similar to Limao's results were the effects of measures of U.S. bargaining power, which was positive and significant for all specifications, indicating that U.S. tariff cuts were less in cases where its bargaining power versus major negotiating parties was strongest. Additionally, the presence of multiple, more detailed, product lines variable has a negative effect in all but one specification, including all significant results. This indicates that subdivisions of tariff lines experienced deeper tariff cuts, on average.

With respect to the political economy variables, the coefficient on labor productivity was positive and significant across the specifications. Thus, it appears that sectors with high productivity tended to be more protected, and thus experienced lower U.S. tariff cuts. This could reflect simply an ability of the larger or more profitable industries (or unions) to better lobby for protectionism. Also, given that multilateral tariff reductions apply to imports from large developed countries that are more likely to have similar productivity profiles, tariffs in such sectors may be relatively more valuable. Coefficients for U.S. RCA values were insignificant, however.

Coefficients for the presence of U.S. anti-dumping measures were also uniformly positive. This would be consistent with a theory that such measures are complementary to other protectionist tendencies on said products, and that their presence did not allow U.S. Uruguay Round negotiators to make more liberal tariff cuts.

The result for the dutiable trade share variable is interesting. Its positive and significant coefficients indicate that the higher the share of dutiable trade on a product, the lower the U.S. cuts. Such a result would be expected for countries that have greater dependence on tariff revenue, but this effect is present across all specifications for the United States as well.

The results for the various Uruguay Round sectoral negotiations also are interesting. Unsurprisingly, the coefficients for the zero-for-zero sectors are negative and strongly significant, as one might expect for product groups whose tariffs were eliminated during the Round. The results for the chemicals sector are the opposite, with reductions to the harmonized levels representing a relatively more shallow decline versus other products, though this result is not significant for all data subsets. Finally, the results for the textiles sector are most interesting because they lack significance and consistency. One would expect that a sector so often regarded as strongly protected would show significantly lower tariff cuts, but that result is not clear here. Disregarding the OLS estimates, both positive and negative significant coefficients are present, depending on the form of ROO index used. This could indicate some co-linearity between the textiles sector and ROOs not controlled for by chapter or other control variables, which is possible given that textiles and apparel products have among the most restrictive NAFTA ROOs.

3.5 Conclusion

This essay outlines a theoretic basis by which ROOs may have an effect on external tariff rates. While general protectionist motivations may induce both restrictive ROOs and high external tariffs, the former may have an additional effect on the latter by providing an inter-sector connection by requiring specific levels of domestic inputs. Analysis of NAFTA ROOs and U.S. tariff reductions in the Uruguay Round provides empirical evidence of such an effect. Products that were both imported from (future) NAFTA partners and subject to more restrictive ROOs experienced smaller MFN tariff reductions. This result is important, as it indicates that the simple presence of preferential tariff access does not have a uniform effect on external tariffs. The details of such access, and particularly the ROOs that govern it, are also significant in determining the extent to which external tariffs are maintained. By implication, the more restrictive a preferential trade agreement's ROOs, the more it can hinder multilateral liberalization.

Chapter 4: Impact of Rules of Origin, U.S. Unilateral Preferences vs. Free Trade Agreements

4.1 Introduction

The effect of rules of origin (ROOs) on trade flows has been an issue central to both the academic and policy examination of ROOs in preferential arrangements. The ability of ROOs, by imposing additional production costs, to negate much of the benefit to preferential tariff access has great importance for the examination of the effects of preferential arrangements in general. Given the large proliferation of such agreements, the importance of analyzing when and how ROOs are protectionist is only increasing.

The existing literature has theoretically established that ROOs can act to deter preferential trade, and empirical studies have generally borne this result out. Much of the empirical testing of ROOs' protectionist effect has been based upon examinations of NAFTA or EU preference programs, and been cross-sectional in nature, examining trade or utilization across different products vis-à-vis ROOs in a single year. Even in those parts of the literature that utilize cross-temporal analysis, trade effects are typically studied only within the same preferential regime.[24] This is not surprising, given that ROOs typically do not change over the lifetime of the preferential arrangement, as opposed to tariffs, which can be progressively liberalized. As such, estimations of the

[24] Exceptions include Augier et al (2004, 2005), who study the effects of broadening PANEURO cumulation provisions; and Estevadeordal and Miller (2002), who identify decreases in preferential utilization rates of sectors in which U.S.-Canada FTA to NAFTA ROOs became more strict.

effect of ROOs restrictiveness on trade have typically been derived from variation in the types of ROOs assigned across products.

In this essay, I provide a slightly different analysis by examining how changes in the type of ROO applied to products affects preferential trade. This methodology takes advantage of the fact that certain countries transitioned from one ROO regime to another as they graduated from unilateral U.S. preferences to full free trade agreement (FTA) partners. The United States has concluded a series of FTAs with countries that were previously eligible for unilateral preference programs. The ROOs across the unilateral and FTA preference regimes are distinct – U.S. unilateral preferences maintain a 35 percent value content ROO on nearly all products,[25] while the majority of U.S. FTAs incorporate product-specific ROOs that include tariff shift, value content, technical requirements, and combinations thereof. Additionally, recipient countries of U.S. unilateral preferences lose eligibility for these programs upon implementation of their FTA with the United States.[26] This ensures that producers in FTA partners do not have the option of choosing between preferential regimes and their applicable ROOs. Using such scenarios as the subject of investigation contributes to our understanding of the function of ROOs on preferential trade in two main ways.

[25] The exceptions are primarily apparel products. For those unilateral preferences that do provide for tariff benefits in apparel, some type of technical ROO must be met.

[26] Israel and Jordan are exceptions, as their eligibility for U.S. Generalized System of Preferences continues in parallel to their respective FTA preferences.

First, analyzing changes from U.S. unilateral preferences to FTAs provides a convenient means to examine the effects of ROOs on trade generally. This ROO regime switch isolates changes in ostensible ROO restrictiveness as applied to the same product, thereby better controlling for product heterogeneity. Additionally, while U.S. preferential tariffs provided through unilateral programs are most commonly zero, these preferential rates were generally not raised or otherwise adjusted when countries graduated to full FTA partners. Thus, the U.S. preference regime faced by these countries on applicable products changed with respect to ROOs, but was identical with respect to tariffs. As a result, studying ROOs under this scenario allows for a somewhat more precise analysis of the effect of ROO restrictiveness on preferential trade than is present in previous literature.

Secondly, such analysis is useful for development purposes in terms of examining the role of ROOs in determining benefits and costs to producers in U.S. preference recipients when they transition their benefit regime to an FTA from unilateral preference programs. Since tariff preferences under both regimes are identical, there may be the presumption that such a switch is neutral with respect to preferential access for products covered by both regimes. If the result found in previous literature that more restrictive ROOs can hinder or retard preferential trade holds true in the case of preference transitions, then that this would not be the case. Changing ROO requirements may adjust production costs, which in turn affects the beneficiary producer's ability to profitably qualify for the regime at all. Given that ROOs in most U.S. FTAs are product-specific, we can assess at a product and aggregate level whether the change to FTA ROOs were to the producers' benefit. I analyze a few statistics informative as to the producers' benefits from the preference regime, namely growth in preferential trade and program utilization, and the level of producers' prices when controlling for the different ROOs regimes.

The essay is organized in the following manner. Section 4.2 summarizes the relevant literature. Section 4.3 outlines the scope, market access provisions, and origin requirements for U.S. unilateral preference programs and FTAs. Section 4.4 details the econometric strategy and results of the examination of the changing ROO regimes on trade and utilization. Section 4.5 complements this with an empirical examination of changes in producer prices under the divergent regimes. Section 4.6 concludes.

4.2 Literature

Literature on the theoretical and empirical effect of ROOs on preferential trade and utilization is summarized in Chapter 2. The general conclusion has been to confirm that restrictive ROOs significantly act to retard preferential trade flows. Much of this literature has focused on cross-sectional studies.

Cadot et al (2005b) represents the only literature that examines of the impact of ROOs on the division of RTA rents in a systematic way. The authors focus on the textile and apparel sector under NAFTA, and examine the relative pass-through of tariff rents between U.S. upstream and Mexican downstream producers. Their results indicate that when controlling for NAFTA ROOs, the rents obtained by Mexican producers drop dramatically, while those of U.S. producers increase. In this manner, ROOs serve to divert the benefits of tariff preference. More broadly, questions of tariff pass-through under preferential programs have been studied by Özden and Sharma (2006) and Olarreaga and Özden (2005), who examine preferential apparel exports to the United States under the CBI and the AGOA, respectively. Both papers found that preference beneficiaries' ability to capture the tariff preferences associated with textile and apparel exports was less than complete, with Özden and Sharma finding that CBI beneficiaries captured approximately two-thirds of the preferential tariff margin and Olarreaga and Özden estimating that AGOA beneficiaries captured roughly two-fifths. In both analyses, there is significant variation across individual countries within the sample.

4.3 Overview of ROOs and Tariff Preferences in Unilateral U.S. Programs and FTAs

The two main U.S. trade policy devices that incorporate both tariff preferences and ROOs are unilateral preferential regimes and FTAs. While both have the same effect in terms of providing a preferential tariff rate to qualifying partner imports, they differ in terms of scope of products covered, implementation of tariff reductions, and most importantly for my analysis, the specific requirements by which an import qualifies for such preferences. In this section, I provide an overview of these two preferential regimes as implemented by the United States, and how their comparison may provide additional insight into the effects of ROOs on trade and utilization.

4.3.1 Unilateral U.S. Preference Programs:

The fundamental U.S. unilateral preference program is the Generalized System of Preferences (GSP). GSP provides duty-free access to the United States on a substantial portion of the United States' dutiable tariff schedule, and is available to most developed countries. The program was initiated by the Trade Act of 1974, and began in 1976. It is not permanent, and has periodically lapsed and been renewed since its inception.

There are two broad levels of country and product eligibility in the GSP program. Standard GSP provides for preferential treatment on over 3,400 U.S. 8-digit tariff lines that would otherwise be subject to *ad valorem* tariffs ranging from less than 1 percent to nearly 30 percent. The program covers roughly half of dutiable U.S. tariff lines, though it continues to exclude some agricultural and chemical products, most textiles and apparel products, many glass and metal products, video equipment, motor vehicles and bicycles, watches, footwear, luggage, and other leather items. There is also an enhanced GSP version that provides for duty-free treatment on an additional 1,400 tariff lines for least-developed[27] beneficiary countries. The additional products covered by this program include some additional agricultural items, most remaining chemicals, glass and metal products, video equipment, and motor vehicles.[28]

[27] As defined in the annual U.S. tariff schedules, but generally following the UN list of least-developed countries.

[28] U.S. Generalized System of Preferences Guidebook

While GSP applies to a broad list of developing countries, including nearly all those with whom the United States has subsequently signed an FTA, countries are not necessarily eligible for every product subject to the standard GSP program. For a product or products in which a country is deemed competitive, it may be excluded from preferential treatment. Countries' competitiveness is determined on a product-specific basis and depends upon either the absolute value or import share of their exports to the United States. These exceptions to GSP preferences are most commonly applied to the more advanced developing countries (e.g. Brazil, India, Indonesia, etc.). For countries with which the United States has signed FTAs, only a small group of products were excluded from recipients' eligibility.[29]

Beyond GSP, the United States also maintains several other regionally-focused unilateral preference programs. One major one is the Caribbean Basin Initiative (CBI), which provides preferential treatment to many products from Caribbean countries and territories. CBI began initially through the Caribbean Basin Economic Recovery Act (CBERA) in 1983. CBERA provides preferential tariff access to the United States on some 5,400 8-digit tariff lines. Product coverage in CBERA is broader than standard GSP and similar in scope to GSP for least-developed countries.[30] CBERA primarily excludes many textile and apparel products as well as several dairy, confectionary, and other agricultural products. While there is considerable overlap between GSP and

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[29] Excluded products included some agriculture products, precious metals, and copper from Chile; some agriculture, chemical, leather, textile, metal, and electrical products from CAFTA-DR countries, most commonly the Dominican Republic.

[30] Over a third of the U.S. schedule is duty-free on an MFN basis. Of the dutiable lines, 50 percent are covered by the GSP (standard, not LDC-specific), and 80 percent are covered by CBERA.

CBERA in terms of product coverage, one notable difference between the programs is that CBERA was made permanent in 1990, whereas GSP is a temporary program that requires periodic renewal.

CBI was further expanded in 2000 under the U.S.-Caribbean Basin Trade Partnership Act (CBTPA). CBTPA expands preferential treatment to cover all products, and was intended to provide preferences to Caribbean beneficiary countries commensurate with Mexico's NAFTA preferences. Thus, under CBTPA, CBI now included products excluded from CBERA (and usually GSP), most particularly textiles and apparel items. Unlike CBERA, CBTPA is temporary, lasting until 2020. Additionally, while the list of eligible countries differs between CBERA and CBTPA, all countries with which the United States has signed FTAs were eligible for both. Finally, the ROOs between the two components of CBI differ, with CBERA-eligible products requiring a 35 percent value content rule, and CBTPA ROOs requiring compliance with the applicable NAFTA product-specific ROOs.

Beyond GSP and CBI, other U.S. preference programs include the Andean Trade Partnership Act (ATPA), Andean Trade Promotion and Drug Eradication Act (ATPDEA), and the African Growth and Opportunity Act (AGOA). As their names suggest, they are also regionally-focused programs that provide for duty-free treatment to selected products from eligible countries. Like CBI, these programs also supplement GSP for most recipients, and cover an expanded list of products. These programs are also temporary, and must be periodically renewed by Congress. While the ROO for most products under the programs is a simple 35 percent value content, the textile and apparel provisions under ATPDEA and AGOA require that more detailed and rigorous ROOs, similar to those in NAFTA, be satisfied.

Table 4.1: U.S. Unilateral Preference Programs

Program	Scope	Dates in Effect	Rule of Origin Type
GSP/GSP+	129 developing countries globally. Least developing countries for GSP+	1976-2013	35% Value content
CBI (CBERA/CBTPA)	18 Caribbean developing countries (8 for CBTPA)	CBERA: 1983-present CBTPA: 2000-2020	35% Value content for most goods, specific transformation rules for CBTPA apparel goods
ATPA/ATPDEA	4 Andean countries (Bolivia*, Colombia, Ecuador, and Peru).	ATPA: 1991-2013 ATPDEA: 2002-2013	35% Value content for most goods, specific transformation rules for ATPDEA apparel goods
AGOA	37 sub-Saharan African developing countries	2000-2015	35% Value content for most goods, variable percentages and caps for apparel goods

*Bolivia was suspended from the ATPA program in July 2009.

4.3.2 U.S. FTAs:

The United States has entered into FTAs with seventeen countries. Many of these FTA partners are relatively smaller developing countries, though a few are developed countries. While a handful of these FTAs began prior to 2000, most notably NAFTA, a large majority of the agreements were negotiated relatively recently. Given the nature of many U.S. FTA partners as developing countries, many of these partners were previously eligible for one or more U.S. unilateral preference programs, though the few developed partners were not. U.S. FTAs typically include disciplines on multiple facets of trade, including market access in goods and services, government procurement, investment, electronic commerce, intellectual property, standards, and dispute settlement. In terms of market access, these agreements eliminate tariffs on virtually all products, mostly within ten years. There is some differentiation in terms of how ROOs are structured across agreements, however, with at least two fairly distinct models that loosely follow a regional orientation. Within these models, the overall modality of ROOs and tariff elimination is fairly consistent, but there is some difference in speed of market access provided. Below I provide a survey of these modalities and the FTAs to which they apply.

The first model of U.S. FTAs can be characterized as the Americas model. These FTAs typically follow the structure of the U.S.-Canadian FTA and its successor, NAFTA. Unsurprisingly, the FTAs that follow this model include all of those that the United States has signed with countries in North and South America, but several FTAs that the United States has signed with Asian countries could also be grouped in this model. Specific agreements included are the U.S.-Canada FTA and NAFTA itself, the U.S.-Australia FTA, the U.S.-Chile FTA, Dominican Republic-Central American FTA (DR-CAFTA, which includes Costa Rica, El Salvador, the Dominican Republic, Guatemala, Honduras, and Nicaragua), the U.S.-Peru TPA, and the U.S.-Singapore FTA. Aside from the U.S.-Canada FTA and NAFTA, which became effective in 1992 and 1994, respectively, all of these FTAs entered into force after the year 2000. The U.S. FTA with Australia entered into force on January 1, 2005; with Chile on January 1, 2004; the Dominican Republic on March 1, 2007; El Salvador on March 1, 2006; Guatemala on July 1, 2006; Honduras on April 1, 2006; and Nicaragua on April 1, 2006.

In terms of what distinguishes market access in these FTAs from others, the widespread use of product-specific tariff shift ROOs are the most salient features for the purposes of my analysis. ROOs in these FTAs are typically specified at the 4- or 6-digit level of the Harmonized System, though they can be even more specific for particular products. This differs from more uniform ROO regimes in which a single ROO applies to all or most products. Additionally, the ROOs in these FTAs make use of tariff shift as the most common mechanism by which to confer origin. Tariff classification changes at the chapter, heading, and subheading level are the primary origin requirements in all of these agreements, though the proportion of each differs across agreements. It should be noted, however, that while tariff shift constitutes the majority type of ROO applied and is used most prolifically in this set of FTAs, value content and technical ROOs are also applied, often in conjunction with tariff shift ROOs and often to specific product groups such as chemicals, textiles, apparel, and motor vehicles.

