A COMPREHENSIVE COMPARISON OF RULES OF ORIGIN IN U.S. TRADE AGREEMENTS

William Powers and Ricky Ubee

ECONOMIC WORKING PAPER SERIES
Working Paper 2020-05-D

U.S. INTERNATIONAL TRADE COMMISSION
500 E. Street SW
Washington, DC 20436

May 2020

Acknowledgments: We are grateful to Mauricio Mesquita Moreira and David Riker for helpful comments and suggestions. We also thank Ken Kawasaki and Mondher Mimouni, whose work on classifying rules of origin made this paper possible.

 Please address correspondence to william.powers@usitc.gov or ravinder.ubee@usitc.gov.

A Comprehensive Comparison of Rules of Origin in U.S. Trade Agreements
William Powers and Ravinder Ubee
Office of Economics Working Paper 2020-05-D
May 2020

Abstract

This paper provides the first comprehensive comparison of rules of origin (ROO) in U.S. regional trade agreements (RTAs), showing considerable heterogeneity of ROO across agreements and sectors. Although NAFTA has been presented in previous literature as a model of U.S. agreements, we show that ROO in later agreements diverge considerably from those in NAFTA. Regional value content requirements are common in RTAs, both in the United States and elsewhere, yet our analysis shows that the share of value added in exports from U.S. preferential trading partners has played little role in the types of ROO that they face. The recent analysis of USMCA has brought attention to the complex nature of motor vehicle ROO in U.S. agreements. We survey the small literature analyzing these ROO to highlight the challenges of estimating the impact of modern ROO.

William Powers, Director, Office of Economics, william.powers@usitc.gov
Ricky Ubee, Research Division, Office of Economics, ravinder.ubee@usitc.gov

Introduction

Recent negotiations of the U.S.-Mexico-Canada Agreement (USMCA) has brought renewed attention to the role of rules of origin (ROO) in trade agreements. Although ROO are often considered—if they are considered at all—as a narrow, technical matter, there is a large and growing literature that shows that ROO can have substantial economic effects. ROO have been shown to affect the scope of trade, raising trade costs while reducing the value and varieties of traded goods. They have also been shown to reshape trade—for example, limiting trade in final goods while boosting trade in intermediates, and diverting trade from global suppliers to regional supply chains.

There are likely thousands of different ROO in RTAs in force today; our dataset shows 214 different classifications of ROO in U.S. agreements alone. Because of the complexity of ROO, empirical analysis of their impacts has often focused on a single trade agreement or industry. The analysis in this paper provides the first unified examination of ROO in all U.S. free trade agreements prior to the USMCA and shows that ROO in U.S. agreements have diverged considerably over the past 25 years. Contrary to the results in the literature showing increasing stringency of global ROO over time, we do not find any overall increase in the stringency of ROO in U.S. RTAs in this period. However, the variety of ROO for the same products has increased as the number of agreements has risen.

ROO can vary considerably in their effects on trade. While the literature has not shown that one type of ROO is universally the least costly, it is clear that the cost of complying with ROO rises when they vary considerably across products or across agreements, and that harmonizing ROO or allowing other regime-wide facilitation measures such as cumulation can reduce costs and increase utilization of trade agreements.

The complexity of the ROO substantially increase the difficulty quantifying their effects, and the data requirements of the analysis are high. Common trade policy models, such as CGE models, can capture upstream and downstream linkages but lack the product-level detail that reflect how ROO are actually applied. Custom-built partial equilibrium models can provide a tool for ROO analysis, though they require information at the level of the firm or even on individual products. The small literature examining auto ROO in the recently negotiated USMCA provides some useful examples, and highlights the challenges of undertaking the analysis of even a single sector.

Although ROO provide a gateway to preferential tariff treatment, they can also impede competitiveness in the face of changing technology and global sourcing. As demonstrated by USMCA, ROO can affect trade in major sectors of the economy for both developed and developing countries. Getting a better understanding of how ROO affect trade is increasingly important, even as recent changes to U.S. agreements may be increasing the complexity of these rules in some sectors and making them more difficult to analyze.

The rest of the paper is organized as follows. The next section provides a review of relevant academic literature on the impacts of ROO. Then we provide a discussion of the data we use, followed by an analysis of ROO across RTAs and industries, a discussion of the ROO in USMCA, and a conclusion.

Relevant literature

Preferential ROO—hereafter, simply ROO—are the criteria that must be met to confer origin on an import in order for it to enter under a preferential duty rate. Broadly, ROO criteria fall into one of three categories:

- Change in Tariff Classification (CTC): A requirement that a product be processed to the point of changing tariff lines at either the chapter, heading, or subheading level.
- Regional Value Content (RVC): A requirement that the product contain a certain amount or share of value added from an eligible country, or set of countries, specified in the agreement.
- Technical requirements: A requirement that the product undergo a special process.

There are likely thousands of different ROO in RTAs in force today, given that (i) there are numerous types of technical requirements; (ii) ROO can require multiple criteria be met; and, conversely (iii) ROO can provide importers a choice in the criteria used to confer origin. It is possible to find individual ROO that include all three of these complicating factors. This paper relies on a dataset of ROO in all U.S. RTAs prior to USMCA. The dataset was produced by the National Graduate Institute for Policy Studies (GRIPS) in Tokyo and the International Trade Centre in Geneva. It contains 214 distinct types of ROO.

The literature on the effects of ROO has developed substantially since Herin (1986). Since that time there have been dozens of papers quantifying the restrictiveness, determinants, and impact of ROO. Many studies have examined the extent to which ROO increase cost, consistently finding an average ad-valorem equivalent trade cost in the range of 2–5 percent (e.g., Herin, 1986; Cadot et al., 2006a; Francois et al., 2006; Cadot and Ing, 2016). These trade costs can offset a substantial share of preferential tariff margins granted by an RTA. Despite this consistency in estimates, Estevadeordal and Suominen (2004) find that ROO restrictiveness has increased substantially over time. Beyond the average, studies consistently find that ROO are more stringent in sectors with tariff peaks, such as apparel, footwear, and motor vehicles. For example, Cadot and Ing (2016) examine ASEAN agreements and find that, while the average AVE in these agreements is only 3.4 percent, costs in the apparel sector can exceed 35 percent.

