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The Gravity of Rules of Origin

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Abstract – This paper aims to provide a better understanding of how rules of origin (RoO's) operate and the influence they have on global trade flows. I construct an index to measure the restrictiveness of Rules of Origin using a new database gathered by the OECD /World Bank, which compiles all product level Rules of Origin for 159 Trade Agreements, and Regime Wide Rules of Origin for 310 agreements, covering 190 countries. I then present an augmented gravity model where I operationalise my index in order to study the impact of Rules of Origin on bilateral trade flows from 1996 to 2017. I find that an increase in the restrictiveness of Product Specific Rules is related to a decrease in bilateral trade flows, whereas an increase in the flexibility mechanism of Regime Wide rules is related to an increase in bilateral trade flows.

Keywords – trade, tariffs, rules of origin, gravity

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1 Introduction

There has been a proliferation of Preferential Trade Agreements (PTA's) in the last 30 years: the world has gone from 50 agreements in 1990 to 291 agreements in force in 2019 (WTO). Not only the number of PTA's has burst substantially but also their coverage: the Transpacific Partnership and Transatlantic Trade and Investment Partnership are agreements that would respectively cover 40% and 46% of global trade, and also include provisions for a much deeper economic and political integration, ranging from Intellectual Property, Digital Trade, to Human Rights. UNCTAD (2018) estimates that in 2017, 50 % of world trade was taking place between countries that had signed a Preferential Trade Agreement. Along with this, we are in an increasingly globalised world marked by global value chains: a motor engine or an electronic device, for example, could easily cross borders and incorporate inputs dozens of times before reaching the final consumer, and be subject to different tariff and technical requirements in each stage of the process. Given the deep impact that a Trade Agreement could have, it is very relevant to understand the details of what is being negotiated and the effects these could have on trade and the economy.

One of the most important research tools in international trade is the gravity model. The general idea behind it is that trade between any pair of countries is positively related to their GDP's and negatively related to the distance between them. Despite having had a rough inception into the discipline, it has proven to have great explanatory power and has been adopted in the analysis of trade flows, service flows, migration, and changes in tariffs for example. Economic papers, however, rarely go beyond including a dichotomous variable in the gravity model to signify the existence of a PTA. Given the relevance of trade agreements and global value chains today, it is important to account for various degrees of economic integration represented by the PTA's. Using a gravity model, this paper analyses the impact of one of the most important but underrated aspects of a preferential trade agreement: the rules of origin.

Rules of origin (RoO's) are indispensable components of Preferential Trade Agreements. RoO's determine the technical requirements or the transformation that the traded good must undergo in order to be considered "originating" and be subject to preferential tariffs under a PTA. The primary purpose of the Rule of Origin is to avoid trade deflection, and thus prevent countries that are not Parties to the Agreement from taking advantage of it. A failure to comply with the RoO would mean that the good being imported would not profit from the preferential tariff, but rather be subject to the Most Favoured Nation (MFN) tariff.

The impact of Rules of Origin would be more readily experienced at the firm level. Picture a firm in country A exporting widgets to country B at a 15% MFN tariff level, and a new PTA being signed between the countries including a 40% Regional Value Content RoO for widgets. If the firm already complies with the rule, it will benefit from the Agreement and export the widgets at the reduced tariff rate. If the firm does not comply with the rule, it will decide whether to source more inputs regionally in order to comply with the rule and benefit from the tariff exclusion, or continue exporting at the non-preferential tariff level. In the NAFTA predecessor, for example, the US-CA FTA, some Canadian firms reported to have preferred paying for the tariff rather than going through the burden of complying with the RoO (Krueger, 1993). The balance between the restrictiveness of the RoO and the benefits granted by complying with it may be key in determining its impact on trade. Moreover, and unlike tariffs, which would

typically phase out after a couple of years from the signing of the Agreement, the RoO's would remain in place indefinitely and could thus affect the commercial relationship of the countries in the long run.

There are two broad categories of Rules of Origin which are included in a Trade Agreement. The first is Product Specific Rules of Origin (PSR's) which determine the conditions that a particular product needs to comply with in order to be considered originating under the PTA. These are generally in the form of a Change in Tariff Classification (with regards to its position in the Harmonised System), a Regional Value Content requirement, or a Technical Requirement. The second category of Rules of Origin is Regime Wide Rules of origin, which affect equally all products in the agreement, and generally serve as auxiliary provisions to complying with the PSR's. These can be in the form of the type of certification that is required to prove origin, the de minimis tolerance for a product, the types of cumulation (allowances to treat certain third party inputs as originating), among others.