The second general modality of U.S. FTAs could be designated the Middle East model. Most U.S. FTAs with countries in the Middle East and North Africa are part of this group. This includes agreements with Bahrain, Israel, Jordan, Morocco, and Oman. Most of these FTAs are also rather recent, as the Bahrain FTA entered into force in August, 2006; Jordan in December, 2001; Morocco in January, 2006; and Oman most recently in January, 2009. However, the U.S.-Israel FTA is the oldest to which the United States is party, being signed in 1985. The distinguishing characteristic of this group of agreements is that their ROOs regimes generally follow the model of GSP and other U.S. preference programs in applying a 35 percent value content rule. This ROO is applied uniformly to all goods for several of these agreements, and is broadly used for the others; more recent agreements such as Bahrain, Morocco, and Oman include product-specific ROOs only for textiles and apparels and a small number of agriculture and manufactured goods. The ROOs applied to these subsets of goods are mostly tariff shift at various levels of the Harmonized System, or requirements for specific technical change in apparel products.

4.3.3 Transition

In this analysis, I use the experience of certain U.S. FTA partners to better examine the effects of ROOs. Of those countries that have recently entered into an FTA with the United States, all but Australia and Singapore were eligible for at least one unilateral preference program prior to the agreement. As mentioned earlier, when the United States implements an FTA with a preference-eligible partner, it simultaneously removes that country from unilateral preference programs. As such, the country can no longer claim duty-free treatment under any of the unilateral programs for its exports, and FTA preferences are the only option available to it other than general MFN. In theory, this could result in a temporary increase in the preferential tariff charged to these countries, as FTA tariff elimination is negotiated separately. However, as a practical matter, the United States has typically provided immediate duty-free treatment under the FTA to those products that were previously eligible for such treatment via a unilateral program. Complementarily, the ROOs applicable to unilateral preferences no longer apply once the

FTA has entered into effect,[31] and the negotiated FTA rules now govern product qualification. While the preferential tariff rate is generally similar between the unilateral and FTA regimes, FTA ROOs display greater variance from the generally uniform ROOs in most U.S. unilateral preferential regimes.[32] I apply both the h- and adjusted r-index[33] to both the unilateral preference and FTA ROOs applicable to those products eligible for unilateral programs.[34] Recalling that the level of ROOs restrictiveness increases as the indices' value increases, a comparison of the two regimes indicates that the average level of restrictiveness increased in the transition to the FTA according to both indices, though less so according to the r-index. Both indices also indicate that the level of variation in FTA ROOs were higher than under the unilateral programs. The difference between the averages for the two indices rests largely with the h-index's accounting of exceptions, which U.S. product-specific ROO regimes make more frequent use of. Thus, the increase in the level of the h-index is greater for those agreements that follow the 'North American' model of U.S. FTA, Chile and DR-CAFTA. The ROOs in these two agreements also display more variation, which is not surprising since one of their distinguishing characteristics is more widespread use of product-specific ROOs. Table 4.2 illustrates this.

[31] Jordan is an exception, as it maintains GSP eligibility despite having an FTA with the United States.

[32] An exception is some textile and apparel ROOs under CBTPA, AGOA, and ATPDEA, which bear some similarity to those of NAFTA and other FTAs.

[33] Recall that both indices serve as proxies for ROO restrictiveness, with higher values representing more restrictive ROOs.

[34] FTA ROOs apply to the entire universe of products covered by the FTA, which is broader than the scope of products covered by unilateral programs. However, in order to identify only the differences in restrictiveness between the two, this comparison relates only to the subset of products that the respective FTA partners were eligible for under unilateral programs.

Table 4.2: Comparison of unilateral and FTA ROO restrictiveness, h-index/r-index[35]

Agreement / Country	Unilateral Regime		FTA Regime	
	Mean	Standard Deviation	Mean	Standard Deviation
Bahrain	5.00/4.00	0/0	5.39/4.07	2.46/0.43
Chile	5.00/4.00	0/0	7.16/4.22	3.74/1.55
DR-CAFTA	7.19/4.31	6.40/0.92	9.48/4.54	7.07/1.85
Morocco	5.00/4.00	0/0	5.56/4.12	2.71/0.61

Source: Author's calculations based on FTA text and U.S. 2008 HTS

It is thus the case that the ostensible burden imposed by the ROOs is adjusted, for those products eligible for unilateral programs, when the country's FTA with the United States enters into force. Given that preferential tariffs (typically) do not change, this shift in ROOs restrictiveness is the only substantive change to exporters' preference regime.

4.4 Examination of Trade and Utilization under Unilateral Preference and FTA ROOs

As mentioned, the transition of beneficiary countries from unilateral to FTA preferences affords a relatively more controlled environment from which to empirically examine the effect of ROOs. Most previous literature has not examined these transitions explicitly, and therefore may have been less able to control for product heterogeneity. Since the same type of ROO may have practically different effects depending on the nature of the product to which it is applied, examining whether trade and utilization is affected by more restrictive ROOs is better analyzed by looking at the effects of changes in ROOs rather than simply differences in ROOs across products. To conduct such an analysis, I

[35] The products used to calculate the figures in Table 4.2 include only those that were eligible for unilateral preferences, excluding those products eligible for preferential treatment only under the FTA.

empirically estimate the response on preferential import flows into the United States and preference utilization of beneficiary countries under both unilateral and FTA ROOs regimes in order to determine whether increases in ROO restrictiveness had a negative impact.

4.4.1 Empirical specification

In my examination of the effects of ROOs on trade, I use difference-in-difference models to determine the direction and significance of the effect of increasing ROOs restrictiveness. I use a multi-dimensional data set in the analysis, with information across multiple products, countries, and years. However, given that the trade flows of interest are of preferential imports, the ostensibly large data set is actually restricted in terms of actual observations. Even when restricting the analysis to only products with a preferential margin (i.e. only eligible products with a positive U.S. MFN tariff), a very high percentage of the data has zero preferential imports. This presents a significant sample selection problem, which I account for using Heckman selection models. The first model examines ROOs' changes on preferential trade values directly, and takes the form:

$$pref\_imp_{int} = \alpha_0 + \alpha_1 fta_{int} + \alpha_2 roo\_stricter_{int} + \alpha_3 fta_{int} * roo\_stricter_{int} + \alpha_4 tariff_{int} + \alpha_5 transport_{int} + \alpha_6 gdp_{nt} + \delta d_j + \varepsilon_{int} \quad (4.1)$$

where the probability that $pref\_imp_{int}$ is observed is modeled according to:

$$\text{Prob}(pref\_imp_{int} > 0) = \beta_0 + \beta_1 fta_{int} + \beta_2 roo\_stricter_{int} + \beta_3 tariff_{int} + \beta_4 transport_{int} \quad (4.2)$$
$$+ \beta_5 gdp_{nt} + \beta_6 exp\_doc_{knt} + \beta_7 exp\_days_{knt} + \beta_8 adj\_rca_{knt} + \beta_9 exp\_doc{*}adj\_rca_{knt}$$
$$+ \beta_{10} exp\_days{*}adj\_rca_{knt} + \mu d_j + e_{int}$$

The dependent variable in this model is the log of annual U.S. preferential imports from recipient countries (*n*), at the 8-digit level of the U.S. tariff schedule (product *i*) between 2001 and 2008 (year *t*). Thus, this model examines whether changes in ROOs affect the absolute level of imports that enter under a preferential regime. This is the variable most tested for its response to ROOs restrictiveness, and cross-section examinations have generally borne out that it is affected by the level and type of ROOs.

I also estimate a model similar in structure, but measuring preference utilization[36] rather than simple magnitude of imports, a different realization of preference usage. I include this formulation in order to investigate more specifically the impact of ROOs on the actual use of preferences relative to their potential. The examination of utilization rates is somewhat more focused on the impact of ROOs, as any rate less than 100 percent means that trade occurred, but either did not claim preference or was not eligible for it. While there may be other reasons for this, an inability or unwillingness to meet the ROO is a strong possibility. Thus, the dependent variable in this second model represents the annual log share of total imports from the recipient country that was imported under a

[36] I calculate preference utilization as the ratio of the value of U.S. imports from country *n* of product *i* that entered the United States under a preference program (unilateral or FTA), divided by total imports from that country and product, in year *t*. Thus,utilization is defined as: *pref_util* = *pref_imp* / *total_imp*, where *total_imp* is total U.S. imports from the applicable country, product, and year.

preferential (unilateral or FTA) regime, at the 8-digit level of the U.S. tariff schedule. For descriptive purposes, calculations of average preference utilization rates across the countries analyzed, by HS section, are listed in Appendix 4. As indicated, utilization rates for the applicable beneficiaries ranges from 50 to nearly 100 percent, depending on the industry.

$$pref\_util_{int} = \alpha_0 + \alpha_1 fta_{int} + \alpha_2 roo\_stricter_{int} + \alpha_3 fta_{int} * roo\_stricter_{int} + \alpha_4 tariff_{int} + \alpha_5 transport_{int} + \alpha_6 gdp_{nt} + \alpha_7 pop_{nt} + \delta d_j + \varepsilon_{int} \quad (4.3)$$

with the selection model:

$$\text{Prob}(pref\_util_{int} > 0) = \beta_0 + \beta_1 fta_{int} + \beta_2 roo\_stricter_{int} + \beta_3 tariff_{int} + \beta_4 transport_{int} + \beta_5 gdp_{nt} + \beta_6 exp\_doc_{knt} + \beta_7 exp\_days_{knt} + \beta_8 adj\_rca_{knt} + \beta_9 exp\_doc*adj\_rca_{knt} + \beta_{10} exp\_days*adj\_rca_{knt} + \mu d_j + e_{int} \quad (4.4)$$

Two indicator variables, fta_{int} and $roo\_stricter_{int}$, are used to identify the relevant origin regime effects in both models. The variable fta_{int} equals 1 after the FTA entered into force, and 0 prior to the FTA. The variable $roo\_stricter_{int}$ identifies products for which the applicable ROO was more restrictive under the FTA than under unilateral preferences, based upon comparison of the ROOs' relative h- and r-index values of restrictiveness. The variable equals 1 if the FTA rule is more restrictive, and 0 if not. The interaction of these variables in the two models yields the difference-in-differences

operator. The coefficient of this operator, α_3, will be negative if the increase in ROO restrictiveness had a dampening effect on preferential trade and/or utilization.
As an alternate method of evaluating the change in ROO restrictiveness, I also take the simple difference between the h- and r-index values of the FTA and unilateral preference regimes. This value, called *roo_diff*, is substituted in for the bimodal ROO restrictiveness indicator (*roo_stricter*). This specification provides for a more continuous measure of the change in ROO restrictiveness, according to the indices.

The applicable U.S. preferential tariff margin, $tariff_{int}$, to the partner country's exports is included to control for obvious changes in import barriers as well as the tariff incentive to seek preferences. For most products in this analysis, this will equal the U.S. MFN tariff, as unilateral programs typically eliminate the applicable MFN tariff, and this level of preferences is generally continued under the FTA tariff elimination schedules. Thus, this variable will be time-invariant for many products that received preferential treatment prior to the FTA, as the preferential margin is not changing between regimes. However, some variation does exist. For the most part, this variation comes from changing U.S. MFN tariff rates in the early years of the data set, as these rates were still phasing down to their final Uruguay Round bound rates for some products. Alternatively, the unilateral preferential rate for some CBI-eligible products is a discounted, rather than duty-free, rate. Adjustments to this rate, either within the unilateral program or in the conversion from unilateral to FTA, would also result in some time variation in a product's preferential margin.

Transportation costs (*$transport_{int}$*) are represented by the ratio of the value of import charges per dollar of customs value, of total U.S. imports from the world. Import charges include the cost of freight and all other charges except U.S. tariff rates (i.e. are the difference between the C.I.F. and F.O.B. import values). I divide the cumulative import charge value for each 8-digit tariff line by the total (as opposed to preferential) U.S. imports from the world in that tariff line and year, in order to ensure that high import charges do not simply reflect high import values. This data is time-variant and product-specific. Its coefficient is expected to be negative, as increased costs associated with transportation should act to decrease preferential trade.

I include the logs of partner countries' per-capita GDP to control for general motivators of trade. Since I am measuring only U.S. imports from these countries, rather than a full set of bilateral trade flows in which both the sender and recipient vary, U.S. per-capita GDP are not included. This variable is calculated as the log of the division of annual country GDP by annual country population, data for which comes from the World Bank's World Development Index.

As additional controls in the selection model, I include three variables, exp_docs_{knt}, exp_days_{knt}, and adj_rca_{knt}, as well as their interaction. These reflect measures of the number of documents and number of days required to export from the recipient countries, as well as the countries' global revealed comparative advantage (RCA) values. In order to correct for selection bias in countries' preferential exports to the United States, these variable should inform the countries' propensity to export preferentially to the United

States. Measures for the number of documents and days to export, which vary by year,[37] control for the general export environment in the preference-receiving countries. This data is sourced from the World Bank's World Development Indicators. The countries' global RCA values for each HS 6-digit subheading k[38] indicate the country's relative competitiveness in a specific product, thereby providing some product-level detail to the instrumental variables. The RCAs represented countries' export intensity to world export intensity, for each product and year, and were calculated according to:

$$RCA_{int} = \frac{country\ n\ exports\ to\ the\ world\ of\ product\ i / total\ country\ n\ exports\ to\ the\ world}{world\ exports\ to\ the\ world\ of\ product\ i / total\ world\ exports\ to\ the\ world}$$

World and country exports data used to construct the RCAs are sourced from the UN's COMTRADE database.

A greater number of documents and/or days to export would be indicative of obstacles to export to the U.S., while higher RCA values should increase that propensity. In order to make the interaction of these variables more intuitive, I create an adjusted RCA variable by dividing one by the RCA value plus one. Thus, HS 6-digit product categories with greater RCA values (more competitive) have lower adjusted values, while categories with no exports have an adjusted value of one. The interactions of this adjusted export value

[37] Data for neither variable is complete for all years and countries. Data from the most recent year in which it was available for the applicable country is substituted for missing values.

[38] Since I cannot measure countries' exports using the U.S. 8-digit product codes, I utilize 6-digit subheading exports, as that is the most detailed level at which trade data is harmonized internationally.

times the number of documents and number of days to export, should therefore be inversely related to the propensity to export to the United States.

Finally, I use a set of dummy variables, d_j, to control for industry, country, and year effects. The set includes indicator variables for chapters of the Harmonized System as well as for each of the eight countries, and the years 2001 through 2008.

4.4.2 Data

I choose U.S. preferential imports as the subject of my analysis due to the multiple aforementioned instances of transitions between unilateral and FTA ROOs and data availability. Additionally, the United States has fairly broad unilateral preference regimes that provide a robust set of products from which to construct the data set. Also, as mentioned, U.S. FTAs tend to utilize product specific ROOs, which provide the variation necessary to examine their effect on preferential trade and utilization.

I do not include all 8-digit tariff lines in the analysis. Products that were not eligible under the unilateral preferences extended from the United States to the examined countries were excluded. This includes all products in which the United States provides duty-free treatment on an MFN basis during the examined time period.[39] Given that there are no preferential margins possible for such products and their treatment under U.S.

[39] Given that some U.S. MFN tariffs were still phasing down as a result of Uruguay Round commitments, some products are duty-free only for certain years in the data. I eliminate these products from the data set completely, as they are not eligible for preferential treatment throughout the time period examined.

FTAs merely enshrines their MFN duty-free status, such products are not relevant to my analysis. Additionally, as mentioned, the different unilateral preference programs vary in the scope of their product coverage, and so exclude a number of products with positive MFN tariffs. Similarly excluding these products from my analysis is necessary in order to compare actual preferential usage before and after the FTA. However, this has the effect of varying the product coverage by country, with Bahrain, Chile, and Morocco having fewer product observations. Finally, those U.S. tariffs that have no *ad valorem* component are also dropped from the analysis, since specific tariffs are not comparable across products. For those products with compound (both *ad valorem* and unit value) tariffs, only the *ad valorem* component is utilized.

The identification of products eligible under the unilateral programs is generally straightforward, as products' eligibility is often specified unambiguously in the U.S. tariff schedule. However, capturing the apparel preferences within CBTPA is somewhat more complicated, as product eligibility is not comprehensively specified by HS number, but by product descriptions. However, certain HS categories, most significantly chapters 61 and 62 and parts of chapters 64 and 65, are identified as eligible for CBTPA preferences, assuming NAFTA origin requirements are met, under the program's special classification categories. Thus, I denote these products as eligible for duty-free treatment for CBTPA-qualifying countries, subject to the modified ROOs (as opposed to 35 percent value content). I list all other apparel products not otherwise enumerated in the U.S. tariff schedule as ineligible.

The majority of my data are U.S. import statistics from the U.S. International Trade Commission's (USITC) Dataweb database. U.S. 8-digit imports for consumption are available on an annual basis for both general imports and imports entering the United States under a particular preference regime (unilateral program or FTA). This data is used to generate both preferential U.S. imports as well as utilization rates. Measures of import charges and U.S. tariff rates also come from Dataweb. I use imports for consumption, as opposed to general imports, in order to avoid including any transshipment data.

The data used in the analysis include trade and tariff values from years 2001 to 2008 applicable to the Dominican Republic, El Salvador, Guatemala, Honduras, and Nicaragua (DR-CAFTA countries); as well as Bahrain, Chile, and Morocco. These countries represent post-NAFTA U.S. FTA partners whose agreements have entered into force, and for which there is at least one year of trade data available (other than 2009[40]) under FTA preferences.[41] All the countries except Nicaragua were eligible for GSP preferences prior to their FTAs, and all DR-CAFTA countries were eligible for CBI (CBERA and CBTPA) benefits.