Many studies use product-specific ROO information gleaned from tariff schedules in trade agreements. ROO are generally defined at the HS 6-digit level, with over 5,000 products per agreement. Hence, gathering this information is a data-intensive effort, and these studies tend to rely on a limited number of agreements (often only one or two). Table 1 summarizes the results in for selected studies employing product-specific ROO.

Table 1 Analyses of product-specific ROO

Study, year	Regions or agreements	Selected results
Restrictiveness indexes		
Estevadeordal, 2000	NAFTA	ROO more restrictive when preference margin is higher, and when potential for trade deflection is higher
Cadot et al., 2006a	NAFTA, EU	Utilization declines with more stringent ROO; stricter ROO associated with higher preference margins
Harris, 2007	13 RTAs in the Americas	Index allows for multiple types of ROO combinations
Kelleher, 2013	15 RTAs in the Americas and Asia	Modifies Harris index to account for regime-wide facilitation such as cumulation[a]
Effects and determinants		
Carrere and de Melo, 2005	NAFTA	Ranking of ROO costs: CTS<RVC<Technical; combined ROO can be particularly costly, though RVC combinations less so
Cadot et al., 2005	NAFTA (textiles only)	Preference utilization higher for intermediates than final goods; technical ROO particularly expensive; U.S. exporters of inputs capture large price gains
Cadot et al., 2006b	NAFTA	Endogenous trade policy model shows ROO determined by tariffs and exports of upstream intermediate goods; ROO are "hidden export subsidy" to intermediate goods producers
Francois et al., 2006	EU RTAs with Africa, Caribbean, and Pacific	Threshold analysis indicates preference margins above 4% lead to preference utilization
Carrere et al., 2010	ASEAN-EU	Higher preference margins coincide with more restrictive ROO
Cadot and Ing, 2016	About 10 ASEAN RTAs	Textiles ROO most restrictive, with AVE over 35%; allowing importers a choice among ROO lowers costs and increases trade
Hayakawa and Laksan-apanyakul, 2017	ASEAN+1 and Thai RTAs	Harmonization to stringent ROO reduces utilization, while harmonization to less restrictive ROO (e.g., allowing choice) expands utilization
Conconi et al., 2018	NAFTA	ROO contribute to regionalization of GVCs and reduce 3rd-country imports of inputs

[a] Kelleher includes both product-specific and regime-wide ROO.

A major strand of this literature focuses on categorizing the restrictiveness of different types of ROO. This task is made more difficult by the multiplicity of types of ROO noted above. While studies do not agree on an exact ranking of the restrictiveness of types, and it is unlikely that a single ranking of ROO would apply equally well to all agreements, studies commonly agree that technical requirements are the most costly type of ROO (e.g., Carrere and de Melo, 2005; Cadot et al., 2005; Kelleher, 2013). The literature has not

consistently found whether CTC or RVC requirements have the lowest cost of compliance.[1] However, there is some evidence that in combination with other criteria, RVC requirements add relatively low costs (Cadot and Ing, 2016). In a related line of research, Hayakawa and Laksanapanyakul (2017) shows that harmonization of ROO across agreements can also increase exports, though not uniformly. Harmonization to stringent ROO (e.g., requiring multiple criteria) can actually reduce preference utilization, while harmonization to less restrictive ROO (e.g., allowing choice) expands utilization.

While the literature clearly demonstrates that restrictive product-specific ROO reduce trade, a separate strand shows that ROO allowing regime-wide flexibility in RTAs can expand it (table 2). Studies consistently find that cumulation and de minimis rules expand trade (e.g., Estevadeordal and Suominen, 2004 and 2005; Park and Park, 2011). Effects can be large; for example, Andersson (2016) finds that cumulation increased exports of final goods from the Southern Mediterranean countries to the EU-15 by about 20 percent and increased export diversification by about 5 percent. Though a strong effect, there are some limitations. Some studies find that the magnitude can vary by country and direction of trade (Bensassi et al., 2012; Bombarda and Gamberoni, 2013), and not all types of facilitation expand trade equally (Kim, Park, and Park, 2013).

Table 2 Analyses of regime-wide flexibility and related RTA effects

Study, year	ROO data[a]	Regions or agreements	Selected results
Estevadeordal and Suominen, 2004	PS, RW	28 RTAs, global coverage	Globally, ROO restrictiveness rose considerably 1981–2001; regime-wide facilitation boosts trade
Estevadeordal and Suominen, 2005	RW	155 countries	Regime-wide facilitation boosts trade; restrictive ROO in final goods markedly increase trade in intermediates
Park and Park, 2011	RW	154 countries	Diagonal cumulation has stronger effects on trade than bilateral cumulation; full cumulation creates the most trade
Bensassi et al., 2012	RW	6 MENA RTAs	Diagonal cumulation increases trade, though not for every country in MENA
Keck and Lendle, 2012	None	US, EU, Canada, and Australia	Utilization increases with both the preferential margin and the volume of exports
Bombarda and Gamberoni, 2013	PS, RW	Hub and spoke trade in EU	Cumulation increases trade from spokes to hub
Kim, Park, and Park, 2013	RW	151 countries	Diagonal cumulation and de minimis (though not certification type) increase trade
Andersson, 2016	RW	9 Mediterranean exporters to EU	Cumulation increases exports of final goods
Felbermayr et al., 2019	None	129+ countries	Limited potential for trade deflection in RTAs

[a] PS = product specific; RW = regime wide.

[1] Partly, this lack of consistency is due to the fact that the ROO index in Estevadeordal (2000), which serves as the basis of many later studies, does not have a category solely for RVC criteria. Estevadeordal used NAFTA to generate his ranking. As we show below, RVC criteria in NAFTA occur only in combination with other criteria.

In practice, utilization of ROO depends on the characteristics of individual firms, some of which choose to satisfy ROO and obtain preferential access, while others do not. Relatively little work on this topic has been done to date, and there appears to be no studies of ROO effects employing firm-level data other than the studies by the USITC and the Center for Automotive Research discussed below. Bombarda and Gamberoni (2013) model the effects of ROO in a heterogeneous firm context, which provides testable implications for extensive and intensive margins. Keck and Lendle (2012) find that utilization increases with the volume of exports; although they do not explicitly model firm heterogeneity, they note that this finding suggests that the fixed costs of ROO may be substantial.