The emergence of new databases (by the WTO, World Bank, OECD, UNCTAD, etc) seeking to code all product level provisions of all trade agreements in existence opens the door to interesting new possibilities of empirical research. For my research, I make use of the new DESTA Classification Database which is being gathered by the OECD and the World Bank. When completed, this will be the largest and most detailed database on Rules of Origin encompassing 40 different categories for Product Specific RoO's, and 30 categories for Regime-wide RoO's. So far 160 PTA's have been coded for their PSR's, and 350 PTA's have been coded for their regime wide RoO's. With this information, I will present an overview of the different rules of origin found in PTA's, and the differences we can see across trading regions.

In order to measure the "unoberservable" restrictiveness of the RoO's, I elaborate a categorical index for all combinations of product specific RoO's, and I argue why I consider this index to be superior to the two main indexes that have been used in the existing literature, e.g. Estevadeordal (2000) and Harris (2007). To counterbalance this restrictiveness index, I then elaborate a separate index that incorporates the flexibility provided by the regime wide provisions on Rules of Origin. I then present an overview of the level of restrictiveness of Preferential Trade Agreements around the world, in accordance with the index.

In order to assess the impact of RoO's on international trade, I operationalise their restrictiveness though my categorical index and incorporate it in an augmented gravity model. I assess both the impact of the RoO restrictiveness in global trade flows, and the impact of the particular regime wide provisions of the agreement. I first find that an increase in the restrictiveness of the Product Specific Rules is related to a decrease in aggregate trade flows. Then I find that an increase in the flexibility mechanisms of Regime Wide Rules of Origin is related to an increase in aggregate trade flows.

The contribution of this paper to the existing literature is threefold:

1. I present a new index of restrictiveness, which I argue is superior to the existing ones.
2. I make use of the DESTA classification database which is the largest of its kind and includes relevant Rule Of Origin provisions that had not been included in a database before.
3. I present a larger country coverage, year coverage, and Trade Agreement coverage than previous works.

The paper proceeds as follows: Section 2 presents the Literature Review of both the gravity model and the Rules of Origin. Section 3 gives an overview of the different types of Rules of Origin and their distribution worldwide. Section 4 describes the construction of the Indexes. Section 5 presents the Data and lays out the empirical strategy. Section 6 discusses the results. Section 7 concludes.

2 Literature Review

2.1 The Gravity Equation

The gravity equation owes its name to the similarities it shares with Newton's law of gravity (see Table 2.1). Just like a particle would attract another particle with a force proportional to their masses, and a force inversely proportional to the distance between them; this equation suggests that countries will trade in direct proportion to the size of their GDP, and in indirect proportion to the distance between them. Tinbergen (1962) is credited as having "discovered" the gravity equation, but it was initially regarded as a mere representation of the empirically stable relationship of trade and the size of the economies on the one hand, and trade and the distance between them on the other. The trade models at the time, such as the Ricardian model which explains trade patterns through differences in technology, and the Heckscher-Ohlin model which explains trade patterns through differences in factor endowments, were assumed incapable of explaining the gravity equation. As a taste of the great explanatory power of the Gravity Equation, Figure 2.1 plots the logarithm of Mexico's total trade in 2012 against the logarithm of the GDP of its trading partners, where we can see a clear positive relationship. Figure 2.2 plots the logarithm of Mexico's total trade in 2012 against the logarithm of its distance with its trading partners, showing a clear negative relationship [1].

[1]The data that I used to construct the graphs is taken from the CEPII BACI databse and the CEPII GeoDist Database (Fouquin & Hugot, 2016).

Table 2.1: The Gravity Analogy

Newton's Law of Gravity	Gravity Trade Model (Head & Mayer, 2013)
$F_{ij} = G\ \frac{M_i M_j}{D_{ij}^2}$	$X_{ij} = \tilde{G}\ \frac{Y_i E_j}{T_{ij}^{\theta}}$
where:	where:
F_{ij}: Gravitational force between objects i and j	X_{ij}: Exports from countries i and j
G: Gravitational constant	$\tilde{G}$: Inverse of world production, $\tilde{G} \equiv 1/Y$
M_i: Object i's mass	Y_i: Country i's domestic production
M_j: Object j's mass	E_j: Country j's aggregate expenditure
D_{ij}: Distance between objects i and j	T_{ij}^{θ}: Total trade costs between countries i and j and $T_{ij}^{\theta} \equiv \left(\frac{t_{ij}}{\Pi_i P_j}\right)^{1-\sigma}$