The exact timing of the entrance into force of the various FTAs is a complicating factor. Data for countries whose FTAs with the United States became effective at the turn of the

[40] I do not utilize 2009 import data given the widespread trade adjustments in that year due to the U.S. recession and general global slowdown.

[41] The U.S.-Bahrain FTA entered into force on January 11, 2006; Chile on January 1, 2004; the Dominican Republic on March 1, 2007; El Salvador on March 1, 2006; Guatemala on July 1, 2006; Honduras on April 1, 2006; Morocco on January 1, 2006; and Nicaragua on April 1, 2006.

year is clearly delineated into that which was eligible under the unilateral program, and that which was eligible under the FTA. However, for DR-CAFTA countries, their FTA became effective at least a few months into the year. This complicates the data set, as annual data can no longer be assigned only to one regime or the other. I therefore delete countries' data for the year in which their FTA entered into force, if it did so after January. Thus, 2006 data for El Salvador, Guatemala, Honduras, and Nicaragua is removed from the data set, as is 2007 data for the Dominican Republic.

Data used in constructing the h-index measurements of ROO restrictiveness for products under each preference regime was sourced directly from the preference program description or text of the agreements themselves. For unilateral preferences with the uniform 35 percent value content, single index values were used for all subject products. For data corresponding to ROOs under U.S. FTAs with Chile and the DR-CAFTA countries, the ROOs required for preferential treatment were product specific. The U.S.-Bahrain and U.S-Morocco FTAs generally adopt the 35 percent value content ROOs used in GSP. However, both agreements include product-specific exceptions, most particularly in some textile, apparel, and agriculture sectors.

4.4.3 Comparison to previous literature

As an initial examination, I test whether the effect of ROOs on preferential trade in these more recent FTAs conforms to the results found in the previous literature on the impact of NAFTA ROOs (Cadot et al, 2002; Anson et al, 2005; Cadot et al, 2005a). The sample for this analysis is a simple cross section of 2008 U.S. imports under its FTAs with Bahrain, Chile, the Dominican Republic, El Salvador, Guatemala, Honduras, Morocco, and Nicaragua. It is these countries' transition from unilateral preference to FTA that I will examine later in the essay, but identifying the simple impact of the FTA ROOs themselves will provide a useful comparison to similar estimates in previous literature. The model used is similar to the one highlighted above, though applied as a simple cross-sectional analysis: regressing preferential imports on tariff preferences, the level of ROOs restrictiveness, import charge per dollar shipped, GDP per-capita, and country- and industry-level control variables using OLS with robust standard errors.

Table 4.3: Relationship of ROOs restrictiveness on U.S. preferential imports under FTAs, 2008

	expected sign	(1)	(2)
constant		7.74**	7.07**
		(2.15)	(2.12)
tariff	(+)	6.61**	6.78**
		(1.07)	(1.07)
r_index	(-)	-0.21**	
		(0.07)	
h_index	(-)		-0.07**
			(0.02)
gdp	(+)	0.46**	0.46**
		(0.12)	(0.12)
transport	(-)	-4.70**	-5.00**
		(1.76)	(1.75)
chapter indicators		yes	yes
country indicators		yes	yes
Observations		2,397	2,397
R-squared		0.15	0.15

Standard errors in parentheses
* Significant at 5%
** Significant at 1%

As can be seen in Table 4.3, the results are similar to those obtained by other such analyses in the literature. The coefficients for the level of ROO restrictiveness are negative and significant, indicating that products subject to more restrictive ROOs generally have lower import values. The magnitudes of the coefficients on the two indices are also logical. Given the less granular ranking of ROO restrictiveness provided by the r-index, we'd expect it to have a larger absolute coefficient value; an increase in the index by one presumably represents a greater increase in restrictiveness than a unit increase in the h-index. Results for the tariff margin, country per-capita GDP, and transportation costs also all conform to expectations. These results give some confidence that the standard interpretation of ROOs' effect as a deterrent to preferential trade is applicable to these more recent FTA ROOs.

4.4.4 Caveats

A few caveats to this analysis of the impact of ROOs on preferential trade and utilization are worth mentioning. The first is that it focuses only on the direct border measures governing preferential trade between the two countries. The FTAs under consideration in this analysis incorporate broader trade liberalization in both services and goods, as well as commitments in investment, customs procedures, standards, government procurement, labor, environment, etc. These broader and more indirect FTA effects were not present, or were not present in the same form, under unilateral preferences, and may also play a role in any changes in trade flows. These effects are controlled for generally by simple indicator variables for the presence of an FTA, but any variation beyond that would be unaccounted for.

Additionally, I do not control for changes in the recipient countries' preferential export regime to other countries. Thus, if there were changes to the countries' preferential trade regime beyond its relationship with the United States -- the initiation of an FTA with another country, for instance -- then that is included in my model only through its effects on the country's exports to the United States. While the inclusion of country and industry indicator variables may control for this to some degree, there could be situations whereby growth in exports to other countries in response to policies diverts trade from the United States. Such an effect is more likely to be represented in raw preferential trade flows than utilization rates.

Finally, literature on the determinants of ROOs themselves has found that ROOs, and thus the indices derived from them, are the product of trade flows.[42] In the case of my model, this distortion is mitigated by the fact that trade flows are measured at the 8-digit HS level of specificity, while the 6-digit level is generally the most detailed level at which ROOs are specified. Additionally, the focus of the analysis on the impact of the change in the level of ROOs' restrictiveness creates additional separation. Nevertheless, some bias is likely to be present as a result.

4.4.5 Results

The results of the model regressions are mixed with respect to determining whether the tightening of origin requirements via the transition from unilateral to FTA preferences

[42] Estevadeordal (2000), Harris (2007)

had a negative effect on recipient countries' preferential trade and utilization. More specifically, increases in ROO restrictiveness did not appear to hinder preferential trade generally, but they did negatively impact preference utilization. In general, this outcome is supportive of the conventional theory that ROOs can act as barriers to preferential trade, and thus their use as protectionist devices.

The results for the model as estimated on preferential trade flows are detailed in Table 4.4. Estimations are run on the data examining the change in ROO restrictiveness both as a simple treatment effect for when the rule became more restrictive (columns 1-4) as well as by examining the ROO change as the difference in the indices' values across regimes (columns 5-8). While the former set of regressions is useful to examine simply whether increases in ROO restrictiveness matter, the latter set better captures whether the degree of increase is also a factor.

The model is first estimated using simple pooled OLS. While the size of the panel data set makes intensive statistical methods computationally difficult, these estimates use robust standard errors to control for the presence of heteroskedasticity, as confirmed by the Breusch-Pagan/Cook-Weisberg test. However, given the large number of observations with zero preferential imports, these estimates contain selection bias. The model is then estimated using the Heckman sample selection technique as previously specified. The results of the first stage selection model for the Heckman specifications are listed in Appendix 5.

Table 4.4: Effect of Changing ROOs Restrictiveness on U.S. Preferential Imports

	expected sign	OLS (1)	Heckman (2)	OLS (3)	Heckman (4)	OLS (5)	Heckman (6)	OLS (7)	Heckman (8)
constant		-8.03	-13.84	-6.50	-11.81	-8.37	-14.54	-7.87	-13.47
		(7.52)	(7.82)	(7.52)	(7.83)	(7.54)	(7.83)	(7.52)	(7.82)
tariff	(+)	7.15**	3.01**	6.99**	3.10**	7.13**	3.03**	7.24**	2.98**
		(0.45)	(0.43)	(0.45)	(0.43)	(0.45)	(0.43)	(0.44)	(0.43)
fta	(?)	0.06	0.17	-0.04	0.02	0.12	0.24*	0.12	0.26*
		(0.11)	(0.12)	(0.12)	(0.13)	(0.11)	(0.12)	(0.11)	(0.12)
r_stricter	(?)	-0.47**	0.09						
		(0.08)	(0.09)						
r_stricter*fta	(-)	0.26**	0.33**						
		(0.09)	(0.10)						
h_stricter	(?)			-0.08	-0.07				
				(0.08)	(0.08)				
h_stricter*fta	(-)			0.31**	0.44**				
				(0.09)	(0.09)				
r_diff	(?)					-0.11**	0.01		
						(0.03)	(0.03)		
r_diff*fta	(-)					0.06	0.08*		
						(0.03)	(0.03)		
h_diff	(?)							-0.04**	0.01
								(0.01)	(0.01)
h_diff*fta	(-)							0.01	0.01
								(0.01)	(0.01)
gdp	(+)	2.01*	3.24**	1.82*	3.02**	2.03*	3.31**	1.96*	3.19**
		(0.79)	(0.82)	(0.79)	(0.82)	(0.79)	(0.82)	(0.79)	(0.82)
transport	(-)	-3.70**	-3.76**	-3.65**	-3.70**	-3.61**	-3.72**	-3.71**	-3.82**
		(0.52)	(0.52)	(0.52)	(0.52)	(0.52)	(0.52)	(0.52)	(0.52)
chapter indicators		yes	yes	yes	yes	yes	yes	yes	yes
country indictors		yes	yes	yes	yes	yes	yes	yes	yes
year indicators		yes	yes	yes	yes	yes	yes	yes	yes
Observations		16,602	240,575	16,602	240,575	16,602	240,575	16,602	240,575
R-squared		0.18		0.18		0.18		0.18	

Standard errors in parentheses
* Significant at 5%
** Significant at 1%

The results for the variables of interest, the interaction term of the ROO restrictiveness and FTA variables, are either statistically insignificant or unsupportive of the theory that increasing ROO restrictiveness impedes preferential trade. Examining first the estimates utilizing the simple indicator of whether the ROO become more restrictive or not (columns 1-4), the difference-in-difference estimator is actually positive and significant.

This would indicate that preferential trade actually *increased* for products subject to more restrictive ROOs in the FTA. The relative size of the coefficients is also interesting, as an increase in h-index restrictiveness had a larger effect than the r-index, the opposite of the cross-sectional effect. This is most likely due to the increased probability that a change in the ROO would be represented by a change in the h-index, given its more comprehensive inclusion of aspects of ROOs.[43]

The results of the estimates in columns 5 though 8, in which the difference in indices' values between the unilateral and FTA regimes was used as the treatment variable, show similar results. The coefficients on the interaction variables are again positive across estimations, though now much smaller and statistically insignificant in all cases except column 6. Thus, contrary to the results of the simple cross-sectional examination, increases in the level of ROO restrictiveness do not appear to evidence declines in preferential trade.

Results of the other variables are less surprising. The coefficients of the tariff margin are positive and significant under all specifications. Consistent with expectations, this indicates that preferential trade is greater for products with larger margins of preference, and thus potentially allowing for larger rents to be obtained. The per-dollar cost of transport is strongly negative for all specifications, consistent with its depression of trade. Partner country per-capita GDP is uniformly positive and significant at varying levels.

[43] The higher average h-index values under FTAs versus unilateral programs is consistent with this.

These results are consistent with the theory of cost and per-capita GDP as drivers of trade.

Table 4.5 details the results for the preference utilization model. As with the previous regressions on preferential trade, I estimated the preference utilization model using both an indicator (columns 1-4) and continuous (columns 5-8) measure of change in ROO restrictiveness. I again utilize robust pooled OLS as well as a Heckman sample selection technique to regress the model.

Table 4.5: Effect of Changing ROOs Restrictiveness on U.S. Preferential Utilization

	expected sign	OLS (1)	Heckman (2)	OLS (3)	Heckman (4)	OLS (5)	Heckman (6)	OLS (7)	Heckman (8)
constant		2.99	3.15	2.29	2.44	3.41	3.58	3.11	3.26
		(2.26)	(2.35)	(2.23)	(2.35)	(2.26)	(2.36)	(2.25)	(2.35)
tariff	(+)	0.62**	0.73**	0.62**	0.74**	0.60**	0.71**	0.59**	0.70**
		(0.15)	(0.13)	(0.15)	(0.13)	(0.15)	(0.13)	(0.15)	(0.13)
fta	(?)	-0.03	-0.03	0.05	0.05	-0.04	-0.05	-0.03	-0.03
		(0.03)	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
r_stricter	(?)	0.04*	0.03						
		(0.02)	(0.03)						
r_stricter*fta	(-)	-0.09**	-0.09**						
		(0.02)	(0.03)						
h_stricter	(?)			0.12**	0.12**				
				(0.03)	(0.03)				
h_stricter*fta	(-)			-0.18**	-0.19**				
				(0.03)	(0.03)				
r_diff	(?)					0.03**	0.02**		
						(0.01)	(0.01)		
r_diff*fta	(-)					-0.04**	-0.04**		
						(0.01)	(0.01)		
h_diff	(?)							0.01**	0.01**
								(0.00)	(0.00)
h_diff*fta	(-)							-0.02**	-0.02**
								(0.00)	(0.00)
gdp	(+)	-0.33	-0.36	-0.26	-0.29	-0.37	-0.41	-0.34	-0.37
		(0.24)	(0.25)	(0.24)	(0.25)	(0.24)	(0.25)	(0.24)	(0.25)
transport	(-)	0.18*	0.18	0.15	0.15	0.17*	0.17	0.20*	0.20
		(0.08)	(0.16)	(0.08)	(0.16)	(0.08)	(0.16)	(0.08)	(0.16)
chapter indicators		yes	yes	yes	yes	yes	yes	yes	yes
country indictors		yes	yes	yes	yes	yes	yes	yes	yes
year indicators		yes	yes	yes	yes	yes	yes	yes	yes
Observations		16,602	240,575	16,602	240,575	16,602	240,575	16,602	240,575
R-squared		0.15		0.15		0.15		0.15	

Standard errors in parentheses
* Significant at 5%
** Significant at 1%

With respect to the effect of increases in ROO restrictiveness across different preference regimes, the results uniformly indicate that such increases did negatively impact utilization. This is consistent with the conventional theory, and distinctly different from the previous case on preferential trade. More specifically, the difference-in-differences interaction term is negative and significant under both the pooled OLS and Heckman specifications. This result is robust to the type of ROO measure and index used; both a simple indicator of increased restrictiveness and the actual difference in indices' levels are negative. Thus, this analysis would indicate that while ROO restrictiveness increases may not reduce preferential trade generally, it does reduce it in comparison to non-preferential trade, resulting in a lower level of preference utilization.

The size of the difference-in-differences h-index indicator coefficient is again larger than that of the r-index. However, the coefficients for the interaction terms of the indices' differences are again smaller for the h-index. This may reflect the fact that the range of h-index difference values is much larger than that of the r-index, given its greater upper bound.

The tariff margin continues to have a positive and significant effect in the utilization model, consistent with general theory and the results from the preferential trade model. The gravity control variables exhibit some interesting results. The coefficients for relative transportation costs are positive across the estimations, though significant only for OLS estimates. While costs of transport might be thought of as sunk with respect to the decision or ability to claim preferences, and thus incidental to utilization, a positive effect is puzzling. It could be that utilizing preferences, as opposed to simply exporting, becomes relatively more valuable for trade with high transport costs. Thus, while trade flows are negatively affected by transport costs, trade that does occur is more likely to take advantage of preferential treatment. The results for per-capita GDP are consistently negative, though not significant. This result is curious, as one would think that countries with higher per-capita GDP and likely higher levels of development would better be able to utilize preferential regimes. One explanation might be that such preferential regimes are relatively more important to smaller, less developed countries, as their trade relationships outside of them could be weaker. Thus, larger-country exporters' greater ability to utilize preferences could be balanced by smaller-country exporters' relatively greater incentive to do so.

Overall, these results do provide support for the conventional theory that increasing ROOs restrictiveness hinders the use of preferential regimes, but highlight that this effect is more nuanced than previous literature may suggest. Contrary to results derived from cross-sectional examinations of ROOs and trade, increasing ROOs restrictiveness did not reduce actual preferential trade flows. However, in comparison to other products, total trade flows (including non-preferential flows) increased relatively more for those products in which the level of ROOs restrictiveness increased, leading to a relative decline in preference utilization. Thus, while the conversion from unilateral preference regime to FTA increased U.S. imports from the partner markets generally, increased ROOs restrictiveness limited the relative shares of such trade that qualified for preferential access.

4.4.6 Estimating the effect of ROO regime switching without indices

The results in the previous section present something of a dichotomous outcome, with relative preferential trade flows increasing with increases in the level of ROOs restrictiveness, but relative preferential utilization decreasing with higher levels of ROOs restrictiveness. While the latter result is consistent with theory, the former result gives pause. One possibility is that FTA partner exports to the United States increase more dramatically for products that become subject to more restrictive ROOs, but the ability of those exports to qualify for preference is limited by heightened ROOs requirements. This is a logical explanation, though it raises the question of why products subject to more restrictive ROOs should have relatively higher export growth. One reason for this could be that exporters mis-appreciate whether the ROOs are actually increasing in restrictiveness, which in turn raises the issue of exactly how ROO restrictiveness is measured.

In this analysis, I utilized the h- and r-indices as proxies for ROO restrictiveness. As indicated previously, these indices are based upon a logical extrapolation of the written ROO provisions, but are not empirically derived. Given the previous results, I analyze the impact of changes in the ROO regime by estimating the effects with indicator variables representing each type of ROO requirement change, as opposed to change in the restrictiveness indices. While this empirical strategy lacks the indices' ability to compare restrictiveness across all types of ROOs, it allows for a more direct evaluation of trade and utilization changes in response to specific adjustments to ROOs.