The literature provides clear evidence that ROO affect the location of international production. Multiple studies have found that ROO are more stringent in final goods sectors, resulting in increased trade in intermediate inputs (e.g., Carrere and de Melo, 2004; Cadot et al 2005; Estevadeordal and Suominen, 2005). Cadot et al. (2006b) and Conconi et al. (2018) highlight the importance of using upstream-downstream links contained in input-output tables to accurately estimate the connection between inputs and more processed goods. Conconi et al. (2018) further show that the increase in intermediate trade between partners results in substantial contraction in trade of intermediates with third countries, leading to the regionalization of supply chains. Cadestin et al. (2016) show that ROO constrain integration into global value chains, i.e., that they reduce foreign value in exports.

The related literature on trade in value added (TiVA) is voluminous and growing. To date, Cadestin et al. (2016) appears to be the only paper to incorporate TiVA data into ROO analysis. It appears that no papers, however, have examined whether increased domestic value in exports increases preferential trade or preference utilization. Given the prevalence of RVC criteria in RTAs, this would appear to be a fruitful area of investigation. Our analysis in the next section, while not a formal model, provides a first look into this topic.

A comprehensive look at ROO in US RTAs

Although numerous studies cited above have examined ROO in U.S. RTAs, none has provided a comprehensive treatment.[2] The analysis below provides the first unified look at all ROO across all U.S. RTAs prior to USMCA. Our analysis shows considerable lack of harmonization across U.S. agreements, even within sectors, which can increase costs of compliance and reduce preference utilization. Our analysis also incorporates estimates of domestic value added by the exporter in trade with the United States, which can be an important component of ROO utilization given that U.S. agreements commonly include RVC components. We conclude with an examination of motor vehicle ROO in U.S. agreements. A comparison of existing estimates of the effects of motor vehicle ROO in USMCA shows that analyzing these complex requirements in detail requires custom-built models and data at the level of the firm for specific products.

Our analysis employs an innovative new database developed by GRIPS and the International Trade Centre which categorizes ROO associated with U.S. RTAs and U.S. trade preference programs at the HS6 level. For the purposes of this analysis, we exclude unilateral preference programs and include all 14 U.S. RTAs with the 20 associated trading partners. Although the GRIPS-ITC database provides a simplified way of categorizing ROO, it still holds 214 unique classifications of ROO since ROOs are so complex and

[2] The highest number of U.S. agreements in previous studies appears to be six, in Cadestin et al. (2016); Estevadeordal and Suominen (2004) include four.

heterogeneous. We further simplify the GRIPS-ITC classifications by aggregating them into the following seven categories, including the three categories discussed above and several joint categories.

1. **CTC:** A requirement that a product be processed to the point of changing tariff classification at either the chapter, heading, or subheading level.
2. **RVC:** A requirement that the product contain a certain amount or share of value added from an eligible country, or set of countries, specified in the agreement.
3. **CTC or RVC**: A requirement that allows importers to choose whether to comply with either a tariff classification change or a value-added requirement.
4. **CTC + RVC:** The product must meet both a tariff line change and value-added requirement.
5. **Combo:** The ROO provides a choice between either a tariff classification change (generally a change in chapter) or meeting both a less stringent tariff classification change (e.g., change in subheading) and a value added requirement.
6. **Other:** Other types of requirements, such as the requirement that all parts of a product are wholly obtained from RTA partners, or a technical requirement that the product undergo a special process.[3]

U.S. RTAs can be categorized into two ROO regimes: the five agreements with countries in Middle-East and North Africa (MENA), which generally follow the approach of the U.S.-Israel agreement, and the nine other agreements, which more closely follow NAFTA (table 3). Rules also differ within these two groups, as rules depend on negotiations with specific partners, and prior agreements can serve as the basis of subsequent negotiations. Because there can be a considerable lag between when an agreement is negotiated and when it enters into force, the date that negotiations began provides a better reference for the evolution of U.S. agreements than the date that agreements entered into force. For example, Peru and Columbia began negotiations in the same year (2004) and show remarkable consistency in tables 3 and 4, yet they entered into force five years apart—Peru in 2007 and Colombia in 2012. Like Peru and Colombia, Bahrain and Oman were negotiated at nearly the same time and have the same share of ROO in each category (though not the same ROO in all cases).

The U.S.-Israel agreement provides the foundation for all agreements in MENA. It is also the simplest U.S. agreement, with all preferential imports requiring compliance with a uniform 35-percent regional value content (RVC) criterion. Subsequent MENA agreements incorporated new rules, largely for textile and apparel imports. For example, the U.S.-Jordan RTA includes process requirements; in the case of textiles, some fabric must "be both dyed and printed in a Party, and such dyeing and printing is accompanied by 2 or more" finishing operations such as bleaching or embossing. Other MENA agreements introduced tariff shift rules requiring a change in chapter or heading for textiles and apparel, as well as a few sensitive agricultural commodities.[4]

[3] In about 1 percent of cases, ROO are defined at a finer level of disaggregation than HS-6 and contain a mix of categories within the HS6; these cases are included in the "other" category.

[4] For further details, see USITC, 2004, p. 11–13; and USITC, 2006, p. 2-4 to 2-6.

Table 3 Share of tariff lines subject to each ROO category, by RTA

RTA (start of negotiations)	CTC	RVC	CTC or RVC	CTC+RVC	Combo	Other	Total
MENA							
Israel (1984)	—	100.0	—	—	—	—	100
Jordan (2000)	—	83.4	—	—	—	16.6	100
Morocco (2003)	14.0	80.3	—	—	0.2	5.5	100
Bahrain (2004)	11.4	83.0	—	—	—	5.6	100
Oman (2005)	11.4	83.0	—	—	—	5.6	100
All MENA	7.4	85.9	—	—	—	6.6	100
Non-MENA							
NAFTA (1988)	59.8	—	0.4	4.3	28.7	6.8	100
Chile (2001)	80.3	—	1.2	4.4	7.2	7.0	100
Singapore (2001)	79.9	—	1.4	4.6	3.7	10.5	100
DR-CAFTA (2003)	80.0	0.8	3.0	3.2	5.0	7.9	100
Australia (2003)	80.3	0.3	2.7	3.8	5.2	7.7	100
Peru (2004)	79.3	0.8	3.6	3.7	5.2	7.4	100
Colombia (2004)	79.3	0.8	3.6	3.7	5.2	7.4	100
Panama (2004)	80.7	0.7	2.6	2.8	5.9	7.3	100
Korea (2006)	81.7	0.7	2.1	3.2	5.4	7.0	100
All non-MENA	78.0	0.5	2.3	3.7	7.8	7.7	100
All RTAs[a]	52.7	26.4	1.5	2.4	5.1	11.9	100

Source: Authors' calculations based on GRIPS and International Trade Centre, 2019, "U.S. Rules of Origin database." Start dates of negotiations (other than NAFTA and Israel) from CEA, 2009, p. 133.