Given the great explanatory power of the gravity equation on many important empirical works, there was a strong need for a theoretical explanation to back it up. Its use in policy analysis and the impact of tariffs was limited due to its "unidentified" properties. Although it was a purely probabilistic model, the first important work to attempt to provide a theoretical foundation for the gravity model was Anderson (1979). He presents a model with expenditure systems and identical homothetic preferences across regions. Each product is differentiated by its place of origin (à la Armington). The constraint is the expenditure system which specifies that the share of national expenditure accounted by tradable goods is a stable function of income and population. In his model, the share of tradable goods expenditure across regions is a function of transit cost variables. So all goods are traded, and all countries trade. And the share of the expenditure that they devote to tradables will only vary with the size of the country: larger countries will export and import more. He later extends his Cobb-Douglas assumptions to the Constant Elasticity of Substitution case, which is the more common specification in modern gravity models. And he warns that the use of his model is limited to countries where the structure of preference for tradables is very similar, and where their tariff structure and transport cost structures are similar.

Fig. 2.1. Trade flows and GDP: Mexico, 2012

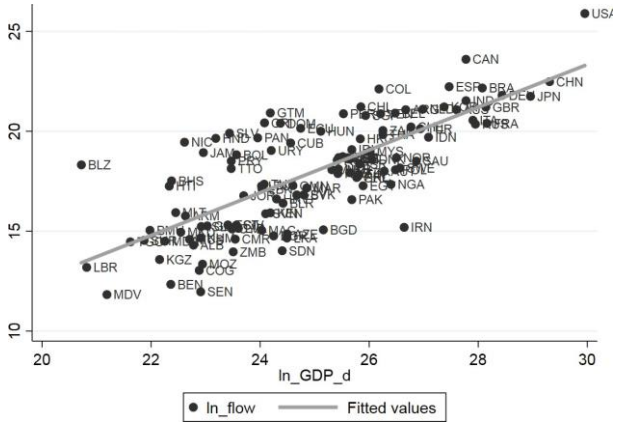
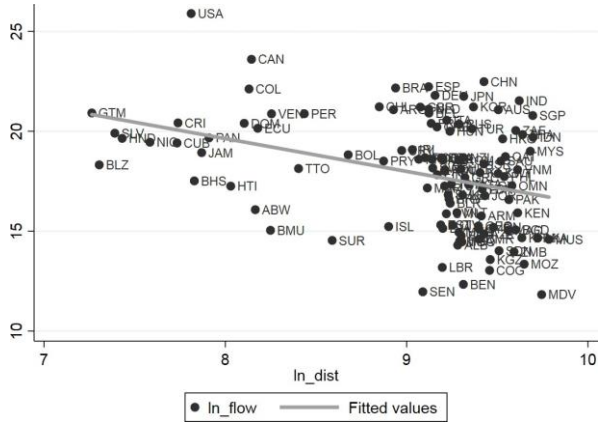


Fig. 2.2. Trade flows and distance: Mexico, 2012



An important paper that ignited a spark in a more adequate theoretical foundation for the theoretical model was McCallum (1995). He studies the impact of the Canada-US border on regional trade patterns. Canada and the US were chosen given their similarities in terms of culture, language, and institutions; providing the right environment to test whether borders do in fact have an impact on trade patterns. He uses 1988 data on imports and exports for each pair of provinces, as well as imports and exports between each of the 10 provinces and each of the 50 states. He uses a log linearised gravity equation to find that the elasticities of exports to own GDP, importing region GDP, and distance are respectively 1.3, 1.0 and -1.5. More notably, he finds ceteris paribus, trade between two provinces is more than 20 times larger than trade between a province and a state [exp(3.09)=22]. As an illustration they present a borderless gravity model to predict that, given their distance and their corresponding GDP's, Quebec should export 10 times more to California than to British Columbia. In reality, however, the data shows Quebec exports more than three times to British Columbia than to California. They note that "whatever the reasons may be and whatever the future any hold, the fact that even the relatively innocuous Canada-US border continues to have a decisive effect on continental trade patterns suggest that national borders in general continue to matter" (McCallum, 1995).