Estimating this adjusted model requires changing the previous models only by adjusting the ROOs restrictiveness change variables ($roo\_stricter_{int}$, roo_diff_{int}) and their interactions with the FTA variable. As outlined below, I supplant this single indicator variable instead with six indicators that signify products for which specific ROOs transitions took place when the country graduated from unilateral preference beneficiary to FTA partner.

Indicator Variable	Description
cc_cs	ROO change from change in chapter to change in subheading
rvc_cc	ROO change from 35% RVC to change in chapter
rvc_ch	ROO change from 35% RVC to change in heading
rvc_cs	ROO change from 35% RVC to change in subheading
rvc_tech	ROO change from 35% RVC to change in tech requirement
rvcl_rvch	ROO change from a relatively lower RVC to a higher RVC

I then individually interact these indicators with the FTA variable to generate difference-in-difference estimators for each type of ROO transition, and estimate the model in the same manner as done previously. I estimate the model on both previously analyzed dependent variables: preferential imports (*pref_imp*) and preference utilization (*pref_util*). Table 4.6 lists the regression results.

Table 4.6: Effect of Specific ROO Transitions on Preferential Imports and Utilization

dependent variable		pref_imp		pref_util	
	expected sign	OLS	Heckman	OLS	Heckman
		(1)	(2)	(3)	(4)
constant		-4.56	-9.17	1.97	2.10
		(7.59)	(7.88)	(2.21)	(2.37)
tariff	(+)	7.30**	2.88**	0.63**	0.76**
		(0.44)	(0.44)	(0.15)	(0.13)
fta	(?)	-0.20	-0.13	0.07	0.07
		(0.14)	(0.14)	(0.04)	(0.04)
cc_cs	(?)	-1.88**	-2.66**	0.44**	0.46*
		(0.48)	(0.77)	(0.12)	(0.22)
rvc_cc	(?)	-0.40*	-0.27	-0.03	-0.04
		(0.20)	(0.20)	(0.07)	(0.06)
rvc_ch	(?)	0.32	-0.11	0.02	0.03
		(0.18)	(0.18)	(0.07)	(0.06)
rvc_cs	(?)	0.19	-0.10	-0.11	-0.10
		(0.19)	(0.20)	(0.07)	(0.06)
rvc_tech	(?)	0.70**	1.04**	0.01	0.00
		(0.13)	(0.14)	(0.03)	(0.04)
rvcl_rvch	(?)	-1.30**	0.22	-0.21	-0.25*
		(0.35)	(0.33)	(0.15)	(0.10)
cc_cs*fta	(+)	0.86	0.94	-0.12	-0.12
		(1.17)	(1.47)	(0.12)	(0.42)
rvc_cc*fta	(-)	0.57**	0.70**	-0.20**	-0.21**
		(0.12)	(0.13)	(0.03)	(0.04)
rvc_ch*fta	(-)	0.42**	0.58**	-0.21**	-0.22**
		(0.12)	(0.12)	(0.03)	(0.04)
rvc_cs*fta	(+)	0.38*	0.28	-0.05	-0.05
		(0.16)	(0.15)	(0.05)	(0.05)
rvc_tech*fta	(-)	-0.28	-0.42*	0.01	0.01
		(0.18)	(0.20)	(0.04)	(0.06)
rvcl_rvch*fta	(-)	-0.73	-0.62	0.45**	0.44**
		(0.54)	(0.50)	(0.17)	(0.16)
gdp	(+)	1.68*	2.78**	-0.22	-0.25
		(0.80)	(0.82)	(0.23)	(0.25)
transport	(-)	-3.53**	-3.64**	0.15	0.15
		(0.51)	(0.52)	(0.08)	(0.16)
chapter indicators		yes	yes	yes	yes
country indictors		yes	yes	yes	yes
year indicators		yes	yes	yes	yes
Observations		16,643	241,928	16,643	241,928
R-squared		0.19		0.15	

Standard errors in parentheses
* Significant at 5%
** Significant at 1%

The regression results are interesting in comparison to the restrictiveness ordering of the h- and r-indices. Of particular interest is the behavior of products for which 35 percent value content ROOs transformed to a tariff shift ROO specifying a change at the chapter or heading level. The results for those two groups mirror the dichotomy of the general results, and are the likely drivers behind it. The indices generally count such changes as an increase in ROO restrictiveness, but the positive and significant coefficients for their interaction terms indicates that preferential trade increased in the FTA for those product categories relative to others. Alternatively, the coefficients on the regressions measuring effects on the utilization rates were negative and significant, indicating relatively lower utilization, as one would generally expect.

Results for the other variables are similar to those displayed in the previous models. Tariff preferences are positive and significant, as is country per-capita GDP for the preferential trade model. Transport costs are also negative and significant for estimations of preferential trade. Gravity variable results for the preference utilization estimations are insignificant.

4.5 Examination of Producer Prices under Unilateral Preference and FTA ROOs

The previous section examined the effect of ROOs on preferential trade and utilization in the context of graduation from unilateral preferences to FTA, and found mixed results. While this provides insight into how trade flows themselves may have responded to changes in ROOs, it does not specifically address how benefits from preferential access for recipient country producers could change under the ROOs switch. Even for products that meet the producers' participation constraint and are shipped under both unilateral and FTA regimes, the conversion from a 35 percent value-content ROO to a higher percentage value-content ROO, a product-specific ROO, or a technical ROO could be expected to alter producers' costs and thus the rents obtained from tariff preferences.

In this section, I examine this question of the value of the preferences to recipient country exporters by analyzing the responsiveness of the prices received by exporters to forgone tariff rates under both preference regimes and changing ROOs. Changes in these prices provide additional insight into not just whether it is cost effective to claim preferences in the face of changing ROOs, but the extent to which such changes are similarly affecting the marginal benefit of the preferences as well.

4.5.1 Empirical specification

In order to estimate how the switch in ROOs between preference programs affects developing country producers, I will follow a methodology outlined in Özden and Sharma (2006), similar to other previous studies that examine the pass-through of tariff preferences on unit values.[44] The fundamental issue is the extent to which exporters capture the tariff preference provided under the unilateral program or FTA. In order to identify this effect, I estimate the following linear regression model:

[44] See Olarreaga and Özden (2005), and Cadot et al (2005b)

$$pricediff_{cit} = \lambda_0 + \lambda_1 tariffdiff_{cit} + \lambda_2 mfn\_share_{it} + \lambda_3 CC_{cit} + \lambda_4 CH_{cit} + \lambda_5 CS_{cit} + \lambda_6 EC_{cit} + \lambda_7 EH_{cit} + \lambda_8 ES_{cit} + \lambda_9 AS_{cit} + \lambda_{10} RVC\_35_{cit} + \lambda_{11} RVC\_high_{cit} + \lambda_{12} RVC\_alt_{cit} + \lambda_{13} TECH_{cit} + \lambda_{14} alt_{cit} + \partial D_{cit} + \varepsilon_{cit} \quad (4.5)$$

The dependent variable is defined as the natural log of the ratio of a country's unit values on preferential imports into the United States, versus the unit values of their non-preferential imports, for product *i* in year *t*. These unit values are calculated by dividing the products' customs values by the quantity of imports. Given that customs value does not include transport costs, tariffs, or other import fees, unit values are used as a general proxy for the producer-obtained price of the traded good. Thus, the dependent variable represents, in general percentage terms, the extent to which the exporting country is able to set the sale price of preference-qualifying exports higher than those for goods that do not qualify for preferences and thus must pay the MFN tariff. Divergence between these values, allowing for product and country heterogeneity, would be indicative of beneficiary exporters' ability to capture the rents provided by the preferential tariff margin in their sales to the United States.

While varying levels of pass-through would manifest in price differences across products, other factors can also cause such differences. In order to make the most direct comparison between preference-receiving and non-preference-receiving products, I used U.S. unit value data collected at the 10-digit level of disaggregation. While different product types might still be classified within the same HS 10-digit, there is less variability than if product data was specified at the 8- or 6-digit level. Nevertheless, quality differences within the same product may still be present, which could bias the price differences.

The first explanatory variable represents the difference between the (MFN) tariff rate applied to non-preferential imports from a beneficiary country and the tariff applied to preferential imports from that country (i.e. the preferential regime's tariff rate) – essentially the recipient country's margin of preference on that product i in year t. Tariff rates, both preferential and non-preferential, are calculated by dividing the total duties collected on imports by their customs value; generating *ad valorem* equivalent percentage tariffs. I use this method so as to capture trade in products for which the official U.S. tariff rates are specific or compound in nature (i.e. have a component that charges a certain value per quantity unit).

This preferential tariff margin captures the relative value of the additional tariff that non-preferential imports must pay, but preferential trade does not – the classical tax wedge. Theoretically, this percentage margin should be the upper bound on the level to which an exporter could increase its price on preferential exports of identical quality. To raise the price beyond this would price the product above the tariff-ridden world price, whereas pricing it below would mean that some percentage of the forgone tariff is passing through to consumers in the form of a reduced consumption price. The coefficient on this variable, λ_1, therefore represents a measure of the share of the preferential tariff margin that is obtained by the exporters in the preference-receiving country. Alternatively, $1-\lambda_1$

represents the share of the tariff margin that passes through to U.S. consumers. Thus, if the coefficient equals 1, this indicates that the exporter fully captures the tariff preference in its sales price. A value between 1 and 0 would indicate that some share of the tariff preference is passed through to the exporter, while a value of 0 indicates that the exporter captures none of the tariff preference.

This ‘pass-through’ measure is the key result of interest in the analysis. A comparison the sizes of this coefficient under alternative data specifications, controlling for unilateral preference and FTA ROOs, provides some insight into how ROOs in the alternate regimes affects producers’ ability to obtain rents from the tariff preferences.

The variable mfn_share_{it} represents the share of total U.S. imports for each product i in year t that was subject to the U.S. MFN tariff rate. This is intended to control for a general ability of partner country exporters to price above the non-preferential price. If only a small share of U.S. imports of a product is subject to MFN tariffs, then it is more likely that the large share of preferential imports would compete to bid down their export price, thus passing through more of the tariff rent to U.S. consumers. Alternatively, if the partner country’s exports to the United States are the only preferential imports and make up only a small share of total imports, then there are no competitive pressures preventing them from pricing up to the tariff-ridden import price. This variable is expected to have a positive coefficient, as a higher share of dutiable imports would therefore increase the preferential to non-preferential price differential.

The direct effect of ROOs themselves is captured by a series of indicator variables that identify those aspects of ROOs that apply to that product. This includes the general type of ROOs, including tariff shift changes at the chapter (CC), heading (CH), and subheading (CS) level; regional value content requirements both less than or equal to 35 percent (RVC_35), greater than 35 percent (RVC_high), and whether the product has alternate value content thresholds (RVC_alt); technical requirements (TECH); and whether alternate ROO types can be used to qualify for origin (alt). Additionally, I include indicators for whether the ROO on the product included exceptions at the chapter (EC), heading (EH), or subheading (ES) level. Alternately, indicators for specific ROO additions at the subheading (AS) level also exist.[45]

Finally, D_{it} represents a full set of control variables. These include indicators for the analyzed countries and years, as well as for HS subheadings. I include dummies for each subheading, identified at each 6-digit HS number, in order to best control for product heterogeneity while not overburdening the model computation.

4.5.2 Data

Data on approximate import prices and tariffs is specified at the 10-digit level of the HS, and as indicated, are calculated from customs values, quantities, and calculated duties for U.S. imports from Bahrain, the Dominican Republic, Chile, El Salvador, Guatemala,

[45] Indicators for exceptions to product level tariff-shift ROOs are omitted, as are chapter, heading, and product level additions. While these aspects of ROOs are included in FTA schedules, they are not present in the particular data used in this analysis.

Honduras, Morocco, and Nicaragua. I again use annual data from 2001-2008 in order to capture trade flows from the aforementioned countries when they were eligible for both unilateral and FTA preferences from the United States. As with the analysis in the previous section, I identify the data by preference regime, and deleted data from those years in which alternate regimes were both in force for some substantial time.[46] Also as before, I eliminate from the data products that were ineligible for preferences under the unilateral regime, so as to ensure comparability. This data was drawn from the U.S. ITC's Dataweb. Table 4.7 lists summary statistics for the data applicable to both the unilateral and FTA preference regimes.

[46] For CAFTA-DR countries there is in fact overlap between yearly unilateral and FTA preference data, since the FTA(s) with those countries became effective partway through a year (2006 for all countries except the Dominican Republic, which was 2007). Thus, while unilateral and FTA preferential unit values exist for the countries in the same year, they correspond to the respective regime.

Table 4.7: Summary Statistics, Tariff Pass Though Under Unilateral and FTA Preferences

		Unilateral		FTA	
Variable	Description	Mean	Std. Dev.	Mean	Std. Dev.
pricediff	Ln(pref. unit value / non-pref. unit value)	-0.05	0.95	-0.06	1.17
tariffdiff	Ad valorem equivalent pref. tariff margin	0.11	0.09	0.10	0.09
mfn_share	Share of U.S. imports subject to MFN tariff	0.70	0.26	0.69	0.27
CC	Indicator of change in chapter ROO	0.70	0.46	0.78	0.42
CH	Indicator of change in heading ROO			0.12	0.32
CS	Indicator of change in subheading ROO			0.07	0.25
EC	Indicator of chapter exception	0.69	0.46	0.60	0.49
EH	Indicator of heading exception	0.69	0.46	0.63	0.48
ES	Indicator of subheading exception			0.02	0.13
AS	Indicator of subheading addition			0.00	0.02
RVC_35	Indicator of value content ROO ≤ 35%	0.30	0.46	0.04	0.20
RVC_high	Indicator of value content ROO > 35%			0.01	0.08
RVC_alt	Indictor of alternative RVC percentages			0.00	0.06
TECH	Indicator of technical ROO	0.70	0.46	0.63	0.48
Alt	Indicator of alternative ROO available	0.01	0.10	0.03	0.17
Observations		7,708		2,817	

Author's calculations based upon FTA agreement text and specified data.

Although U.S. tariff rates are specified at the 8-digit level of the HS, I use 10-digit data in order to better capture quality and other product details. An evaluation of 8-digit data revealed wide discrepancies in unit values of import of the same product, even from the same country. Some of this is due simply to the nature of the Harmonized System, which could include disparate products with the same HS classification. While using 10-digit data (the most detailed level of data available) does not fully mitigate these discrepancies, it is better at grouping like products within the same classification. Nevertheless, both the negative sign and relatively high standard deviation of the price difference variable provide evidence that such product heterogeneity remains significant, even within 10-digit classifications.

For calculation of unit values, the quantity measure I use to divide the customs value is 'first unit quantity.' This measure simply reflects the quantity of imports, denominated in the units first specified in the tariff schedule, if more than one is used to identify import quantity. Types of quantity units are obviously not constant across products (i.e. pairs of shoes vs. square feet of paper), but since my examination focuses on marginal differences in preferential and non-preferential unit values this is not a concern as long as the quantity units for each 10-digit product are the same across all import sources and preference regimes, which I verify is true.

In order to measure the extent to which exporters capture the preferential tariff margin, unit values and tariff rates are calculated not just for preferential imports from the analyzed countries, but also for non-preferential imports from those countries. Dataweb provides the aforementioned data by special import program, including unilateral preference programs as well as FTAs, or for imports where no program was selected (i.e. where the import paid the MFN tariff). In constructing unit values and tariffs for preferential imports, I created estimates for unilateral programs and FTAs.[47] I separately constructed estimates for country imports that did not claim any preferential treatment. The use of preferential and non-preferential unit values for imports from the same country further controls for product heterogeneity, as products from the same country are

[47] When constructing estimates for unilateral preference programs, I combined all individual program imports to generate a single estimate. This is due to the fact that in some cases countries are eligible for both GSP and CBI preferences on the same product. Since the ROOs across the two programs are the same for such products, this does not bias the estimates. Products with alternate ROOs under CBI (i.e. apparel) are not eligible for GSP preferences.

relatively less likely to differ greatly in terms of quality or other attributes that might drive its sale price.

Indicators of the aspects of ROOs to which a product is subject (i.e. type, exceptions, additions, alternates) were created based upon the ROOs descriptions of the applicable unilateral program and FTA. For U.S. unilateral programs, these descriptions are specified in the U.S. tariff schedule, while for FTAs they reside in the text of the agreement itself.

4.5.3 Caveats

One concern endemic to this analysis is that unit value data, and specifically the quantity measures used to derive it, is relatively scarce in comparison to simple trade values themselves. There are a considerable number of products for which positive customs values are reported, but for which the quantity statistics report zero imports. One possible cause of this is that even at the 10-digit level of specificity, imports within that tariff line are reported in different quantity units, such that no harmonized unit value exists. Alternatively, it could be that quantity data is not collected as systematically as value data. Regardless, this restriction limits the number of observations. Given that the unavailable data does not represent zero trade, and the relevant variables cannot be constructed from partial data, I eliminate from the estimations those products that do not report positive unit values. While necessary for the empirical analysis, these omissions limit the sample size and could potentially bias my results.

4.5.4 Results

In order to compare the response of tariff pass-through in both the unilateral and FTA preference regimes, I estimate the model separately for each set of data. Therefore, two sets of pass-through coefficients are estimated, one applicable to the U.S. unilateral preference regime, and one applicable to FTA imports. A comparison between these coefficients provides insight into the how pass-through may have changed under the different regimes, and their applicable ROOs.