[a] Calculated as the unweighted share of tariff lines in each category across all agreements.

Table 4 Number of tariff lines subject to each ROO category for the Colombia and Peru RTAs

ROO category in Colombia RTA	ROO category in Peru RTA						
	CTC	RVC	CTC or RVC	CTC+RVC	Combo	Other	Total
CTC	4,143	0	0	0	0	0	4,143
RVC	0	43	0	0	0	0	43
CTC or RVC	0	0	187	0	0	0	187
CTC+RVC	0	0	0	193	0	0	193
Combo	0	0	0	0	269	0	269
Other	0	0	0	0	0	387	387
Total	4,143	43	187	193	269	387	5,222

Source: Authors' calculations based on GRIPS and International Trade Centre, 2019, "U.S. Rules of Origin database."

NAFTA provided the basis for all other U.S. agreements, though substantial divergence from NAFTA has occurred over time. The majority (59.8 percent) of NAFTA ROO require a tariff shift, most commonly a change in chapter. NAFTA is unusual in its reliance (28.7 percent) on what we have termed "combo" ROO, which provide alternative methods of conferring origin; generally either (i) a stringent tariff shift, such as a change in chapter; or (ii) a combination of a less-stringent tariff shift, such as a change in subchapter, and an RVC criterion.[5] Other U.S. agreements use these "combo" rules less frequently, often eliminating the RVC criteria and instead relying on tariff shift requirements.

Although NAFTA has been the focus of much of the literature, this analysis shows for the first time how much it stands out from the other U.S. agreements. The extent of its reliance on RVC criteria puts it in a unique position, much below the MENA agreements, and considerably above the other non-MENA agreements. Prior analysis focused either exclusively on a single agreement, generally NAFTA (e.g., Carrère and de Melo, 2004; and Conconi et al., 2018) or included, at most, six U.S. agreements (Cadestin et al., 2016). This finding throws into question how much NAFTA-based results can be relied on as a guide to the nature and restrictiveness of U.S. ROO in other agreements.

U.S. RTAs tend to apply fairly consistent mix of ROO across multiple sectors. Hence, MENA agreements apply RVC criteria in most sectors, while non-MENA agreements apply tariff-shift criteria in most sectors. There are a few exceptions, however, including textiles and apparel, rubber and plastics, and motor vehicles.

Table 5 decomposes ROO by sector for free trade agreements with non-MENA partners and presents incidence of each of the ROO categories. There are a few notable patterns in the data. First, the majority of industries are dominated by CTC ROO. Second, only a few industries—textiles and apparel and coke and refined petroleum—are characterized by a substantial fraction of "other" (i.e., special processing) criteria. The prevalence of processing requirements in textiles and apparel, and the high compliance costs associated with these relatively stringent ROO, have long been noted in the literature (e.g., Cadot et al., 2005; and Cadot and Ing, 2016), though little attention has been paid to such requirements in other sectors. Third, rubber and plastics have by far the highest incidence of ROO requiring both a change in tariff classification and an RVC requirement. Lastly, motor vehicles stand out by facing the broadest mix of ROO, which is discussed further below.

[5] These combination ROO predominate in the chemicals sector and in the computers, electronics, machinery and equipment sector.

Table 5 Share of tariff lines subject to each ROO category, by industry, for non-MENA RTA partners

Industry	CTC	RVC	CTC or RVC	CTC+ RVC	Combo	Other	Total
Agriculture, forestry, and fishing	96.1	—	—	—	—	3.9	100
Mining and quarrying	100.0	—	—	—	—	—	100
Food, beverages, and tobacco	95.4	—	—	0.0	0.2	4.3	100
Textiles, apparel, and leather	62.7	—	—	2.0	—	35.3	100
Wood, wood products, and cork	100.0	—	—	—	—	—	100
Paper products and printing	100.0	—	—	—	—	—	100
Coke and refined petroleum products	75.6	—	—	—	4.2	20.2	100
Chemicals and pharmaceuticals	88.3	—	0.0	0.7	10.8	0.2	100
Rubber and plastic products	55.0	—	4.3	33.9	6.7	0.1	100
Other non-metallic mineral products	99.8	—	0.2	—	—	—	100
Basic metals	91.4	0.1	1.4	2.2	3.2	1.7	100
Fabricated metal products	86.3	2.0	0.5	—	11.1	—	100
Computers, electronics, and machinery and equipment	71.9	0.6	4.3	8.3	12.3	2.6	100
Motor vehicles and parts	17.2	20.7	15.8	18.6	27.4	0.3	100
NAFTA	18.4	—	1.3	36.8	40.8	2.6	100
Non-MENA ex-NAFTA	11.5	51.6	10.9	10.1	15.9	0.1	100
Other transport equipment	61.0	—	1.0	2.3	33.7	1.9	100
Other manufacturing	62.2	0.1	9.6	1.5	25.3	1.3	100
All industries[a]	78.0	0.5	2.3	3.7	7.8	7.7	100

Source: Authors' calculations based on GRIPS and International Trade Centre, 2019, "U.S. Rules of Origin database."
[a] Calculated as the unweighted share of tariff lines in each category across all industries.

The literature has identified a number of determinants of preference utilization, including the preference margin, the volume of imports, and the type of ROO that imports face. We include these factors in table 6 below, along with a new focus on domestic value-added contributions.[6] However, there is limited analysis in the literature on the role of value added by partners. We showed above that RVC criteria are a common requirement for some industries to obtain origin. But, the difficulty traders face to meet RVC thresholds may be impacted by how much value added is provided by an RTA partner. Table 6 shows that the share of value added in U.S. imports from preferential trading partners has played little role in the types of ROO that they face. For example, NAFTA has a relatively low value added share in U.S. imports, and a relatively high share of RVC-based ROO. On the other hand, Singapore and Korea also have low domestic value-added shares in imports, and low shares of RVC-based ROO. Finally, not much can be said conclusively about the MENA countries due to the lack of value-added statistics, but to the extent that their economies produce high-value-added primary commodities, the high share of RVC-based ROO could

[6] Nearly all preferential tariff rates in 2015 were zero. For the purposes of this analysis, we assume that all preferential rates are zero. Therefore, the preference margins in table 6 and table 7 equate to the trade-weighted average of MFN tariffs.

complement their trade structure. Given the variability of ROO criteria at the product-level, further analysis at the product level is warranted to find clearer correlations.