The impression from the McCallum (1995) results (trade between Canadian provinces 20 times higher than between provinces- US states) was such that it became known as the "border puzzle". Obstfeld & Rogoff (2000) called it one of the six puzzles in open macroeconomics. Helliwell & McCallum (1995) call it a violation of economists' prior beliefs. Anderson & Van Wincoop (2003) finally solve the "border puzzle" (it was both the result of the small size of the Canadian economy and of omitted variable bias) while at the same time providing one of the most important micro-founded explanations to the gravity equation. Anderson & Van Wincoop (2003) introduce "multilateral resistance" terms. The idea is that controlling for size, trade between two regions is decreasing in their bilateral trade barrier relative to the average barrier of the two regions to trade with all their partners. So the more resistant to trade with all others a region is, the more it is pushed to trade with a given bilateral partner. The problem with McCallum (1995), they argue, is that he does not introduce "multilateral resistance" terms and so the calculations suffer from omitted variable bias.

Introducing multilateral resistance terms for the same data, they find that given the small size of the Canadian economy, any barrier with Canada and the rest of the world would lead to high multilateral resistance because it affects trade barriers between a province and almost all potential trading partners (16.4 times state-province level, which is smaller than the 22 previously calculated). For the US, in contrast, the multilateral resistance is much less affected by a border since it does not affect trade between a state and the large US economy (1.5 times state province level). In their model they present identical, homothetic preferences approximated by a Constant Elasticity of Substitution; and each good is differentiated by place of origin (à la Armington). They include iceberg trade costs and the CES expenditure systems permits a decomposition of trade resistance into three components: bilateral trade between region i and region j; i's resistance to trade with all regions; and j's resistance to trade with all regions. The famous trade cost term they include in their equation, $(t_{ij} / \Pi_i P_j)^{1-\sigma}$ can therefore be interpreted as:

- t_{ij}: bilateral trade costs between i and j which is typically approximated by bilateral distance, tariffs and the presence of regional trade agreements
- P_j: inward multilateral resitance, which represents the impoter j's ease of market access
- Π_i. outward multilateral resistance, which represents the exporter i's ease of market access

Besides Anderson & Van Wincoop (2003), the other important theoretical paper of the gravity equation is Eaton & Kortum (2002), finally dismissing the belief that gravity equations lack microfoundations. They develop a Ricardian model of international trade based on technological differences which incorporates geography. The model importantly captures parameters relating to absolute advantage, to comparative advantage (promoting trade), and of natural and artificial geographic barriers (resisting trade). They adapt a Ricardian trade model with a continuum of goods, and where countries have differential access to technology, so that efficiency varies across commodities and countries, and additionally introduce iceberg trade costs. Consumers maximise a Constant Elasticity of Substitution utility function with a continuum of goods. Technology (or productivity) is assumed to follow a Fréchet distribution $F_i = e^{-Tz^{\sigma}}$ where T_i is a country specific parameter governing location of the distribution, and where the parameter θ reflects the amount of variation within the distribution. This particular distribution allows the Ricardian model of many countries and a continuum of goods to reflect a country's absolute advantage with T_i, the country's state of technology; and to reflect its comparative advantage with θ, its heterogeneity across goods with regards to the country's relative efficiencies. The model they present is no longer limited to Armington assumption or to monopolistic competition models. The sensitivity of trade to costs depend on the technological parameter θ (as opposed to tastes as in the Armignton case). And the share of trade depends on costs and geographic barriers at the extensive margin: as a source becomes more expensive or remote, it exports a narrower range of goods (in monopolistic competition models or Armington, higher costs leave the set of traded goods unaffected but spend less on each good).

2.2 Content Protection and Rules of Origin

Rules of Origin (RoO's) are critical components of any Preferential Trade Agreement. RoO's determine the technical requirements that the traded good must undergo in order to be considered "originating" and be subject to preferential tariffs under a PTA and consequently avoid trade deflection from non-signatories of the Agreement. In what follows I describe the most relevant literature for RoO's, including theoretical models of how they could act as protectionist devices on the one hand, and promote investment and trade in intermediate goods on the other. The later empirical papers available finally put those theories to the test with the limited data available and present some informative results. It will become clear that with the emergence of new Trade Agreement Databases, there is important new research to be done in the area of rules of origin and its impact on trade.

One of the first important works of the theoretical modelling of content protection is Dixit & Grossman (1982). They pose as their motivation that comparative static analyses of content protection policies in input-output models are particularly inappropriate as these are limited to one particular regime or pattern of trade, and with the growing importance of intraindustry trade, alternative models should be introduced. They present a model which is a succession of vertical stages where value is added in each stage of production. Each stage is considered an endogeneous variable of the model, and policy shifts, such as a content requirement, move the margin of comparative advantage providing an additional channel for resource allocation. In the different stages of production there is a continuum of intermediate goods, but consumers only demand output for the final (completed) good. This productions takes place in the "manufacturing" sector. The rest of the output is produced directly from primary factors and called "agriculture sector". In the model, they find that countries with the highest wage-rental ratio would concentrate on the most capital intensive stages of production. They find that increasing content requirement would indeed expand the stages of the processes produced domestically. But they warn that this could cause a decrease in the quantity of output of the manufactured good as resources are shifted away from this sector.