The model's regression results are presented in Table 4.8. As indicated, columns (1) and (2) of the table show the regression results based upon trade that entered the United States under a unilateral preference program. Alternatively the results in columns (3) through (6) are based upon U.S. imports under FTA preferences. I further segment the FTA preference data by analyzing only those products for which the ROO increased in restrictiveness in the FTA regime (columns 5 and 6).

I estimate the model on both the full set of applicable data, as well as upon only processed products. I define processed products as those included in chapters 15-24, 28-40, and 42-97 of the Harmonized System. I construct this definition by using the UN's Broad Economic Categories to identify raw material products, to which I add oil and some other mineral products. Thus, primary raw materials such as unprocessed agriculture products, minerals, and raw hides and skins are excluded from the model estimates of processed goods. This is done so as to examine the pass-through effect on products that are more likely to be subject to ROOs constraints. A raw material that has trouble meeting the ROO (i.e. was not grown or mined in the country of export) is less likely to be present in the trade flows, and thus may dilute the impact of ROOs on pass-through.

Both data sets also include some significant outliers, a possible cause of which is the aforementioned product heterogeneity within the 10-digit classifications. For example, a 10-digit HS imported from Chile in 2008 had a unit value of over $28 thousand under the FTA preference regime and only $2 under general MFN treatment. While extreme divergences between preferential and non-preferential unit values are not common, their presence causes concern. To partially mitigate the impact of such data, I estimate the model using weighted least squares. This method involves iteratively estimating the model and assigning higher weights to better behaved observations.

Table 4.8: Estimates of Tariff Pass-Through under Unilateral and FTA Preferences

	Expected sign	unilateral, all (1)	unilateral, processed (2)	fta, all (3)	fta, processed (4)	fta, stricter, all (5)	fta, stricter, processed (6)
constant		0.08	0.48	-2.31*	-2.43*	-4.74**	-2.80**
		(0.58)	(0.44)	(1.15)	(0.96)	(1.67)	(0.94)
tariffdiff	(0<x<1)	0.78**	0.79**	0.75**	0.65*	0.39	0.28
		(0.12)	(0.12)	(0.28)	(0.27)	(0.53)	(0.54)
mfn_share	(+)	-0.00	-0.02	0.23*	0.17	0.15	-0.09
		(0.05)	(0.05)	(0.10)	(0.10)	(0.15)	(0.19)
CC	(?)	-0.18	-0.56	2.48**	2.80**	4.61**	3.29**
		(0.55)	(0.40)	(0.78)	(0.78)	(1.36)	(1.01)
CH	(?)			2.22**	2.13**	3.88*	2.54
				(0.76)	(0.74)	(1.76)	(1.49)
CS	(?)			1.97**	2.00**	1.90**	1.74**
				(0.70)	(0.68)	(0.58)	(0.56)
EC	(?)	1.55*	1.98**	0.10	0.20	-0.12	-0.13
		(0.68)	(0.57)	(0.32)	(0.33)	(0.32)	(0.35)
EH	(?)			0.19	-0.47	0.15	0.12
				(0.25)	(0.24)	(0.97)	(0.63)
ES	(?)			-0.10	-0.17	-0.39	-0.03
				(0.29)	(0.30)	(0.40)	(0.39)
AS	(?)				0.13	-0.30	-0.17
					(0.71)	(1.46)	(0.75)
RVC_35	(?)			2.43**	2.69**	4.93**	3.88**
				(0.77)	(0.76)	(1.16)	(1.36)
RVC_high	(?)			-0.36	0.71	0.70	0.51
				(0.86)	(0.50)	(1.18)	(1.07)
RVC_alt	(?)			1.39	0.27		
				(0.82)	(0.80)		
TECH	(?)			0.75	1.00	0.99	1.22*
				(0.74)	(0.72)	(0.61)	(0.59)
Alt	(?)	-1.54*	-1.97**	0.01	0.06	5.05**	1.17
		(0.69)	(0.57)	(0.24)	(0.25)	(1.27)	(0.89)
subheading indicators		yes	yes	yes	yes	yes	yes
country indicators		yes	yes	yes	yes	yes	yes
year indicators		yes	yes	yes	yes	yes	yes
Observations		7,706	7,362	2,726	2,579	846	625
R-squared		0.43	0.44	0.49	0.57	0.77	0.81

Standard errors in parentheses
* Significant at 5%
** Significant at 1%

The coefficient of interest, that of the tariff difference between preferential and non-preferential imports, is positive and between zero and one under all data sets and model specifications. This indicates that pass-though is present but not absolute under both preference regimes. The relative size of the coefficients across regimes also indicates that partner country exporters obtained a greater share of the preferential tariff rent under unilateral programs than the FTA.

The coefficient applicable to preferential tariff margin under the unilateral preferences approaches 80 percent for both all and processed goods, and is significant under both specifications. Thus, exporters captured roughly four-fifths of the rents provided by their access to the preferential tariff margin. The figure is slightly higher when estimating only processed products, indicating that the ROOs did not appear to have a sizable impact on pass through.

Alternatively, the coefficient applicable to FTA preference tariff margins is somewhat lower: 75 percent for the full set of FTA data, and 65 percent for processed products. Both figures are again significant at the 1 and 5 percent level, respectively. This indicates that partner country exporters received a smaller share of the tariff rent under the FTA as opposed the unilateral regime, to the order of 15 percent for processed products. This, along with the positive coefficients on many of the significant FTA ROO control variables,[48] would be consistent with the ROOs in the FTA acting to erode the share of rent captured by partner country exporters.

[48] Positive and significant ROOs coefficients indicate that their presence drives up the preferential unit value relative to the non-preferential values. Thus, the level of markup reflects not the exporters' ability to capture the rent, but costs associated with meeting the ROO.

In order to examine whether this effect is general to FTA ROOs, or is the result of specific increases in the level of ROOs restrictiveness under the FTA, I isolate those products for which such restrictiveness increased (as per the h-index). In theory, should complying with the increased ROOs restrictiveness similarly increase production costs for preferential imports, we would expect the coefficient on the tariff margin to be lower than both the estimate for unilateral trade and FTA trade generally, indicating that a smaller share of tariff rent was captured by exporters. Indeed, while the tariff pass-through estimates do drop notably (to 40 and 28 percent) for products subject to increased ROO restrictiveness, the estimates also suffer from a severe decline in significance. Thus, while the coefficient estimates perform in a manner consistent with the theory that tightening of ROOs erodes the benefit to preference recipients, this lack of significance makes the results inconclusive.[49]

Results for the MFN share variable comport with theory. While its coefficient is negative for some specifications, the result with statistical significance is positive, indicating that a higher relative presence of non-preferential U.S. imports allowed partner country exporters to better increase the price of preferential exports to the United States.

While ROO variables are included largely as a control measure, their estimated results are generally as expected. Estimates of the major ROO classification – change in tariff classification, value content threshold, and technical change – are positive where

[49] Interestingly, t-tests of the coefficients for the preferential tariff margins fail to reject their statistical difference from one at the 5 percent level of significance, with t-statistic values ranging from -0.93 to -1.88 across specifications. Only the coefficients for the two estimates of unilateral preference data reject the coefficients' equivalence to one at the 10 percent level of significance.

significant. Further, results for more restrictive ROO elements have higher coefficient estimates, with the estimates for change in HS chapters categorically higher than change in heading, which are categorically higher than change in subheading. This indicates that preferential ROOs did increase preferential unit values, and did so in a manner consistent with expectations as to the level of costs required to meet them.

4.6 Conclusions

The analyses in this chapter provide additional evidence that ROOs impact preferential trade, but do not unambiguously support the assertion that increasing ROO restrictiveness decreases preferential trade more. While comparison of pre- and post-FTA utilization rates are clearly negatively affected by a switch to more restrictive ROOs, the value of preferential trade flows directly are not. This latter result stands in contrast to cross-sectional analysis of preferential trade with respect to both the data set used here, and that used in previous literature. The analysis also provides evidence, however, that the preference receiving country's ability to obtain tariff preference rents is mitigated by the increase in ROO restrictiveness.

The alternating outcome of the trade versus utilization analysis might be explained as the increase in ROO restrictiveness depressing preferential trade in the applicable products, such that they increased by less than for products not subject to a ROO increase, relative to total imports.

Additionally, these results raise issues about the manner in which the ROO indices assign relative restrictiveness to value content and higher level tariff shift (change in chapter, change in heading) ROOs. It may be that while the indices generally capture relative restrictiveness, the ranking of differing types of ROOs (value content versus tariff shift) is imprecise.

Chapter 5: Value Content Rules of Origin and Exchange Rates

5.1 Introduction

Regional value content ROOs differ from tariff shift and technical ROOs insofar as the ability to satisfy them is dependent not just on the production process itself, but also on the values of the components to that process. Variability in the prices and costs of factors of production could therefore alter whether an import meets the ROO, even when the production process and source of inputs are constant. One possible source of such variability is exchange rates.

That exchange rates may have an effect on the relative restrictiveness of value content ROOs seems logical. Given that value content ROOs specify the share of the final value of the good that must originate in the beneficiary country in order to claim origin, the greater the value of a beneficiary's domestic content relative to any non-beneficiary inputs, the easier the ROO is to meet. To the extent that exchange rates alter domestic value added relative to its final value, they could adjust the effective restrictiveness of the ROO.

The logic for exchange rates impacting value content ROOs does not hold for tariff shift and technical change ROOs, however. Tariff shift ROOs mandate a change of varying degree within the Harmonized System (HS). Since HS categories are (typically) not constructed with the value of the product(s) in mind, this type of ROO requirement would be insensitive to exchange rate changes. Similarly, technical change requirements specify a particular aspect of the production process that must take place in order to confer origin. Since production processes themselves are unrelated to the relative prices of their inputs, products' ability to satisfy technical ROOs would also be expected to be insensitive to exchange rates.

This essay examines the connection between exchange rates and ROOs' impact on preference. While the impacts of ROOs and exchange rates on trade have been analyzed individually, their interaction has not been explored. The issue is important, insofar as it explores the question of whether or not the conventional theory that currency depreciation expands exports is altered by the presence of preferences with value content ROOs. Traditionally, a local currency that depreciated relative to that of its export markets could be expected to increase exports, as costs of production, and price of the domestic export, decline relative to those of products denominated in the relatively higher-value currency of the destination market. All else equal, tariff preferences would also be expected to boost exports. However, as outlined in the previous paragraph, it's possible that the combination of these two factors, coupled with value content ROOs, could actually have the effect of reducing preferential trade. Such a result would have interesting implications for exchange rate policy among preference-receiving countries.

To establish a basis for the exchange rate-ROO relationship, I employ a simple theoretical framework of the benefit to an exporter of utilizing a preferential trade regime that employs value content ROOs. While this framework is based upon Anson et al

(2005), I make the important alteration of modeling the ROO such that it specifically requires that a value threshold be met, rather than simply a share of production.

I then test this connection empirically through an analysis of countries' aggregate utilization of U.S. preference programs. If exchange rate changes do systematically affect exporters' ability to qualify for tariff preferences, then evidence of this should appear in utilization rates of preferential regimes.

The empirical results generally support the theory that a weakening of the exchange rate has a depreciative effect on utilization of preferences subject to value content ROOs. This is true even as currency depreciation increases exports generally. This result has interesting implications for the export potential of developing countries eligible for such preferences. It indicates that while currency depreciation may bolster exports by decreasing relative costs, it can also make exports ineligible for otherwise available tariff preferences if those preferences are contingent upon value content ROOs. This may also raise the question of whether there are advantages to be gained for countries by requesting tariff shift or technical ROOs in the preference regimes they receive.

The essay is organized in the following manner. Section 5.2 outlines additional literature relevant to the exchange rate theory and its connections to ROOs. Section 5.3 describes in greater detail the use of value content ROOs in U.S. unilateral preference programs and FTAs. Section 5.4 constructs a theoretic relationship between exchange rates and

ROOs compliance. Section 5.5 outlines and tests this relationship empirically. Section 5.6 concludes.

5.2 Literature

As indicated, the interaction between value content ROOs and exchange rates has not been specifically studied. The principle of content-share has been used extensively to theoretically model ROOs, however. Indeed, as tariff shift or technical ROOs are difficult to model, percentage content has been used universally in theoretic work. In their exploration of the impact of ROOs under various conditions, Krueger (1993), Cadot et al (2002), Anson et al (2005), and Cadot, Estevadeordal, & Suwa-Eisenmann (2004), apply the content criterion in various models of preferential trade. The models used in these studies are focused on examining the responsiveness of preferential trade to the restrictiveness of the ROO itself, the preferential tariff margin, or the rents captured by the various producers in the product's supply chain.

While this literature does use a content-share criterion to model ROOs, the content requirement is most commonly specified in terms of a share of output or intermediate goods vis-à-vis the production function. As mentioned in Chapter 3, this captures the fundamental motivation behind content share ROOs, but basing the rule upon real inputs ignores the fact that such ROOs are more commonly applied based upon value terms. Anson et al (2005), for instance, uses a regional content criterion to operationalize ROOs in their model, but specify it in terms of quantity rather than value. Prices then impact the decision to utilize the preferential regime only through their direct effect on total costs of compliance (i.e. a higher price of foreign inputs does not make the ROO technically more difficult to satisfy, it just increases costs and decreases profits).

There is indication that the exact specification of value in value content ROOs can have significant impacts upon the ROOs' overall level of restrictiveness. Krishna and Kreuger (1995) highlight how the impact of value content ROOs is sensitive to the relative values of the content components. A logical extension from this concept is that exchange rates, by altering the costs of various inputs, would similarly adjust value content ROOs' restrictiveness.

Separate from explicit discussions of ROOs and preference programs, there is considerable literature on the impact of exchange rates on trade balances. Conventional theory suggests that a currency depreciation should improve the trade balance, as it decreases the relative price of exports versus imports. How long it might take such an effect to manifest has been the topic of considerable study. Magee (1973) raises the possibility that the trade balance should follow a "J-curve" path after a currency depreciation. The theory is that short-term trade is characterized by set contracts. Thus, a depreciation would raise the relative cost of imports, but would have no effect on actual trade flows. Over the longer term, the depreciation actually decreases imports and boosts exports. Thus, the overall trade balance post-depreciation would first fall, then rise.

A great number of studies have empirically examined whether currency depreciations actually manifest a J-curve type reaction in the trade balance. Results have been mixed, with evidence both for and against the J-curve. Additionally, the time period over which the J-curve would manifest is inconsistent across the literature. Bahmani-Oskooee and Ratha (2004) provide a review of the literature on this topic, enumerating the results of the various empirical analyses.

5.3 Value content ROOs in U.S. unilateral preferences and FTAs

Value content ROOs are commonly used criteria for establishing eligibility for preferential tariffs under U.S. unilateral preference programs. As indicated previously, most U.S. unilateral programs, including GSP, CBI, ATPA, and AGOA, utilize 35 percent value content ROOs as the basis for preference eligibility. Some specific product preferences under various program extensions (CBTPA, ATPDEA, and AGOA textile and apparel provisions) require technical or tariff shift ROOs compliance, but the majority of trade that enters the United States under a unilateral preference regime does so under the 35 percent value content criteria.

As identified in the literature, however, exactly how this value content criteria is specified can have a significant impact on its ultimate effect. The value content ROOs in U.S. unilateral preferences stipulate that "the sum of (1) the cost or value of the materials produced in the beneficiary developing country, plus (2) the direct costs of processing operations performed in such beneficiary developing country is not less than 35 percent of the appraised value of such article at the time of its entry into the customs territory of the United States." Additionally, the customs value of a good – the value of imports as appraised by the U.S. Customs Service – is defined as "the price actually paid or payable for merchandise, excluding U.S. import duties, freight, insurance, and other charges."[50] Based upon these ROOs criteria, changing exchange rates could alter the relative values of the input and direct processing costs in relation to the product's customs value upon entrance into the United States, thus altering the share of 'originating' content in the export.

Another issue of relevance with respect to U.S. unilateral preference programs is countries' ability to cumulate inputs in order to meet the ROOs requirements. These programs provide varying types and/or scope of accumulation, but there is no uniform mechanism across all programs. The GSP program, both the regular and enhanced version provided to least developed countries, allows for certain groups of beneficiary countries to cumulate inputs within themselves, which contribute to meeting the 35 percent value content ROO. These groups are based upon countries' own integration agreements, and would be expected to have integrated supply chains.[51] Not every country within a designated region or association may cumulate within the GSP program, however. Other regional-based U.S. preference programs make more liberal use of accumulation. Countries eligible for the CBERA, AGOA, and ATPA may cumulate

[50] Harmonized Tariff Schedule of the United States (2009) (Rev. 1) http://dataweb.usitc.gov/

[51] These country groups, identified in Section 507(2) of the Trade Act of 1974, include certain members of the Cartagena Agreement (Andean Group), Association of South East Asian Nations (ASEAN), Caribbean Common Market (CARICOM), West African Economic and Monetary Union (WAEMU), Southern Africa Development Community (SADC), and the South Asian Association for Regional Cooperation (SAARC).

inputs among themselves without limit in order to meet the value content ROO, provided that said inputs are themselves originating products. Additionally, U.S. domestic content may also contribute to meeting the ROO, up to an amount equal to 15 percent of a product's value. These accumulation provisions provide greater incentive to source production inputs from within the region, and commensurately make it easier to meet the ROO.