Table 6 Determinants of preference utilization, by agreement

RTA	Preference utilization[a] (%)	Preference margin (%)	U.S. imports (billion $)	Partner value added share in imports (%)	ROO Decomposition		
					CTC	Any RVC[b]	Other
MENA							
Israel	12.6	0.7	23.9	73.9	—	100.0	—
Jordan	95.2	23.2	1.4	[c]	—	83.4	16.6
Morocco	29.7	4.0	1.0	70.2	14.0	80.5	5.5
Bahrain	63.3	5.5	0.8	[c]	11.4	83.0	5.6
Oman	67.3	3.7	0.9	[c]	11.4	83.0	5.6
All MENA	20.7	2.2	28.1	[c]	7.4	86.0	6.6
Non-MENA							
NAFTA	56.0	2.6	564.9	68.8	59.8	33.4	6.8
Chile	56.3	1.4	8.6	74.9	80.3	12.8	7.0
Singapore	21.8	2.0	15.6	56.7	79.9	9.6	10.5
DR-CAFTA	58.9	8.9	23.0	74.5	80.0	12.0	7.9
Australia	50.3	1.6	10.2	80.5	80.3	12.0	7.7
Peru	55.0	4.7	5.0	84.7	79.3	13.3	7.4
Colombia	40.4	1.0	13.4	79.5	79.3	13.3	7.4
Panama	17.3	0.8	0.2	[c]	80.7	12.0	7.3
Korea	26.3	1.7	68.1	68.6	81.7	11.3	7.0
All non-MENA	52.1	2.6	708.9	[c]	78.0	14.3	7.7
All RTAs	50.9	2.6	737.0	[c]	52.7	40.0	7.3

Source: Authors' calculations based on GRIPS and International Trade Centre, 2019, "U.S. Rules of Origin database." OECD Trade in Value Added database (TiVA) 2018 edition. USITC DataWeb/USDOC (accessed December 2, 2019).

[a] Preference utilization is the value of imports that enter under a preferential tariff as a share of total imports for consumption from the RTA partner. "All RTAs" presents the trade-weighted average.

[b] "Any RVC" includes all categories with any RVC criteria (RVC, CTC or RVC, CTC+RVC, and combination)

[c] Not available in the OECD TiVA database.

Consistent with the literature, table 7 shows that preference margins are clearly correlated with preference utilization, with the three sectors that have the highest preference utilization also facing the highest MFN tariffs. The high preference utilization in textiles and apparel is particularly notable, because of the numerous technical requirements (here, categorized in "other"), which the literature notes are the most costly type of ROO. Turning to value added, primary products such as agriculture, mining, food, and wood—with high value added shares contributed by partners in U.S. imports—exhibit no particular pattern in preference utilization. Similarly, sectors with low value added in exports, such as refined petroleum, computers, and motor vehicles, do not have notably low preference utilization. These results indicate that the effects of value added on preference utilization, and their interaction with the RVC criteria, will require further analysis at the level of the product, controlling for other determinants given here.

Table 7 Determinants of preference utilization, by industry

Industry	Preference utilization[a] (%)	Preference margin (%)	U.S. imports (billion $)	Partner value added share in imports (%)[b]	ROO Decomposition		
					CTC	Any RVC[c]	Other
Agriculture, forestry, and fishing	55.8	1.3	16.9	85.3	60.9	36.6	2.5
Mining and quarrying	7.6	0.1	3.3	88.5	64.4	35.6	—
Food, beverages, and tobacco	64.9	3.6	51.9	80.0	63.2	34.0	2.8
Textiles, apparel, and leather	84.8	16.2	21.5	71.4	53.0	11.0	36.0
Wood, wood products, and cork	17.3	0.8	11.7	81.0	64.1	35.9	—
Paper products and Printing	—	0.0	9.4	76.6	64.5	35.5	—
Coke and refined petroleum products	51.4	0.2	94.3	56.1	48.6	38.4	13.0
Chemicals and pharma	27.3	1.8	36.2	69.6	56.7	43.2	0.2
Rubber and plastic	90.2	4.5	26.4	67.0	35.4	64.5	0.1
Other non-metallic mineral products	56.9	3.4	5.1	75.2	65.7	34.1	0.3
Basic metals	37.1	1.0	38.1	71.5	59.4	39.5	1.1
Fabricated metal products	76.3	3.4	4.8	73.3	55.5	44.5	—
Computers, electronics, machinery and equip.	38.7	1.4	178.3	69.1	46.1	52.2	1.7
Motor vehicles and parts	84.8	5.2	151.3	64.9	12.0	87.7	0.3
Other transport equip.	5.5	0.1	12.8	70.7	39.3	59.4	1.4
Other manufacturing	14.5	0.7	74.8	75.1	41.3	57.4	1.3
All industries	50.9	2.6	737.0	73.4	52.7	40.0	7.3

Source: Authors' calculations based on GRIPS and International Trade Centre, 2019, "U.S. Rules of Origin database." OECD Trade in Value Added database (TiVA) 2018 edition. USITC DataWeb/USDOC (accessed December 2, 2019).

[a] Preference utilization is the value of imports that enter under a preferential tariff as a share of total imports for consumption from the RTA partner. "All industries" presents the trade-weighted average.

[b] Average value added shares are only based on the countries for which data is available (see table 6).

[c] "Any RVC" includes all categories with any RVC criteria (RVC, CTC or RVC, CTC+RVC, and combination)

Motor vehicle ROO in U.S. agreements

As mentioned in the industry-level analysis earlier, ROO in the motor vehicles industry tend to be complex, with an unusual reliance on RVC criteria—on average, over 85 percent of tariff lines in this sector can obtain origin by meeting RVC criteria (table 8). The U.S. RTA with Korea is notable among the non-MENA agreements, with an unusually high share of RVC–based ROO in the motor vehicle sector. In addition to the variation in the share of RVC criteria across agreements, the level of value-added required by product

to confer origin can vary greatly. Notably, the U.S. RTAs with Korea and Australia have the least stringent motor vehicle ROO, while NAFTA has the most restrictive (table 9).