Krueger (1993) is the first to provide a theoretical framework for rules of origin as particular provisions inside Free Trade Agreements (as opposed to a broad national content protection policy). The motivation for her research is the ongoing NAFTA negotiation, the contents of which had not all been made public, and questions about why "the United States was supporting a more stringent ROO while Canada and Mexico were in favour of a lower percentage and a broader definition"(Krueger, 1993). She argues that there is a strong protectionist bias in Free Trade Agreements, which is inexistent in customs union, and which is reflected in the Rules of Origin negotiated in an FTA. To present her theory she builds upon the classical Customs Union versus Free Trade Agreements Economic Theory and then introduces RoOs. Traditionally, it was implied, given that there is no change in tariff levels, a country would invariably benefit from forming an FTA as it would gain access to the other country's market at no extra cost, and its producers could benefit from a low cost source. Introducing a Rule of Origin in the form of a "substantial transformation" or value content requirement, however, means that the incentives for producers to export to their trading partner would vary with the RoO and not just the structure of the tariffs. Moreover, the RoO negotiated would effectively extend the protection to all Members of the Agreement (as they are reciprocal, unlike necessarily, the tariffs). This, she argues, creates a source of bias towards economic inefficiency. Efficient Mexican

producers, for example, could shift their sourcing from efficient low cost countries, to higher cost American inputs in order to comply with the rule of origin. Under her model, she shows that "producers of a final good in an FTA would find it advantageous to purchase higher cost (protected) inputs from other FTA members than to purchase from lower cost ROW sources whenever: 1) the effective rate of protection in the partner country was greater than in the home country; and 2) the rule of origin would not be satisfied without such purchases"(Krueger, 1993).

A follow up theoretical paper by Krishna & Krueger (1995) argues that even if a rule of origin is not very restrictive it could have a strong impact on trade and investment flows. They distinguish the welfare impacts that could be obtained by a rule of origin both in a perfectly competitive market and with imperfect competition, where interestingly they argue that the effect on welfare is likely non-monotonic in the restrictiveness of the RoO, meaning that a more restrictive RoO could actually raise welfare. Under perfect competition, using the potential effects of NAFTA as an example, they argue that "Mexico can shift the source of inputs away from the low cost supplier even though there is no Mexican tariff. In addition the investment flows into Mexico needed for Mexico to serve the entire U.S. market are likely to be substantial. Also, U.S. welfare is not monotonic in the restrictiveness of the RoO. ROO's could raise U.S. welfare compared to the absence of an FTA, as long as they are not too restrictive" (Krishna & Krueger, 1995). Under a foreign monopoly in the product market, they show that the effects of RoO are not as straightforward. Assuming that the foreign and the domestic inputs are perfect substitutes, they demonstrate that as the RoO becomes binding, output would rise and the effect on consumer surplus would increase (more than the loss in tariff revenue), raising welfare from the FTA. But if this restriction becomes more binding, past the critical threshold, output could fall, and thus reduce welfare.

Given the lack of empirical research on the actual negotiating dynamics of Free Trade Agreements at the time, and the growing interest of NAFTA, Estevadeordal (2000) studies the negotiating dynamics of trade agreements, focusing particularly in preferential tariff phase outs and the accompanying rules of origin of NAFTA. He argues that unlike the popular view that RoO's merely have a "supportive" function to tariff negotiation, they are actually "an independent commercial policy instrument with a "primary" market access function as it is the case with traditional preferential tariffs"(Estevadeordal, 2000). After presenting all the tariff phase out categories (today they are fully liberalised, given that the longest phase out period was 15 years) and the different types of rules of origin included in the NAFTA (e.g. change of tariff classification, technical requirement, and regional value content) he introduces his empirical specification where he explores the interdependence between preferential tariff phase-outs and the RoO's using an ad-hoc econometric model. He faces the problem that one of the endogenous variables, RoO restrictiveness, is not directly observable, so for this he will introduce an ordered categorical variables (the RoO index) with the simple rule that a Change of Chapter would be more restrictive than a Change of Heading, which would itself be more restrictive than a Change of Subheading.