Value content requirements are generally far less utilized in U.S. FTAs. While older U.S. FTAs and those signed with Middle Eastern countries do make broad use of value content ROOs, most U.S. FTAs since NAFTA make greater use of tariff shift ROOs and utilize value content ROOs much more sparingly. In cases where value content ROOs are presented, it is often in the context of an addition or alternative to tariff shift rules.

For those products that either can or must meet a value content requirement in order to claim preference, U.S. FTAs often allow for a variety of calculation methods and value content thresholds. The two most common are the 'build up' and 'build down' means of calculation.[52] The first is based upon the share of originating material in the final adjusted value of the good.[53] The second is based upon the share of all value other than non-originating material (1 – the share of non-originating material) to the final adjusted

[52] An additional method, net cost, is also presented for certain automotive products. This method involves a more precise and nuanced calculation of the exact level of originating inputs involved in all stages of production of both the final good and its inputs.

[53] The relevant total value of the good for ROOs purposes is its customs value - the value for which it's sold to the importer. The invoice value is sometimes adjusted to remove costs associated with transportation, in order to derive a more accurate customs value.

value of the good. The provision of these ‘positive’ and ‘negative’ list approaches to calculating and meeting a value content requirement provides some flexibility in meeting the ROO. Typically, the ROOs threshold for value content calculated using the build-up method is lower than that from the build-down method. The exact calculations of value content according to the two methods can become quite detailed depending on the costs of various activities not related directly to inputs or production, such as taxes, fees, insurance, packaging, transportation, waste, etc. This difference is exactly the type of effect noted by Krishna and Kreuger (1995), and the provision of different ROOs thresholds to these different calculation methods is evidence of ROOs’ sensitivity to method of calculations.

Accumulation is also available in most U.S. FTAs, though the scope of countries with which partners can cumulate varies across agreements. Generally, bilateral and/or diagonal accumulation is provided, depending on the nature of the agreement (i.e. between only the United States and a single partner country, or between the United States and two or more countries). In FTAs, the full value of cumulated inputs contributes to satisfying the ROO. This is distinct from unilateral programs that allowed U.S. content to contribute up to a maximum of 15 percent of the originating value.

A final difference between U.S. unilateral preferences and FTAs is with respect to the scope of products covered. As noted in the previous essay, most U.S. unilateral preference programs omit certain product sectors from eligibility, whereas FTAs cover all products. The regular GSP program is the least broad, while the enhanced GSP as well as regional programs cover most dutiable products.

5.4 Theoretic framework between preference utilization and exchange rates

In this section of the essay, I construct a simple theoretic framework of the benefit of utilizing preferences under ROOs requirements. The framework generally follows the analytic structure used by Anson et al (2005), and is based upon the producer's decision whether or not to utilize the preference regime under ROOs, or pay the tariff with no origin restrictions on production. The framework is a simple perfect competition setup; world prices are exogenously given and the producer has only to decide under which regime his profits are higher. While this framework ignores the broader factors in the decision to export, I believe that it captures the essential determinants of preference utilization and provides a convenient means of incorporating exchanges rates into this decision.

In order to explicitly examine how exchange rates may impact the producer's decision, I make two adjustments to the standard representation of content ROOs. First, I define the ROO requirement as based explicitly upon value rather than physical content. This mirrors the actual nature of regional value content ROOs used in U.S. unilateral preference programs and FTAs, thus making the framework more representative of actual policy. The second adjustment made to my framework is to directly incorporate the exchange rate into the producers' profit function. Thus, all values are translated in domestic currency units, and are directly comparable.

5.4.1 Specification

A preference regime is extended by a northern (N) country to a southern (S) one, which completely eliminates northern tariffs on imports of a representative final good Y from the south, so long as it qualifies as originating. This final good is produced in the south according to Leontief technology and is consumed in the north upon export. The components of good *Y's* production function are a unit of labor and an input good X.

$$Y = min\ \{l, X\} \tag{5.1}$$

The input good is produced both within the preference regime's cumulation zone (call this southern, X_S) and outside of it (call this foreign, X_F), and inputs from the two sources are perfect substitutes. Thus, $X = (X_S + X_F)$.

Assume that the preferential regime allows for cumulation of the full value of the input to contribute to satisfying the ROO. Thus, for purposes of meeting the ROO, X_S is identical throughout the cumulation zone. Additionally assume that labor costs are lower in the south, so final good production within the preference regime only takes place there, and the south does not apply an external tariff to input goods. Finally, the north also imports the final good from the world under a tariff; the south is 'small' and cannot satisfy all northern demand.

Under the preference regime, the south gains duty-free treatment on its exports of the final good to the north only if it satisfies a value content ROO. The ROO stipulates that a certain share (α) of the total value of inputs must be of domestic origin.[54] I express this formulaically as:

$$P_S X_S \geq \alpha[P_S X_S + P_S X_F] \tag{5.2}$$

P_S represents the price of the intermediate good in domestic currency. However, foreign inputs are priced not in domestic currency, but in foreign currency, P_F. I assume that the law of one price holds, and thus the value of these inputs in nominal domestic value is then its value in foreign currency times the exchange rate, E, which is defined as the domestic cost of a foreign currency unit.

The ROO condition therefore becomes:

$$P_S X_S \geq \alpha[P_S X_S + EP_F X_F] \tag{5.3}$$

Re-arranging terms, and assuming that the ROO binds, this can be consolidated to:

[54] For simplicity, I assume away the value of domestic labor in the ROO definition, but the value of domestic labor would contribute to origin under all types of ROOs studied here. Thus, incorporating this value explicitly would make the ROO generally easier to satisfy but would not otherwise alter the framework's results in terms of input sourcing and relative price.

$$P_S X_S = \alpha(1- \alpha)^{-1} E P_F X_F \tag{5.4}$$

Evaluated at domestic prices, the value of all intermediate goods used in production of a unit of Y is equal to:

$$P_S X_S + P_S X_F = P_S X_S + E P_F X_F \tag{5.5}$$

Substituting the binding ROO condition (5.4) from above, with (5.5) yields:

$$\alpha(1- \alpha)^{-1} E P_F X_F + E P_F X_F = (1- \alpha)^{-1} E P_F X_F \tag{5.6}$$

where $(1- \alpha)^{-1}$ represents the premium that equates what the producer pays using only the less expensive foreign inputs (i.e. $X = X_F$) to what he would need to pay by using domestic inputs in order to satisfy the ROO.

Examining the unit value added in the final good, a producer that complies with the ROOs obtains the tariff-ridden price, but must source intermediates at the ROO-ridden value:

$$VA_{pref} = P_Y(1+t_Y) - (1- \alpha)^{-1} E P_F \tag{5.7}$$

However, if the producer chooses not to comply with the ROO, they obtain the usual producer price but are free to source all of their inputs (i.e. $X = X_F$) from the lower-cost foreign sources:

$$VA_{mfn} = P_Y - EP_F \tag{5.8}$$

The difference between these values results in the marginal net benefit from utilizing the preference program:

$$B = P_Y(1+t_Y) - (1- \alpha)^{-1}EP_F - (P_Y - EP_F) = P_Yt_Y - \alpha(1- \alpha)^{-1}EP_F \tag{5.9}$$

The end result of the framework is this measure of the benefit to using the preferential regime, defined as the difference in profits for the representative firm between using the regime and not. By utilizing the regime, the firm gains the tariff-ridden world price in the north for its final good exports, but must pay higher costs for a larger share of domestic inputs.

5.4.2 Comparative statics and implications

Taking comparative statics with respect to the previously constructed benefit equation (5.9), it is clear that the benefit from using the preferential regime is decreasing in both the restrictiveness of the ROO, and in the exchange rate:

$$\partial B/\partial \alpha < 0; \partial B/\partial E < 0$$

Thus, the theoretical prescription from this simple analytic framework both corresponds to the standard interpretation of ROOs (i.e. more restrictive ROOs decrease the benefit to preference usage) and indicates that an increasing exchange rate (i.e. relative weakening of domestic value) has a similarly depreciating effect on preferential benefits.

More specifically, domestic currency depreciations relative to imported inputs make the effective price of foreign inputs higher. In order to continue satisfying the ROO, a greater proportion of domestic inputs will then need to be used, increasing overall costs and decreasing the benefit of utilizing the preference.

This specification remains true so long as the ROO is binding (i.e. so long as foreign inputs remain the lowest cost). In other words, so long as a producer structures its production so as to specifically incorporate enough domestic content to satisfy the ROO, rather than simply sourcing the lowest-priced foreign inputs, increases in the relative domestic price of foreign inputs will decrease the benefit of preferential tariff access under value content ROOs. It does this in two ways. First, higher prices for foreign inputs raise costs directly. Secondly, they force an expansion of domestic input sourcing so as to continue to meet the ROO. By assumption, domestic inputs are more costly than imported ones (else the ROO would not be binding). Alternatively, if the expansion of domestic inputs is not cost competitive, the ROO will not be met and the exported product no longer qualifies for tariff preferences.

The assumption that the ROO is binding is an important caveat to this analysis, however. If producers do not need to make any adjustments to the profit-maximizing level of domestic input in order to satisfy the ROO (i.e. domestic inputs are competitive and represent the least-cost method of production), then changes to relative foreign and domestic input prices is less likely to alter input sourcing or have an effect on utilization of the preferential regime.

While this framework focuses on the exchange rate between foreign input suppliers and the preferential partner, an additional consideration is the exchange rate between the preferential countries themselves (i.e. north and south). The extent to which northern inputs can contribute to meeting the ROO via accumulation is relevant to this issue. If such inputs can fully cumulate, then changes in the exchange rate between the preferential partners would tend to be minor in terms of their effect on ROO restrictiveness. However, if such inputs cannot cumulate, then the impact on the export's ability to meet the ROO is lowered. In such a case, the value of non-originating versus originating content increases both absolutely (northern inputs cost more relative to southern) and relative to the total value of the exported product (which will now be relatively more expensive).

5.5 Empirical analysis

The theoretical framework outlined in the previous section guides an empirical analysis of the interaction between exchange rates and ROOs. The theoretical setup measures the benefit for a representative firm to export under the preferential regime as a function of the preference margin (external tariff) on the final good, the ROO's value content measure, and the exchange rate. This results in a series of decisions about whether or not to export shipments under preferences, depending on the expected net benefits from doing so. Generalizing this process to total trade flows of eligible products would yield the preferential utilization rate. Following this intuition, I examine the utilization rate of eligible U.S. imports from preference-receiving countries to evaluate whether the countries' exchange rates had the effect implied by the theoretic framework.

I include both U.S. unilateral preference programs and FTAs in the analysis. The theoretical results on the impact of exchange rates are specific to the use of value content ROOs, and there is no reason to believe that alternate ROO types would produce a similar effect. It is thus necessary to specifically isolate, to the extent possible, the interaction between value content ROOs and exchange rates as the cause of utilization differences. Since the use of value content ROOs is most ubiquitously used in U.S. unilateral programs, the inclusion of utilization rates for FTAs with tariff shift or technical requirement ROOs provides an important control on unobserved trade effects.

5.5.1 Empirical Specification

As noted, I evaluate the interaction between exchange rates and value content ROOs through an examination of the eligible countries' utilization rates of U.S. preference programs. To that end, I perform regression analysis based upon the following linear model:

$$util_{ct} = \beta_0 + \beta_1 rate_{ct} + \beta_2 rate_{ct} * rvc_{ct} + \beta_3 tariff_{ct} + \beta_4 gdp_{cT} + \beta_5 pop_{cT} + \beta_6 english_c \quad (5.10)$$
$$+ \beta_7 distance_c + \lambda_1 program_{ct} + \lambda_2 year_T + \lambda_3 cntry_c + \lambda_4 month_t + \varepsilon_{ct}$$

The dependent variable in the model represents the log share of U.S. imports from country *c* in month *t* that were eligible for preferential access, and actually were imported under a preference program (unilateral or FTA). This is the aggregate (all preference programs combined) utilization rate referred to in the previous section. Not all products are eligible for unilateral preferential treatment, and the scope differs by recipient country. Thus, countries' utilization rates are not based on single set of products, but on what country *c* is eligible for.

The first independent variable, $rate_{ct}$, represents the percent change in recipient country's real exchange rate across a period of two, three, and four months, identified in local currency per U.S. dollars. Given that the theory being examined is whether changes in exchange rates from when imports entered the production process and when the final good must satisfy a value content ROO, changes in exchange rates between consecutive months may not influence the ability of the final good to meet the value content rule. Thus, changes across a variety of more distant months are analyzed.[55]

The local currency versus the U.S. dollar exchange rate is also used in the analysis due to both the availability of data and the fact that the dollar denomination of the final good is the basis upon which the ROO is satisfied. If a product fails to satisfy the ROO, then it must be that the relative dollar value of originating content declined. This could be accomplished through either the local currency depreciating versus the dollar, or the currency used to denominate non-originating inputs appreciates versus the local currency. Since identifying the latter effect would require at least general knowledge of the supply chain for non-originating inputs, I focus on the former scenario in my analysis.

In order to isolate whether any exchange rate effect is contingent on value content ROOs, I interact the change in exchange rates with a dummy variable (rvc_{ct}) that equals 1 if the applicable preference regime employs value content ROOs, and 0 if it does not. This is the variable of relevance for my analysis, as the theory I seek to test is whether increases in the exchange rate (depreciation of local currency) decrease utilization, specifically when subject to value content ROOs. Thus, the coefficient on this interaction variable would be negative if the theory is supported by the data.

[55] Additionally, an examination of overall export responsiveness to real exchange rate changes indicate that a 2-month gap is the minimum required before an export improvement manifests (see Table 5.2; rate), at least for the data analyzed here.

The average U.S. MFN tariff, $tariff_{ct}$, is used to represent the average benefit to the recipient country from utilizing the preference in the month of export. Since most U.S. preferential imports over the applicable period were eligible for duty-free treatment, the average U.S. MFN tariff is very close to the average tariff margin available to eligible imports from recipient countries in the applicable month.[56] Generally, the higher this preference margin, the greater the incentive claim preferences. Thus, this variable would be expected to have a positive effect on utilization.

I include a series of gravity-type variables to control for general trade motivations. These include the log of the recipient country per-capita GDP (gdp_{cT}) in year T, whether the recipient country is ethnic English-speaking ($english_c$), the log of distance between the United States and the recipient country ($distance_c$). Whether these variables have their typical gravity effects is less certain for preference utilization rates than for general trade flows.

One would expect that countries' per-capita GDP to be generally correlated with development and an ability to take better advantage of preference, either by having greater access to inputs from its own production (and thus making it easier to satisfy ROOs), or simply by having a better trade facilitation infrastructure. Having a common language would also be expected to have a positive effect on utilization, as it seems likely to affect not just trade generally, but the ability to successfully participate in preference

[56] Generally, a country's preference-eligible product list and tariff preferences do not change except across years. However, some changes do occur across months. Examples include when a FTA enters into force in any month other than January, as well as when a country loses GSP eligibility for specific products (such changes to the GSP regime occur in July).

programs. The effect of distance is less clear when applied to utilization. Higher costs to trading erode the rents obtained from tariff preferences, but this negative effect would apply to both preferential and non-preferential trade, making their effect on utilization more ambiguous. It may be that such costs, coupled with higher costs from complying with ROOs, makes preferential trade less likely than trade generally, decreasing utilization. However, it's also possible that rents from tariff preferences are what makes otherwise un-economical trade profitable in the face of high trade costs, increasing the proportion of preferential trade and positively affecting utilization.

Finally, I include indicator variables to control for specific unilateral preference programs or non-specific FTAs ($program_{ct}$), years ($year_T$), months ($month_t$), and countries ($cntry_c$).

5.5.2 Data

My analysis examines the impact upon utilization rates for U.S. preference programs of various factors, including exchange rates. Given that exchange rate data is country- and time-specific only, and uniform across products, my data is a panel set of aggregate country utilization rates, exchange rates, and other control variables. The country dimension of the data is restricted to those countries to which the United States granted tariff preferences. Given its availability, I examine trade and exchange rate data on a monthly basis between 1997 and 2008. This provides a larger sample size and accounts for sometimes significant volatility within years.

In order to calculate utilization rates, I divide U.S. imports, by country, that claimed tariff preferences under the various preference regimes by the total imports from that country that were eligible for preferential treatment. Given the differing levels of product coverage provided by the various preferential regimes, I download this data at the HTS 8-digit level of specificity by country from the U.S. International Trade Commission (USITC) Dataweb.[57] Dataweb identifies imports by special import regime, including all U.S. unilateral preference programs and FTAs. I matched both preferential and total imports to the U.S. tariff schedule for the relevant year, which also comes from the USITC. These tariff schedules identify those 8-digit product lines that were eligible for tariff preferences from the recipient country, and thus allowing for the summation of total preference-eligible trade. This is then compared to the sum of total trade that actually received preferences to calculate the country utilization rates.[58]

In creating the utilization rates, it is important to differentiate preferential trade that was subject to value content versus other types of ROOs. Imports eligible for the Generalized System of Preferences (GSP), the Caribbean Basin Economic Recovery Act (CBERA), the African Growth and Opportunities Act (AGOA), and the Andean Trade Promotion Act (ATPA), all require a 35 percent value content rule in order to qualify for origin.

[57] As a point of clarification, I used 8-digit data in my calculations only for unilateral preference program utilization rates, as such programs do not cover all products. FTA utilization rates were calculated from more aggregate data.