The recently enacted USMCA, which replaces NAFTA, builds upon the ROO in NAFTA in terms of both strictness and complexity. Firstly, it increases the value-added requirements for vehicles to obtain origin from 62.5 percent to 75 percent. Secondly, it incorporates a new type of value added ROO—labor value content (LVC)—which requires that a share (at least 40% for cars and 45% for light trucks) of vehicle production costs or expenditures must be at a base wage of $16 per hour or higher. If the producer uses an engine, transmission, or battery plants that pays a high-wage, then it may receive a 5% credit towards the LVC threshold. These ROO changes have led to considerable attention on this sector and have given rise to some new analyses of their effects.

Table 8 Share of motor vehicle and parts tariff lines subject to each ROO category, by RTA

RTA	CTC	Any RVC[a]	Other	Total
MENA				
Israel	—	100.0	—	100
Jordan	1.3	98.7	—	100
Morocco	13.2	86.8	—	100
Bahrain	—	100.0	—	100
Oman	—	100.0	—	100
Non-MENA				
NAFTA	18.4	78.9	—	100
Chile	18.4	81.6	—	100
Singapore	19.7	80.3	—	100
DR-CAFTA	18.4	81.6	—	100
Australia	18.4	81.6	—	100
Peru	18.4	81.6	—	100
Colombia	18.4	81.6	—	100
Panama	18.4	81.6	—	100
Korea	5.4	94.6	—	100
All RTAs[b]	11.9	87.8	—	100

[a] "Any RVC" includes all categories with any RVC criteria (RVC, CTC or RVC, CTC+RVC, and combination)

[b] Calculated as the unweighted share of tariff lines in each category across all agreements.

Table 9 Motor Vehicle ROO in Selected U.S. Trade Agreements

RTA	Entry into force	Motor vehicle RVC and LVC thresholds
USMCA	—	Regional value content (RVC) of at least 75% for passenger vehicles and light trucks; 75% for "core" parts, such as engines, transmissions, and chassis; 65–70% for other parts, such as tires, A/C, and headlamps; and 70% for steel and aluminum. Labor value content (LVC): A share of production expenditures (40% for passenger vehicles and 45% for light trucks) must go towards high-wage assembly plants, and high-wage research and development and IT.
NAFTA	1994	RVC of at least 62.5% using the net cost requirement for passenger automobiles, light trucks, and their engines and transmissions; for other vehicles and auto parts, the threshold is 60%.
Australia	2005	RVC of not less than 50% under the net cost method for automotive products.
Korea	2012	One of three RVC tests can be used: not less than 55% under build-down; not less than 35% under build-up; and not less than 35% under the net cost method.

Source: Canis, et al., 2017, p. 16.; Schultz et al., 2019, p. 7; USITC, 2019, p. 76–80.

Effects of USMCA motor vehicle ROO

The complexity of USMCA's new ROO add to the challenge of estimating the impacts of ROOs in the motor vehicle sector. ROO have nuanced effects that depend on the location of production and the sourcing of core parts. Effects can vary by motor vehicle producers, and even by individual motor vehicle models within a firm (such as the Dodge Ram or the Toyota Camry). For this reason, a model at a highly granular level is much more likely to capture the economic effects of the ROO. The analyses discussed below by the Center for Automotive Research and the USITC use such granular data, though only the USITC provides a formal model of the effects. In contrast, Burfisher, et al. (2019) uses a CGE model to develop broad estimates of the ROO impacts.

Burfisher, et al. (2019) use the GTAP model to analyze the impact of USMCA on a number of economic outcomes related to the motor vehicles industry. Their model splits the motor vehicles and vehicle parts sectors from an aggregate and incorporates a number of assumptions. The authors' assume that the increased costs for firms to comply with the USMCA ROO halves the remaining benefits gained from importing under preferential tariffs. They implement this change in trade costs by increasing the amount of the preference margin that ROO consume for U.S. and Canadian imports of vehicles from 50 percent to 75 percent, and by applying a 3 percent tariff on imports of Mexican vehicles. They also assume that all North American trade in auto parts moves entirely to MFN rates and that LVC requirements will raise wage rates in the Mexican auto sector by 50%. These higher costs reduce production of vehicles and parts across all three markets and induce more vehicle and vehicle parts sourcing from non-USMCA markets. In the United States, motor vehicle production decreases by 0.03 percent (or $135 million) and auto parts production drops by 0.44 percent (or $1.25 billion). This contrasts with the results of USITC (2019), discussed further below, which estimates that companies will increase parts production in the United States.

There are a few estimates in the literature that estimate the impact of USMCA ROO using information on specific motor vehicle models. Of these, the reports from the Center for Automotive examine the ability

of vehicle models currently produced in North America to comply with USMCA ROO, and assume that vehicle models not in compliance will pay higher MFN tariffs rather than adjust the location of parts production—again, different from the treatment in USITC (2019). In the 2018 report, Dziczek et al. estimate that there are between 22 and 40 vehicle models imported from Canada or Mexico that qualify under NAFTA ROO that would not qualify under USMCA. These vehicle models represent 13–24 percent of all vehicles sold in the U.S. market in 2017. The authors assume that automakers would pay the higher MFN tariff rates on these vehicles, raising costs by $470–2,200 per vehicle. USMCA would result in lower U.S. production and exports, and, assuming the manufacturers pass along the entire tariff cost to the consumer, at least 60,000–150,000 lost U.S. light vehicle sales. In the 2019 update of the report, Schultz et al. estimate that 24 imported vehicle models that currently qualify for NAFTA would not qualify for USMCA, resulting in a 0.22 percent increase in the U.S. consumer prices of vehicles assembled in Canada and a 1.70 percent increase in the prices of vehicles imported from Mexico. These price effects are in line with U.S. price changes estimated in USITC (2019), despite the difference in assumptions on sourcing.