To carry out his analysis he uses a non-traditional simultaneous structure where in the first equation, the latent values of the endogenous categorical values (RoO, which is mutually agreed on by the negotiators) depends on some exogeneous variables. In the second equation, the continuous endogeneous variable, preferential tariff phase outs, is assumed to be a function not of the actual observed values of the RoO index, but rather of their latent indices and other

explanatory factors. Among the relevant explanatory variables introduced in the simultaneous model are a measure of the depth of tariff liberalisation (constructed as the relative margin of the applied tariff rate to third countries vis à vis the initial FTA partner tariff rate), and a measure of trade defection effects (computed as a measure of the absolute value of the spread between each party's MFN rates and third country rates). He obtains very significant results in favour of the hypothesis that RoO are being used to prevent "trade deflection": the higher the spread between Mexican and American tariffs to third parties, the higher the RoO restrictiveness, possibly indicating that some American and Mexican producers tried to avoid cheap competing imports of inputs from third parties to be shipped though the US. He then introduces interindustry variables as proxies of intra-industry linkages which results statistically significant, probably signifying an incentive to preserve the existing industrial complementarity between Mexico and the US though higher levels of restrictiveness based on origin determination. He concludes that "the degree of preferential tariff liberalisation between NAFTA partners is highly and significantly correlated with the degree of restrictiveness of RoO's(. . .) the same forces that push for tariff protection also push for more restrictive RoO. [He] interpret[s] this result as evidence that in FTA negotiations, RoO and preferential tariffs are both primary policy instruments for market access negotiations"(Estevadeordal, 2000),

Using again the NAFTA RoO index, Estevadeordal et al. (2006) are the first to do an empirical analysis of the effects of Rules of Origin on Foreign Direct Investment (FDI). Their interest in particular is the impact RoO's under NAFTA have had in Mexico's FDI. They study 122 Mexican manufacturing industries from 1994 to 2000. Their hypothesis is that, on the one hand, restrictive RoO's can compel producers into obtaining supplies or performing production processes even if supplies and production in the rest of the world were cheaper, encouraging investment in upstream sectors. On the other hand they expect that flexible, non-binding RoO's can attract FDI in downstream industries that procure inputs from around the world. They point that the incentives to invest would also depend of the depth of the tariff preferences (there would not be any added incentive to invest linked to a rule of origin if the MFN tariffs are already zero, for example). They find that the restrictiveness of NAFTA RoO actually enters with a negative and significant sign in their results; so restrictive RoO's appear to discourage FDI in Mexico. Interestingly, they find a positive and significant sign on US FDI to the world indicating that FDI in Mexico is part of a broader global pattern of sectoral distribution of FDI. Afterwards, they introduce three dummies representing the salary levels in Mexico by terciles and they find a positive and significant sign on the highest salary tercile, which indicates that FDI has flown to sectors in Mexico which traditionally did not originally have a comparative advantage. Finally, they find that in the case of downstream industries, restrictiveness of RoO is indeed related to FDI flows. They conclude that FDI in Mexico during NAFTA "has been attracted to sectors with flexible RoO: RoO that allow industries to establish production and supply networks of global reach. Should flexible RoO's be viewed to attract globalised and competitive industries the news is good for Mexico: NAFTA has paved the way for entry of globalised and efficiency-seeking investors to the Mexican market" (Estevadeordal et al., 2006).

3 Rules of Origin

Countries grant each other preferential tariff treatment to the goods they export through Trade Agreements. In order for these agreements to function properly and guarantee that only the goods from the Parties to the Agreement benefit from it, rules of origin for these goods need to be defined. The objective of the RoO is to guarantee that traded goods, which use third country inputs, undergo a substantial transformation in order to be considered "originating" in the region, and thus have preferential treatment while avoiding trade deflection from non-signatories to the Agreement. A good traded under the Agreement would be subject to both its particular Product Specific Rule, and to the Regime Wide rules of the Agreement.

3.1 Product Specific Rules of Origin (PSR's)

There are three main categories of product specific rules of origin by which a product that has incorporated third country inputs would be considered to have undergone the substantial transformation to be considered "originating":

1. **Change of Tariff Classification**[2]:
   The final product needs to undergo a change in tariff classification with regards to the classification of its third party inputs used in production. The change required could be a change of the specific classification of the product (at the subheading or HS6 level), a change of the particular grouping of products (at the heading or HS4 level), or a change of Chapter (at the HS2 level) where these type of goods are classified. Additionally, exceptions can be attached prohibiting the use of non-originating inputs from certain subheadings, headings, or chapters.