[58] As a product example, Brazil was eligible for GSP on HS 41071150 in March of 2003. Total U.S. imports from Brazil on that product in that month were $2,502,666; but only $2,440,913 actually entered under GSP. Since Brazil is eligible for no other preference programs on that product, its utilization rate would be 97.5 percent. To generate country utilization rates, I sum the applicable values for each product for which Brazil is eligible.

Additionally, some countries are eligible for more than one of these programs simultaneously. Thus, when aggregating countries' total preferential and eligible U.S. imports by month, I sum across all products eligible for any program with the 35 percent value content ROO. Given that some products under advanced forms of these programs (e.g. mainly textiles and apparel under CBTPA, AGOA, and ATPDEA) are subject to alternative ROOs, I exclude them from the data.

Most U.S. FTAs, such as NAFTA, CAFTA-DR, and those with Australia, Chile, Singapore, and Peru, rarely make use of only value content ROOs. As such, U.S. monthly imports that entered under these FTAs are designated as not having been subject to value content ROOs. While it is possible that some imports under these FTAs did meet only value content ROOs as the basis for preferential entry, they are not expected to have a substantive impact on the countries' overall utilization rate.[59] Additionally, while the U.S. FTAs with Morocco and Bahrain make rather more widespread use of the 35 percent value content criterion in the ROOs, some products covered by the FTA preferences are also subject to more specific tariff shift and technical ROOs. As a result, I do not categorize utilization under those FTAs as subject to value content ROOs.

Monthly exchange rates are downloaded from the International Monetary Fund's International Financial Statistics (IFS) database. These exchange rates are specified in national currency per U.S. dollars. The availability of exchange rates denominated in

[59] A very small share (1 percent or less) of product lines in these FTAs is subject only to value content ROOs. Even those lines that require both a tariff shift and value content requirement make up a small share (less than 10 percent) of overall lines.

U.S. dollars is broader across countries and time than those of alternate currencies or IMF special drawing rights, and I chose them based upon this relatively more complete set of data. Their use introduces a complication into the analysis, however, because of the accumulation issue noted in the previous section. Under some value content preference regimes, U.S. inputs are allowed to contribute a certain degree of inputs (15 percent) into meeting origin requirements. Thus, widespread use of U.S. inputs in meeting the ROO may temper the exchange rate effect on preference utilization, reducing its significance in the data. This complication is outweighed by the greater sample size afforded by use of U.S. dollar-denominated exchange rates, but will be present in the results.

Using monthly consumer price index data from the IFS, I calculate real exchange rate values as simply the nominal exchange rate multiplied by the ratio of U.S. to recipient country CPI for each country and time period.

Data on the average U.S. MFN tariff is constructed from the U.S. tariff schedules available from the USITC. Additional gravity-type variables such as whether English is an ethnic language in the recipient country, the distance between it and the United States (measured by distance between most populous cities) come from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). In constructing per-capita GDP measures, I use recipient country annual GDP in U.S. dollars. To the extent possible, GDP measured in constant year 2000 dollars were used, though for some countries, current dollar values were the only available. Data on country GDP and population was sourced from the World Bank's World Development Indicators.

While U.S. import data is available for all preference-receiving countries, other data is not. Several countries are missing exchange rate, CPI, and/or GDP data for either some or all of the time periods analyzed. Given expectations concerning estimation techniques, I create a balanced panel by eliminating from the sample those countries with missing data. This eliminates all but 51 countries, which are listed in Appendix 6. Most of the deleted countries are least-developed countries, East European states that were removed from all U.S. preference eligibility upon joining the European Union, and countries that entered into an FTA with the United States since 1997, but were never eligible for unilateral preferences (i.e. Australia, Singapore). Countries remaining in the sample account for the vast majority of U.S. preferential imports.

Table 5.1: Summary Statistics

Variable	Description	Mean	Std. Dev.
util	Ln (preference utilization share × 100)	4.37	0.46
tariff	Average U.S. MFN tariff	1.61	0.19
rvc	Indicator of imports subject to value content ROO	0.93	0.25
rate2	XRT %Δ, 2-month difference	0.00	0.05
rate3	XRT %Δ, 3-month difference	0.00	0.06
rate4	XRT %Δ, 4-month difference	0.00	0.08
gdp	Ln per-capita GDP	7.52	1.12
distance	Ln distance from United States	8.77	0.68
english	Indicator of ethnic English speaker	0.67	0.47
GSP	Indictor of GSP eligibility	0.92	0.28
GSP+	Indicator of GSP+ eligibility	0.10	0.30
AGOA	Indicator of AGOA eligibility	0.10	0.30
ATPA	Indicator of ATPA eligibility	0.06	0.24
CBERA	Indicator of CBERA eligibility	0.24	0.43
CBTPA	Indicator of CBTPA eligibility	0.12	0.33

Author's calculations based upon specified data.

5.5.3 Results

Before estimating the effect of exchange rates on utilization, I first examine whether or not the more conventional theory on the impact of exchange rates on trade holds true for my data. To that end I regress many of the explanatory variables on total U.S. imports from subject countries, along with the change in the recipient countries' real exchange rates, lagged to various periods.

Table 5.2: Impact on Total U.S. Imports from Preference-Receiving Countries

	expected sign	OLS (1)	OLS, robust (2)	PCSE (3)	outliers removed OLS, robust (4)	outliers removed PCSE (5)
constant		12.47**	3.17	3.17	7.24*	7.24**
		(0.93)	(2.90)	(2.19)	(3.55)	(2.74)
tariff	(+)	1.73**	1.73**	1.73**	1.73**	1.73**
		(0.13)	(0.16)	(0.18)	(0.17)	(0.18)
rate (1 month difference)	(?)	0.28	0.28	0.28	0.31	0.31
		(0.29)	(0.27)	(0.27)	(0.33)	(0.33)
rate (1 month difference, lagged 1 month)	(+)	0.12	0.12	0.12	0.03	0.03
		(0.30)	(0.28)	(0.28)	(0.34)	(0.35)
rate (1 month difference, lagged 2 months)	(+)	-0.16	-0.16	-0.16	-0.25	-0.25
		(0.31)	(0.29)	(0.28)	(0.36)	(0.35)
rate (1 month difference, lagged 3 months)	(+)	0.49	0.49	0.49	0.42	0.42
		(0.30)	(0.28)	(0.28)	(0.35)	(0.34)
gdp	(+)	1.54**	1.54**	1.54**	1.54**	1.54**
		(0.11)	(0.15)	(0.12)	(0.15)	(0.12)
distance	(-)	-1.11**	-0.08	-0.08	-0.08	-0.08
		(0.11)	(0.26)	(0.21)	(0.26)	(0.21)
english	(+)	-1.27**	1.03**	1.03**	-2.64**	-2.64**
		(0.10)	(0.28)	(0.26)	(0.43)	(0.42)
program indicators		yes	yes	yes	yes	yes
country indicators		yes	yes	yes	yes	yes
year indicators		yes	yes	yes	yes	yes
month indicators		yes	yes	yes	yes	yes
Observations		7,140	7,140	7,140	7,132	7,132
R-squared		0.92	0.92	0.92	0.92	0.92

Standard errors in parentheses
* Significant at 5%
** Significant at 1%

Table 5.2 presents these results, under OLS, without and with robust standard errors, as well as with panel-corrected standard errors that account for detected panel heterogeneity and cross-panel correlation. Most variables perform according to expectations, but current and lagged values of changes in the real exchange rate are insignificant across the estimations. Most are positive, indicating that a depreciation of the local currency versus the dollar increased exports to the United States, but the insignificance of the results renders them inconclusive. Thus, it appears that this data does not demonstrate a J-curve effect. The size of the average tariff preference has a positive effect on trade, as does recipient countries' per-capita GDP, which conforms to theory. Whether the country is an ethnic English-speaker has varying results under the different specifications. The distance between the exporting country and the United States, used as a proxy for cost of trade, is negative across specifications but insignificant under robust estimations.

These results are not conclusive, given both the levels of significance as well as the fact that I examine only U.S. imports from the country rather than overall trade balance, but they do provide some confidence that the trade data sample used in this analysis is not inconsistent with trade theory with respect to general economic drivers as well as the impact of exchange rate depreciation on exports. Thus, I feel that it represents a reasonable sample upon which to analyze whether value content ROOs cause this relationship to unwind. I therefore proceed to estimate the regression model as previously specified.

The Breusch-Pagan and likelihood ratio tests indicate the presence of cross-panel correlation and groupwise heteroskedasticity (Chi-squared statistics of nearly 10 thousand), and the Wooldridge test indicates the presence of serial correlation (F statistic of 20.7). Thus, I estimate the model using panel-corrected standard errors and assuming panel-specific autocorrelation, which controls for the panel heterogeneity and cross-panel and serial correlation. I also estimate a version of the model without those observations in which the month to month real exchange rate change was extreme (absolute value greater than 50 percent), to eliminate outliers. Finally, I estimate the model on a subsample of countries whose exports of processed products to the United States comprised at least 50 percent of their overall exports. The theory that exchange rate changes may impact value content ROOs restrictiveness is dependent on the product seeking preferences requiring some level of processing. If a product is wholly obtained in the exporting country, then its satisfaction of the ROO is never in question, and changes in exchange rates would have no impact. Thus, I identify those countries whose exports of raw materials represent high levels of total export to the United States, and thus whose utilization would not be expected to be sensitive to exchange rate changes.[60] I then estimate the model with these countries removed.

[60] Using the Broad Economic Categories downloaded from the World Bank WITS system as a general guide, I identify chapters 1-14, 25-27, and 41 of the Harmonized System as comprised of mostly raw materials. I then identify the percentage of countries' total exports to the United States in these chapters.

Table 5.3: Impact on Countries' U.S. Preference Utilization

	Expected sign	PCSE (1)	PCSE (2)	PCSE (3)	PCSE, outliers removed (4)	PCSE, outliers removed (5)	PCSE, outliers removed (6)	PCSE, 50% processed (7)	PCSE, 50% processed (8)	PCSE, 50% processed (9)
constant								7.43**	7.52**	7.68**
								(0.65)	(0.65)	(0.65)
tariff	(+)	-0.12	-0.14	-0.16	-0.12	-0.56**	-0.62**	-0.57**	-0.61**	-0.66**
		(0.15)	(0.16)	(0.17)	(0.15)	(0.17)	(0.18)	(0.08)	(0.08)	(0.09)
rvc	(?)	0.40**	0.39**	0.39**	0.40**	0.20	0.17	-0.08	-0.10	-0.12
		(0.11)	(0.11)	(0.11)	(0.11)	(0.12)	(0.12)	(0.07)	(0.07)	(0.07)
rate2 (2 month difference)	(?)	0.34*			0.34*			0.23		
		(0.17)			(0.17)			(0.15)		
rvc*rate2	(-)	-0.44*			-0.48*			-0.60**		
		(0.19)			(0.22)			(0.20)		
rate3 (3 month difference)	(?)		0.34*			0.35*			0.22	
			(0.16)			(0.17)			(0.12)	
rvc*rate3	(-)		-0.30			-0.40			-0.50**	
			(0.19)			(0.22)			(0.16)	
rate4 (4 month difference)	(?)			0.37*			0.37*			0.22*
				(0.16)			(0.18)			(0.11)
rvc*rate4	(-)			-0.38*			-0.51*			-0.49**
				(0.18)			(0.22)			(0.15)
gdp	(+)	-0.07	-0.06	-0.08	-0.07	-0.01	-0.02	-0.10	-0.11*	-0.11*
		(0.08)	(0.08)	(0.08)	(0.07)	(0.08)	(0.08)	(0.05)	(0.05)	(0.05)
distance	(-)	0.52**	0.53**	0.54**	0.52**	0.57**	0.59**	-0.16**	-0.16**	-0.16**
		(0.08)	(0.08)	(0.08)	(0.07)	(0.08)	(0.08)	(0.03)	(0.03)	(0.03)
english	(+)	2.14**	2.15**	2.24**	2.14**	-0.11	-0.14	0.30*	0.31*	0.33*
		(0.44)	(0.45)	(0.46)	(0.40)	(0.34)	(0.34)	(0.15)	(0.15)	(0.15)
program indicators		yes	yes	yes	yes	yes	yes	yes	yes	yes
country indicators		yes	yes	yes	yes	yes	yes	yes	yes	yes
year indicators		yes	yes	yes	yes	yes	yes	yes	yes	yes
month indicators		yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations		7,228	7,178	7,128	7,220	7,165	7,112	6,516	6,466	6,418
R-squared		0.91	0.91	0.91	0.91	0.91	0.91	0.28	0.28	0.28

Standard errors in parentheses
* Significant at 5%
** Significant at 1%

These results are presented in Table 5.3. Columns one through three represent panel-corrected standard error estimates of the full balanced data set. Columns four through six report the results for the data without those observations in which the absolute value of real exchange rate change was over 50 percent. Finally, estimates for countries whose exports of processed good were at least 50 percent of total exports are listed in columns seven through nine.[61]

The coefficients of key interest, real exchange rate changes for preferences subject to value content ROOs (*rvc*rate[x]*), are negative throughout the estimation results. This is consistent with the theory that currency depreciation (represented by an increase in the domestic currency per dollar exchange rate) has an inverse effect on preference utilization. These results are significant at the 5 percent level for both a 2- and 4-month difference across both the full data set and with outliers removed. The 3-month difference result is not significant under these two data sets. Results for all three difference periods analyzed are significant at the 1 percent level when analyzing only data from countries whose exports are mostly processed products, and thus more likely to face a binding ROO. The absolute size of the coefficients under the 'processed' data also increases for both the 2- and 3-month (though not for 4-month) differences, indicating that the negative effect of value content rules on utilization is greater, which is also consistent with the theory that countries whose preferential exports are most dependent

[61] When censoring the data to include only countries with 50 percent processed product exports (columns 7-9), the Wooldridge test no longer indicated the presence of serial correlation. Thus, these estimates utilize panel-specific standard errors, but do not control for an AR process.

on satisfying ROOs would be more sensitive to the effect of changing exchange rates on ROOs requirements.

The sizes of the coefficients are economically important. Most of the significant interaction coefficients range between -0.4 to -0.6, which would imply that an increase in the exchange rate of one standard deviation would result in average preference utilization rates of recipients subject to value content ROOs of 2 to 3 percentage points less than those of recipients not subject to RVC rules.

The results for other variables are mixed in terms of their allegiance to expectations. The coefficients of the exchange rate change themselves are uniformly positive and in some cases significant, implying that a currency depreciation otherwise improves preference utilization for non-value content ROOs. The impact of the average MFN tariff is negative and significant for some specifications. The significant negative effects are curious, as we'd expect a positive or insignificant result. These results would suggest that while average preference margins have a positive effect on countries exports, they can have an inverse effect on utilization. This result does not appear to be robust to variations in the countries included in the sample.[62] Coefficients for recipient-country per-capita GDP are negative throughout the sample, but significant only for the majority-processed country data. The impact of distance was significantly positive for the full set of country data, but negative and significant for processed country data. Being an ethnic

[62] Estimating the model only on those countries included in Chapter 4 yields a positive effect of the average MFN tariff on those countries' utilization rates, which is consistent with the actual Chapter 4 results.

English speaker had a positive effect on utilization for all specifications in which the effect was statistically significant.

5.6 Conclusion

This chapter analyses the impact of exchange rate changes on preferential trade in conjunction with value content ROOs, and finds evidence of a unique effect. While currency depreciation would tend to expand exports, value content ROOs act as a limiting factor to such expansion due to the manner in which they determine origin. While the analysis includes some curious results for other variables that are not fully explained, the negative effect of exchange rate depreciation on preference utilization is present across several time periods of change. To the extent that this result can be generalized, it would be particularly relevant to preference programs to developing countries, which may experience currency shifts not infrequently. In the sample, countries such as Indonesia, Malawi, Brazil, Turkey, South Africa, and Madagascar experienced higher absolute shifts in their monthly real exchange rates with the United States. The implication of these results is that alternate ROO types, such as tariff shift, could better insulate such countries' preferential access to the United States from currency volatility, thereby enhancing the benefits from preferential programs. As noted in Chapter 4 however, developing equivalence between RVC and tariff shift or technical ROOs, which would ensure that level of restrictiveness stays neutral, is problematic. Nevertheless, such a change in ROOs type may well be useful to countries with relatively large preferential exports and volatile exchange rates.

Chapter 6: Conclusion

This dissertation examines both new issues related to preferential ROOs, and existing theories using unique data and methods. I analyze whether preferential ROOs, not just the presence of preferential access, have an effect on external tariff reductions and find that more restrictive ROOs do hinder MFN tariff liberalization. This evidence implies that trade agreements with restrictive ROOs are more likely to act as a stumbling block to freer multilateral trade, thereby contributing to the accumulating research on the net effects of preferential agreements.

I empirically examine the general theory of ROOs as constraints on preferential trade using a more direct analysis of ROO-switching and find support for the theory, though it is less than definitive. While increases in ROOs restrictiveness has a strong negative effect on preference utilization, the negative effect on preferential trade flows so often observed in various studies of cross-sectional data, including that used here, is absent. Given the relative scarcity of time-series analysis of ROOs' effect on trade, it is unclear whether this absence represents a result specific to U.S. FTAs, a broad over-measurement by cross-sectional studies of ROOs' negative trade effects, or a mis-calibration of the actual level of ROOs' costs by common tools (r- and h-indices) used to rank them. Examination of how FTA tariff rents are split among manufactured and input good producers substantiates the theory that more restrictive ROOs tend to push such rents towards input producers, however. This provides additional empirical support for the notion that ROOs can be a tool of input industries.