To estimate the effects of USMCA ROO on the motor vehicle and parts sector, USITC (2019) uses a formal model of competition among motor vehicle producers in North America. The model simulates a new market equilibrium after the proposed change in the ROO and finds that parts manufacturers bring more production of parts to the United States to comply with the new ROO. The Commission's model examines the pricing and sourcing decisions for almost 400 vehicle models aggregated into four vehicle classes: small cars, mid- and full-size cars, multi-passenger vehicles, and pickup trucks. There is imperfect competition amongst the manufacturers within each of the vehicle classes, reflecting the high degree of market concentration in the industry.

The model addresses ROO by allowing manufacturers to change the sourcing of core vehicle parts, such as their engines and transmissions, from foreign sources to the United States. The RVC requirements shift parts production from non-North American sources, while the LVC requirements shift it from Mexico. The model required substantial granular data including: sales, sourcing data, and retail pricing at the vehicle model level; costs of production across different countries; employment and capital expenditures for production; as well as metrics from individual firms that provide expectations for sourcing adjustments as a result of the new ROO. The narrow focus of the model necessitates a number of assumptions for tractability. For example, the model assumes that manufacturer's costs increase in proportion to the level of vehicle production and that the variety of vehicle models available in each market does not change in response to the new ROO. Furthermore, because of limits on the availability of data, the impact of the new ROO on production costs and employment are only estimated for certain core components (engines and transmissions), whereas the ROO in USMCA also apply to many other components of the vehicles. Also, the partial equilibrium model does not attempt to capture indirect employment effects of the ROO, particularly effects on downstream industries.

Table 10 reports the estimated effects of the automotive ROO in USMCA on the U.S. motor vehicle market. The shift in auto parts sourcing to the United States raises vehicle costs for the four classes of vehicles modeled. The price increase leads to a decline in vehicle sales of 0.40 to 2.35 percent, for a total of 140 thousand fewer vehicles sold in the U.S. market. Production and exports of vehicles also decline, with 103 thousand fewer vehicles produced in North America. Imports from Mexico decrease across all vehicle classes while imports from Canada are mixed; small cars and multi-passenger vehicles decrease, imports of mid- to full-size cars grow, and imports of pickup trucks remain relatively unchanged. These decreases in imports are partly offset by an increase in imports from the rest of the world. The model also estimates

that, while employment in the motor vehicle production declines, by 1,600 jobs, employment in the production of engines and transmissions increases by 29,700 jobs, for a net increase of 28,100 U.S. jobs in the combined motor vehicles and parts sector.

Table 10 Estimated changes in the U.S. market due to the USMCA's automotive ROOs (percent changes relative to the baseline)

Change	Small cars	Mid- to full-size cars	Multi-passenger vehicles	Pickup trucks
Average vehicle price	1.61	0.42	0.53	0.37
Vehicle sales	-2.35	-0.59	-0.40	-0.51
Vehicle production	-2.96	-1.23	-0.94	-0.07
Exports of vehicles to Canada	-3.53	1.24	-1.21	0.02
Exports of vehicles to Mexico	-5.99	-2.42	-0.52	0.03
Imports of vehicles from Canada	-2.15	1.00	-0.72	0.00
Imports of vehicles from Mexico	-9.55	-0.88	-3.31	-2.26
Imports of vehicles from the rest of the world	3.92	1.04	1.33	0.00

Source: USITC, *United States-Mexico-Canada Agreement*, 2019.

Conclusion

This paper provides the first comprehensive assessment of ROO in all U.S. trade agreements. Broadly, U.S. agreements follow two models: one for MENA countries based on Israel, largely based on RVC criteria; and the other for non-MENA countries more closely aligned with NAFTA, with most rules based on change in tariff classification. Although NAFTA has been presented in the literature as a model of U.S. agreements, the analysis here shows that NAFTA is idiosyncratic, with a greater reliance on RVC criteria than found in other non-MENA RTAs. Hence, ROO analysis based on NAFTA may not be representative of ROO effects in all U.S. agreements.

Across all U.S. agreements, RVC criteria account for a substantial share (35.4 percent) of all ROO, and in the five RTAs with MENA countries, RVC criteria account for at least 86 percent of all ROO. The United States is not alone in its use of value-added criteria, with substantial use in European and Asia-Pacific agreements as well (Estevadeordal and Suominen, 2004). Despite the prevalence of these criteria, previous studies have not examined whether foreign value added is a determinant of the type of ROO used in agreements or, similarly, whether higher value added in exports allows for greater utilization of preferences. This study provides a first look at these issues. Regarding the effect of higher value added on preference utilization, the information presented here at the level of the sector does not show clear trends. Further analysis in a gravity framework at the level of the product (i.e., HS 6-digit) could be quite informative, provided that econometric issues, such has how to properly control for multilateral resistance terms in a single-country framework, can be properly controlled for. We are hoping to turn to this topic in subsequent work.

The negotiations for the USMCA have brought new attention to the effects of ROO in policy analysis, particularly in the motor vehicle sector. Our analysis shows that, relative to other sectors, the motor vehicle sector has an unusually high reliance on multiple types and combinations of ROO, such as CTC, RVC, CTC and RVC, CTC or RVC, and CTC and/or RVC. And within this diversity, NAFTA again stands out, with more use of RVC criteria among motor vehicle ROO and a higher RVC threshold of 60–62.5 percent.

The proposed USMCA ROO build on the NAFTA ROO, adding new requirements such as labor value content. The small literature on the effects of the proposed motor vehicle ROO in USMCA shows that analyzing these complex requirements in detail requires purpose-built models and data at or below the level of the firm. Although there are several approaches to estimating the effects of USMCA in the sector, and competing assumptions about whether parts makers will relocate production to the United States to meet the new ROO, studies agree that the agreement will raise vehicle prices, lower U.S. sales and production of vehicles, and increase sourcing from non-USMCA markets. Because ROO affect vehicle producers in the industry differently, and even within a firm the ROO affect their individual vehicle models differently, a model at the highly granular level is much more able to capture the economic effects of the ROO.

References

Andersson, Anna. "Export performance and access to intermediate inputs: the case of rules of origin liberalisation." *The World Economy* 39, no. 8 (2016): 1048–1079.

Bashar H. Malkawi, n.d., "Rules of Origin under US trade agreements with Arab countries: Are they helping and hindering free trade?" https://bilaterals.org/?rules-of-origin-under-us-trade&lang=es.