   Example: "2103.20: A change of a good of 2103.20 from any other chapter except from subheading 2002.90." (NAFTA)
   Subheading 2103.20 contains tomato ketchup. This rule implies that in order for ketchup to be considered "originating" under NAFTA, the substantial transformation required from it is to either be made directly from fresh tomatoes from anywhere in the world (chapter 7), or be made from tomato paste which was produced in the NAFTA region (2002.90).

2. **Regional Value Content (RVC)**:
   The final product needs to incorporate a minimum percentage of regional inputs and processing in order to be considered originating, or alternatively a maximum amount of foreign inputs is permitted for the product. Figure 3.3 presents the variation in average threshold levels of RVC for a ser of representative PTA's.

[2]The change in tariff classification is in accordance with the Harmonised System(HS), an international standardised nomenclature for the classification of traded products developed by the World Customs Organisation.

Example: "8508.11: No change in tariff classification required for a good of subheading 8508.11, provided there is a regional value content of not less than 40 per cent under the build-down method." (TPP)
On the Harmonised System, under 8508.11, we find "Vacuum cleaners (not exceeding 1500 watts and dust bag not exceeding 20 liters)." This means that the percentage of inputs, including labour, that are included from the TPP region, must represent at least 40% of the value of the final good, in order for the good to be considered originating.

3. **Technical Requirement**:
   The final product has to undergo a certain operation or use certain inputs in its production in order to be considered originating, such as a purification process for certain chemical products, or a specific sewing process for certain textile products.

   Example: A good of chapter 28 through 38 that is the product of a chemical reaction is an originating good if the chemical reaction occurred in the territory of one or more of the Parties. (TPP)
   From chapter 28 to 38 in the Harmonised System, chemicals and associated industries are classified, such as pharmaceutical products (Ch. 30), ferlilisers (Ch. 31), tanning extracts (Ch. 32), soaps (Ch. 34) etc. Any of these products can confer origin by demonstrating that the final good was produced by a chemical reaction effected within the TPP region.

Either of these rules may apply **cumulatively** with another or as an **alternative** to another rule, depending of the product in question. Also, a rule may explicitly **exclude** the use of non-originating materials from a particular tariff section.

- *Example*: "64.01-64.05: A change to heading 64.01 through 64.05 from any heading outside that group, except from subheading 6406.10, provided there is a regional value content of not less than 55 percent under the net cost method." (TPP)
  Headings 64.01 through 64.05 covers footwear. Heading 64.06 covers parts of footwear, and 6406.10 refers to footwear "uppers". This rule means that the footwear will be considered originating by complying with a Change of Heading rule, if the footwear uppers are from the Free Trade Region, and the total amount of inputs and labour incorporated into the footwear represent at least 55% of the value of the final good.

Product Specific Rules of Origin vary greatly across Agreements, and across products within those Agreements. As an illustration, Figure 3.1 presents the PSR distribution across a set of representative Agreements, and Figure 3.2 presents the PSR distribution across a set of representative products within those same agreements. In the last section of this Chapter, I briefly discuss the different preferences that exist for Rules of Origin across regions.