Finally, I analyzed the theory that currency depreciation serves to expand exports as conventional theory suggests, but also makes value content ROOs more difficult to meet, thereby hindering preferential exports. I find support for such an effect, which is generally larger the more exports are composed of multi-stage processing. This indicates that macroeconomic theories of trade and exchange rates may become more complicated when preferential value content ROOs are a significant factor to countries' exports.

These results provide additional evidence concerning the importance of preferential ROOs. Not only do ROOs significantly affect preferential trade and utilization, but they interact with broader trade regime issues such as multilateral liberalization and exchange rate changes. As a greater number of preferential agreements involve more and more countries, their accompanying ROOs will continue to be a critical component determining the agreements' effects. Dealing with the effects of ROOs, those highlighted both in previous literature and here, will pose an increasing challenge to policy makers and export good producers.

The conclusions in this dissertation also lend themselves to further research. My examination of the effects of NAFTA ROOs on U.S. tariff changes in the Uruguay Round focuses on a circumstance in which the relative large country (United States) may have been able to utilize the ROO-tariff relationship more than other countries could. Analysis of whether ROOs play a similar role in smaller countries' MFN tariff decisions would therefore be useful. Additionally, the Chapter 4 results show preferential trade patterns for chapter-level tariff shift and value content ROOs that run contrary to the restrictiveness ordering of the indices commonly used to estimate such ranking. This indicates that further comparison between these dissimilar types of ROOs could be useful. Value content ROOs may impose an additional restrictiveness burden via compliance or enforcement costs not otherwise captured simply by the actual percentage of domestic content required. Finally, the evidence of an interaction between value content ROOs and exchange rates is interesting. While my analysis focused on countries' aggregate preferential utilization rates, a more nuanced analysis could better account for sectors' sensitivity to price effects.

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Appendices

Appendix 1: The R- and H-Indices of ROOs Restrictiveness

Estevadeordal's R-Index and Harris's H-Index represent categorical orderings of ROOs' restrictiveness based upon the language of the ROOs themselves. Both indices operationalize the various types of ROOs (change in chapter, value content, technical requirements, etc.) and combine them to generate a single ordering of restrictiveness. The major difference between the two indices is that the h-index more fulsomely incorporates exceptions and additions to each product's base ROO. The r-index, which was originally crafted to capture NAFTA ROOs, was subsequently adjusted in order to better account for exceptions and ROOs that were not utilized in NAFTA, although this accounting is less comprehensive than that done in the h-index. Below are the ordering ROOs for the r- and h-indices, with an example of how an actual ROO translates into a restrictiveness value under each index.

R-Index Restrictiveness Ordering

The core of the r-index's ordering is based upon the convention that ROOs which require tariff shifts at higher levels of aggregation are more restrictive. Thus, a ROO that requires a change in change in tariff chapter is more restrictive than one that requires a change in heading, which is more restrictive than one that requires a change in subheading, etc. Thus, the index is based upon the observation rule:

$\Delta C > \Delta H > \Delta S > \Delta I$,

where ΔC represents a change in chapter, ΔH a change in heading, ΔS a change in subheading, and ΔI a change in item/product. The index assigns a base value of 1 for a change in product, 2 for a change in subheading, 4 for a change in heading, and 6 for a change in chapter, and then augments these base values based upon additional value content or technical transformation criteria. The observation rule for the original r-index was thus specified as:

ROO requirement	r-index value
$r \leq \Delta I$	r = 1
$\Delta I < r \leq \Delta S$	r = 2
$\Delta S < r \leq \Delta S$ & rvc	r = 3
ΔS & rvc $< r \leq \Delta H$	r = 4
$\Delta H < r \leq \Delta H$ & rvc	r = 5
ΔH & rvc $< r \leq \Delta C$	r = 6
$\Delta C < r \leq \Delta C$ & tech	r = 7

As mention, however, this index was originally created to specifically describe NAFTA ROOs, and has been augmented in order to account for ROO types or combinations not used in NAFTA, as well as to account for exceptions and additions. Cadot et al (2006b) adjusts the core index by increasing its value by one in cases where the tariff change requirement is accompanied by an exception or technical requirement. The impact of value content criteria differ depending on the level required. Value content requirement of 40% or less increase the index value by one, while a requirement of greater than 40% increase it by two. Additionally, if the value content criteria is unaccompanied by any change in tariff requirement, an RVC of ≤ 40% receives a raw index value of four, while a requirement of greater than 40% receives a raw value of 5. Alternatively, additions, by making the ROO less restrictive, decrease the index value by one.

H-Index Restrictiveness Ordering

The h-index is created by generating numeric values for each of the individual ROO components that apply to the specific product, then sum these component values into the composite index.

Change in tariff classification points:	
ΔI	+2
ΔS	+4
ΔH	+6
ΔC	+8
ΔS/ΔH w/AI	+2
Exception points:	
exI	+4
>exI and ≤exS	+5
>exS and ≤exH	+6
>exH and ≤exC	+7
>exC	+8
Addition points:	
addI	-5
>addI and ≤addS	-6
>addS and ≤addH	-7
>addH and <addC	-8
add without CC	+8
Value content points:	
>0% and ≤40%	+5
>40% and ≤50%	+6
>50% and ≤60%	+7
>60%	+8
Net Cost	+1
Other:	
Technical Requirement	+4

Alternative Rule -3

Thus, the h-index disaggregates the exceptions, additions, and value content provisions of ROOs to much greater extent than even the adjusted r-index. It also includes the factors such as type of value content (net cost) calculation and the availability of alternative ROOs in the final calculation of restrictiveness.

Below are a few examples of specific ROOs, and how values for both the (adjusted) r-index and h-index indices are calculate so as to capture restrictiveness.

Example 1: 35 percent regional value content

R-Index = 4. A value content requirement of less than 40 percent, unaccompanied by a tariff shift of technical requirement.

H-Index = 5. A value content requirement of less than 40 percent, unaccompanied by a tariff shift of technical requirement.

Example 2: A change to subheading 3823.70 from any other subheading, except from heading 1520.

R-Index = 3. A change in subheading tariff shift requirement (+2), and an exception (+1 under the adjusted r-index criteria).

H-Index = 10. A change in subheading tariff shift requirement (+4), and an exception of a single heading (+6).

Example 3: A change to heading 84.07 through 84.08 from any other heading, including another heading within that group, 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.

R-Index = 6. A change in heading tariff shift requirement (+4), and a value content requirement of more than 40 percent (+2).

H-Index = 13. A change in heading tariff shift requirement (+6), and a value content requirement of either 60 percent (+7) or 50 percent (+6) under net cost (+1).

Appendix 2: Correlation of H- and Adjusted R-Indices, by HS Section

HS Section	Description	H- and R(Adj)-Index Correlation
1	Live animals, animal products	0.91
2	Vegetable products	0.94
3	Animal or vegetable fats and oils	0.88
4	Prepared foodstuffs; beverages, spirits, and vinegar; tobacco	0.68
5	Mineral products	0.59
6	Products of the chemical or allied industries	0.74
7	Plastics, rubber, and articles thereof	0.82
8	Raw hides, skins, and leather; saddlery; travel goods	0.60
9	Wood and articles of wood	0.64
10	Woodpulp; paper and paperboard	0.54
11	Textiles and textile articles	0.66
12	Footwear, headgear, umbrellas, walking sticks; prepared feathers; artificial flowers	0.85
13	Articles of stone, plaster, cement; ceramic products; glass and glassware	0.53
14	Pearls, precious metals, precious or semi-precious stones	0.56
15	Base metals and articles thereof	0.48
16	Machinery; mechanical appliances; electrical equipment	0.50
17	Vehicles, aircraft, vessels, and associated transport equipment	0.80
18	Medical or surgical instruments; clocks; musical instruments	0.41
19	Arms and ammunition	0.45
20	Miscellaneous manufactured articles	0.53
21	Works of art, collectors' pieces, and antiques	0.92

Source: Author's calculations based upon HS section correlations across a pooled set of U.S. FTA ROO regimes at the 6-digit level. U.S. FTAs included in the calculation are NAFTA, the U.S.-Chile FTA, CAFTA, the U.S.-Morocco FTA, and the U.S.-Bahrain FTA.

Appendix 3: Average ROO Index Values, by HS Chapter

HS Chapter	Avg. H-Index	Avg. (Adj.) R-Index	HS Chapter	Avg. H-Index	Avg. (Adj.) R-Index	HS Chapter	Avg. H-Index	Avg. (Adj.) R-Index
01	8.0	6.0	33	9.5	5.4	65	12.1	5.2
02	8.0	6.0	34	3.8	3.9	66	12.0	5.3
03	8.0	6.0	35	3.5	4.0	67	6.5	4.5
04	13.0	7.0	36	4.5	4.0	68	7.9	5.5
05	8.0	6.0	37	8.3	5.8	69	8.0	6.0
06	8.0	6.0	38	13.1	7.0	70	12.5	5.1
07	8.0	6.0	39	13.1	7.0	71	9.5	5.7
08	8.0	6.0	40	9.5	5.4	72	12.2	5.2
09	8.0	6.0	41	4.9	5.4	73	8.7	5.1
10	8.0	6.0	42	10.2	6.2	74	7.9	4.9
11	8.0	6.0	43	8.0	5.2	75	8.3	5.0
12	8.0	6.0	44	6.0	4.0	76	9.5	4.8
13	8.0	6.0	45	10.3	5.4	78	6.2	6.0
14	8.0	6.0	46	7.3	5.3	79	6.6	6.0
15	8.1	5.7	47	8.0	6.0	80	11.1	5.3
16	8.0	6.0	48	10.2	5.5	81	6.9	4.8
17	7.7	5.7	49	8.0	6.0	82	8.0	6.0
18	7.1	4.8	50	8.9	5.1	83	6.3	5.3
19	8.0	6.0	51	10.8	5.4	84	6.9	4.3
20	8.5	6.1	52	13.8	5.8	85	6.3	3.7
21	8.7	5.9	53	10.4	5.5	86	7.8	4.6
22	12.0	5.2	54	5.0	7.0	87	7.7	5.3
23	7.8	5.8	55	13.8	5.8	88	4.4	2.4
24	2.0	5.0	56	23.0	7.0	89	7.1	5.8
25	8.0	6.0	57	22.0	7.0	90	5.3	4.0
26	8.0	6.0	58	23.0	7.0	91	7.9	6.2
27	10.2	5.5	59	16.2	6.7	92	5.3	5.3
28	12.9	6.9	60	23.0	7.0	93	6.3	5.5
29	13.0	7.0	61	25.9	7.0	94	6.0	5.8
30	3.2	4.0	62	25.9	7.0	95	7.8	5.9
31	7.0	3.0	63	27.0	7.0	96	6.7	5.6
32	12.6	6.1	64	23.0	6.9	97	8.0	6.0

Appendix 4: Average Utilization of U.S. Preferential Access, by HS Section

HS Section	Year							
	2001	2002	2003	2004	2005	2006	2007	2008
1	96%	92%	94%	90%	95%	89%	94%	100%
2	97%	95%	96%	94%	95%	92%	98%	97%
3	93%	74%	48%	87%	53%	86%	85%	98%
4	95%	95%	95%	94%	94%	91%	96%	97%
5	50%	100%	100%	100%	100%	83%	0%	57%
6	83%	80%	80%	75%	74%	86%	78%	76%
7	77%	76%	82%	76%	75%	71%	75%	66%
8	69%	74%	77%	77%	77%	69%	72%	71%
9	97%	91%	96%	85%	88%	81%	88%	85%
11	42%	48%	48%	50%	46%	52%	59%	63%
12	29%	40%	46%	57%	63%	68%	80%	77%
13	88%	88%	86%	86%	87%	72%	80%	79%
14	77%	89%	89%	89%	88%	86%	83%	84%
15	82%	85%	82%	82%	82%	71%	73%	75%
16	51%	50%	52%	57%	55%	45%	44%	43%
17	62%	52%	57%	55%	46%	46%	44%	45%
18	57%	56%	73%	58%	58%	53%	50%	43%
20	85%	82%	85%	83%	80%	70%	72%	91%

Source: Author's calculations based upon product (8-digit HS) utilization rates of U.S. preference-eligible products with positive imports from the eight sample countries identified in Chapter 4.

Appendix 5: Heckman Selection Model Results for Chapter 4 Estimations

dependent variable	pref_imp				pref_util			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
constant	0.44	0.33	0.38	0.39	0.44	0.33	0.38	0.39
	(2.31)	(2.31)	(2.31)	(2.31)	(2.31)	(2.31)	(2.31)	(2.31)
tariff	2.75**	2.60**	2.74**	2.82**	2.75**	2.60**	2.74**	2.82**
	(0.09)	(0.09)	(0.09)	(0.10)	(0.09)	(0.09)	(0.09)	(0.10)
fta	-0.08**	-0.08**	-0.08**	-0.09**	-0.08**	-0.08**	-0.08**	-0.09**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
r_stricter	-0.31**				-0.31**			
	(0.02)				(0.02)			
r_stricter*fta	0.01				0.01			
	(0.02)				(0.02)			
h_stricter		-0.08**				-0.08**		
		(0.02)				(0.02)		
h_stricter*fta		-0.00				-0.00		
		(0.02)				(0.02)		
r_diff			-0.08**				-0.08**	
			(0.01)				(0.01)	
r_diff*fta			0.01				0.01	
			(0.01)				(0.01)	
h_diff				-0.03**				-0.03**
				(0.00)				(0.00)
h_diff*fta				0.01**				0.01**
				(0.00)				(0.00)
gdp	-0.22	-0.22	-0.22	-0.23	-0.22	-0.22	-0.22	-0.23
	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)
transport	-0.23*	-0.22*	-0.20*	-0.20*	-0.23*	-0.22*	-0.20*	-0.20*
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
exp_docs	-0.01	-0.00	-0.00	-0.01	-0.01	-0.00	-0.00	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
exp_days	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
adj_rca	-1.20**	-1.20**	-1.20**	-1.20**	-1.20**	-1.20**	-1.20**	-1.20**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
exp_docs*adj_rca	0.02**	0.02**	0.02**	0.02**	0.02**	0.02**	0.02**	0.02**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
exp_days*adj_rca	-0.07**	-0.07**	-0.07**	-0.07**	-0.07**	-0.07**	-0.07**	-0.07**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
chapter indicators	yes	yes	yes	yes	yes	yes	yes	yes
country indictors	yes	yes	yes	yes	yes	yes	yes	yes
year indicators	yes	yes	yes	yes	yes	yes	yes	yes
Observations	240,575	240,575	240,575	240,575	240,575	240,575	240,575	240,575

Standard errors in parentheses
* Significant at 5%
** Significant at 1%

dependent variable	pref_imp	pref_util
	(1)	(2)
constant	0.80	0.80
	(2.32)	(2.32)
tariff	2.93**	2.93**
	(0.10)	(0.10)
fta	-0.10**	-0.10**
	(0.03)	(0.03)
cc_cs	0.59**	0.59**
	(0.20)	(0.20)
rvc_cc	-0.16**	-0.16**
	(0.04)	(0.04)
rvc_ch	0.03	0.03
	(0.03)	(0.03)
rvc_cs	0.04	0.04
	(0.04)	(0.04)
rvc_tech	-0.13**	-0.13**
	(0.03)	(0.03)
rvcl_rvch	-0.97**	-0.97**
	(0.07)	(0.07)
cc_cs_interact	0.05	0.05
	(0.40)	(0.40)
rvc_cc_interact	0.02	0.02
	(0.03)	(0.03)
rvc_ch_interact	0.01	0.01
	(0.03)	(0.03)
rvc_cs_interact	0.07*	0.07*
	(0.03)	(0.03)
rvc_tech_interact	0.03	0.03
	(0.04)	(0.04)
rvcl_rvch_interact	0.13	0.13
	(0.10)	(0.10)
gdp	-0.26	-0.26
	(0.24)	(0.24)
transport	-0.20*	-0.20*
	(0.09)	(0.09)
exp_docs	-0.01	-0.01
	(0.01)	(0.01)
exp_days	-0.01	-0.01
	(0.00)	(0.00)
adj_rca	-1.20**	-1.20**
	(0.02)	(0.02)
exp_docs*adj_rca	0.02**	0.02**
	(0.00)	(0.00)
exp_days*adj_rca	-0.07**	-0.07**
	(0.01)	(0.01)
chapter indicators	yes	yes
country indictors	yes	yes
year indicators	yes	yes
Observations	241,928	241,928

Standard errors in parentheses
* Significant at 5%
** Significant at 1%

Appendix 6: Countries Used in Chapter 5 Model of ROOs and Exchange Rate Effects

Argentina	Ghana	Nepal
Armenia	Guatemala	Pakistan
Bahamas	Guyana	Panama
Bangladesh	Haiti	Paraguay
Bolivia	Honduras	Peru
Brazil	India	Philippines
Cameroon	Indonesia	Russia
Canada	Jamaica	South Africa
Chile	Jordan	Sri Lanka
Colombia	Kazakhstan	St Kitts-Nevis
Costa Rica	Kenya	St Lucia Is
Cote d`Ivoire	Macedonia	Thailand
Croatia	Madagascar	Trinidad & Tobago
Dominican Republic	Malawi	Tunisia
Egypt	Mauritius	Turkey
El Salvador	Mexico	Uruguay
Fiji	Morocco	Venezuela