Bensassi, Sami, Laura Márquez-Ramos, and Inmaculada Martínez-Zarzoso. "Economic integration and the two margins of trade: The impact of the Barcelona process on North African countries' exports." *Journal of African Economies* 21, no. 2 (2012): 228–265.

Bombarda, Pamela, and Elisa Gamberoni. "Firm heterogeneity, rules of origin, and rules of cumulation." *International Economic Review* 54, no. 1 (2013): 307–328.

Burfisher, Mary, Frederic Lambert, and Troy Matheson. "NAFTA to USMCA: What is Gained?" IMF Working Paper WP/19/73, 2019.

Cadestin, Charles, Julien Gourdon, and Przemyslaw Kowalski. "Participation in Global Value Chains in Latin America." OECD Policy Working Paper (2016).

Cadot, Olivier, Céline Carrère, Jaime De Melo, and Alberto Portugal-Pérez. "Market access and welfare under free trade agreements: textiles under NAFTA." *The World Bank Economic Review* 19, no. 3 (2005): 379–405.

Cadot, Olivier, Céline Carrère, Jaime De Melo, and Bolormaa Tumurchudur. "Product-specific rules of origin in EU and US preferential trading arrangements: an assessment." *World Trade Review* 5, no. 2 (2006a): 199–224.

Cadot, Olivier, Antoni Estevadeordal, and Akiko Suwa-Eisenmann. "Rules of origin as export subsidies." In *The origin of goods: Rules of origin in regional trade agreements*. Oxford University Press on Demand (2006b).

Cadot, Olivier, and Lili Yan Ing. "How Restrictive Are ASEAN's Rules of Origin?" *Asian Economic Papers* 15, no. 3 (2016): 115–134.

Canis, Bill, M. Angeles Villarreal, and Vivian C. Jones. "NAFTA and Motor Vehicle Trade," CRS report 7-5700, Congressional Research Services (2017), Washington, DC.

Carrère, Céline, and Jaime de Melo. ''Are Different Rules of Origin Equally Costly? Estimates from NAFTA.'' Discussion Paper 4437. London: Centre for Economic Policy Research (2005).

Carrère, Céline, Jaime De Melo, and Bolormaa Tumurchudur. "Disentangling market access effects of preferential trading arrangements with an application for ASEAN members under an ASEAN–EU FTA." *World Economy* 33, no. 1 (2010): 42–59.

Conconi, Paola, Manuel García-Santana, Laura Puccio, and Roberto Venturini. "From final goods to inputs: the protectionist effect of rules of origin." *American Economic Review* 108, no. 8 (2018): 2335–65.

Council of Economic Advisers, 2009. *Annual Report of the Council of Economic Advisers*. Washington, DC. https://www.govinfo.gov/content/pkg/ERP-2009/pdf/ERP-2009.pdf.

Dziczek, Kristin, Michael Schultz, Bernard Swiecki, and Yen Chen. "NAFTA Briefing: Review of current NAFTA proposals and potential impacts on the North American automotive industry." Center for Automotive Research, 2018.

Estevadeordal, Antoni. "Negotiating Preferential Market Access: The Case of the North American Free Trade Agreement." *Journal of World Trade* 34, no. 1 (2000).

Estevadeordal, Antoni and Kati Suominen. "Rules of Origin: A world map and trade effects." Paper prepared for the Seventh Annual Conference on Global Economic Analysis (2004).

Estevadeordal, Antoni, and Kati Suominen. "What are the Effects of Rules of Origin on Trade." (2005). https://www.semanticscholar.org/paper/What-Are-The-Effects-of-Rules-of-Origin-on-Trade-Estevadeordal-Suominen/b8096b4ba06f5d96aeb9b5a072cc343c5597e786.

Felbermayr, Gabriel, Feodora Teti, and Erdal Yalcin. "Rules of origin and the profitability of trade deflection." *Journal of International Economics* 121 (2019).

Francois, Joseph, Bernard Hoekman, and Miriam Manchin. "Preference erosion and multilateral trade liberalization." *World Bank Economic Review* 20, no. 2 (2006): 197–216.

Harris, Jeremy. *Measurement and Determination of Rules of Origin in Preferential Trade Agreements (PTA's)*. Ph. D. thesis (2007).

Hayakawa, Kazunobu, and Nuttawut Laksanapanyakul. "Impacts of common rules of origin on FTA utilization." *International Economics and Economic Policy* 14, no. 1 (2017): 75–90.

Herin, Jan. 1986. "Rules of Origin and Differences between Tariff Levels in EFTA and in the EC." Occasional Papers, v. 13, European Free Trade Association Secretariat, Geneva.

Keck, Alexander, and Andreas Lendle. "New evidence on preference utilization." World Trade Organization Staff Working Paper No. ERSD-2012-12 (2012).

Kelleher, Sinéad. *Playing by the rules? The development of an amended index to measure the impact of rules of origin on intra-PTA trade flows*. No. 12/22. Working Paper Series, 2012.

Kim, Sangkyom, Innwon Park, and Soonchan Park. "Trade-creating regime-wide rules of origin: a quantitative analysis." *Applied Economics Letters* 20, no. 11 (2013): 1056–1061.

Park, Innwon, and Soonchan Park. "Best practices for regional trade agreements." *Review of world economics* 147, no. 2 (2011): 249–268.

Reinsch, William, Jack Caporal, Madeleine Waddoups, and Nadir Tekarli. “The Impact of Rules of Origin on Supply Chains: USMCA’s Auto Rules as a Case Study.” Center for Strategic & International Studies, 2019.

Schultz, M., Dziczek, K., Chen, Y., and Swiecki, B. U.S. Consumer & Economic Impacts of U.S. Automotive Trade Policies. Center for Automotive Research, February 2019.

U.S. International Trade Commission (USITC). *U.S.-Morocco Free Trade Agreement: Potential Economywide and Selected Sectoral Effects.* USITC Publication 3704. Washington, DC: USITC, 2004.

USITC. *U.S.-Oman Free Trade Agreement: Potential Economy-wide and Selected Sectoral Effects.* USITC Publication 3704. Washington, DC: USITC, 2006.

USITC. *United States-Mexico-Canada Agreement: Likely Impact on the U.S. Economy and Specific Industry Sectors.* USITC Publication 4889. Washington, DC: USITC, 2019.