Fig. 3.1. RoO Distribution in PTAs

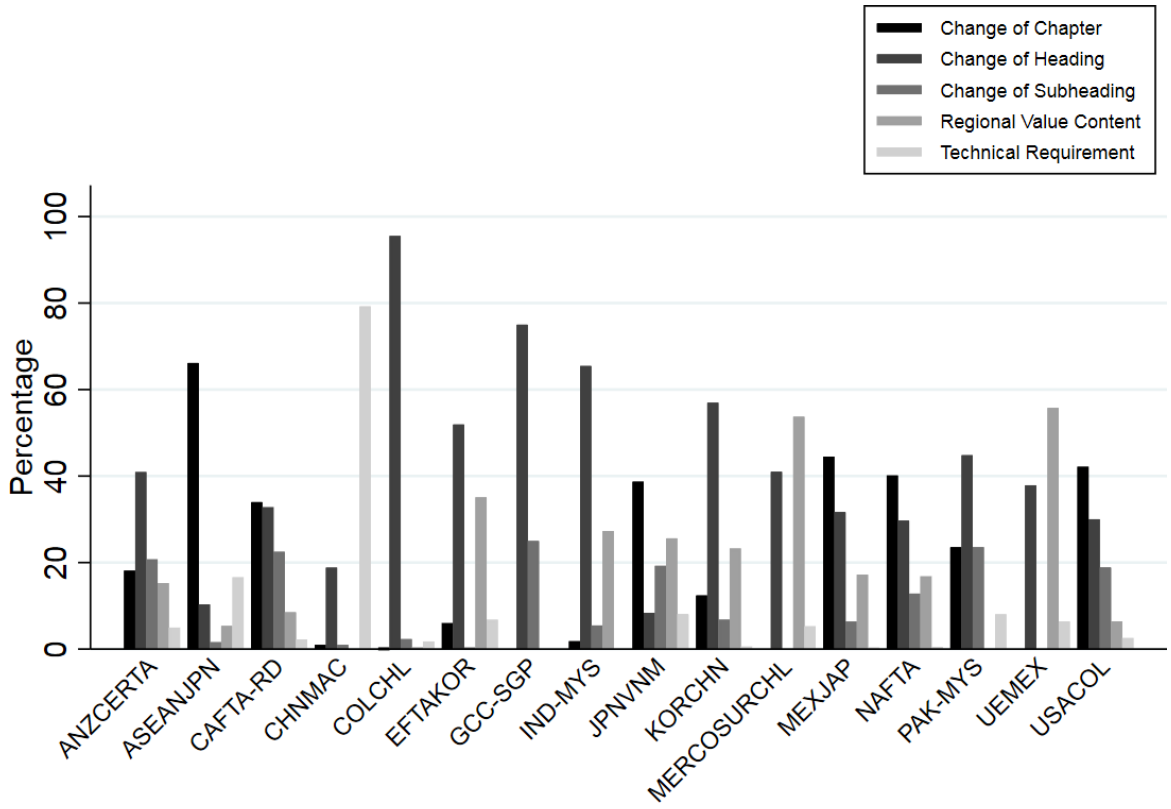


Fig. 3.2. RoO Distribution across products

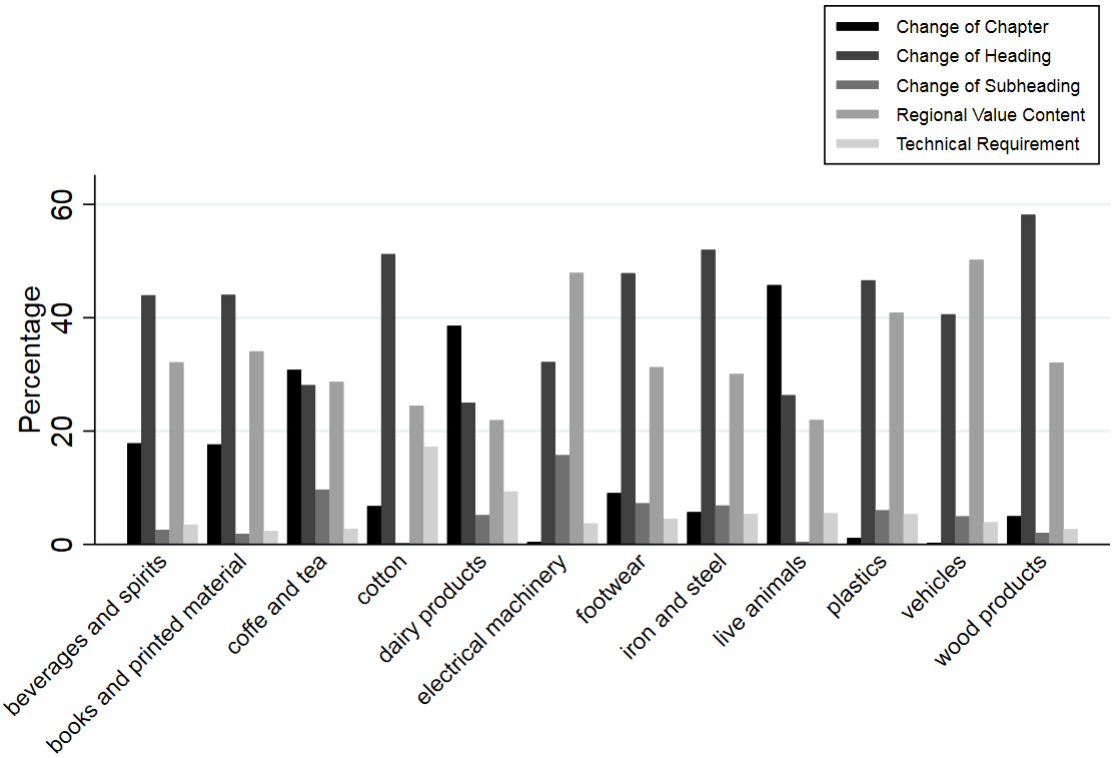
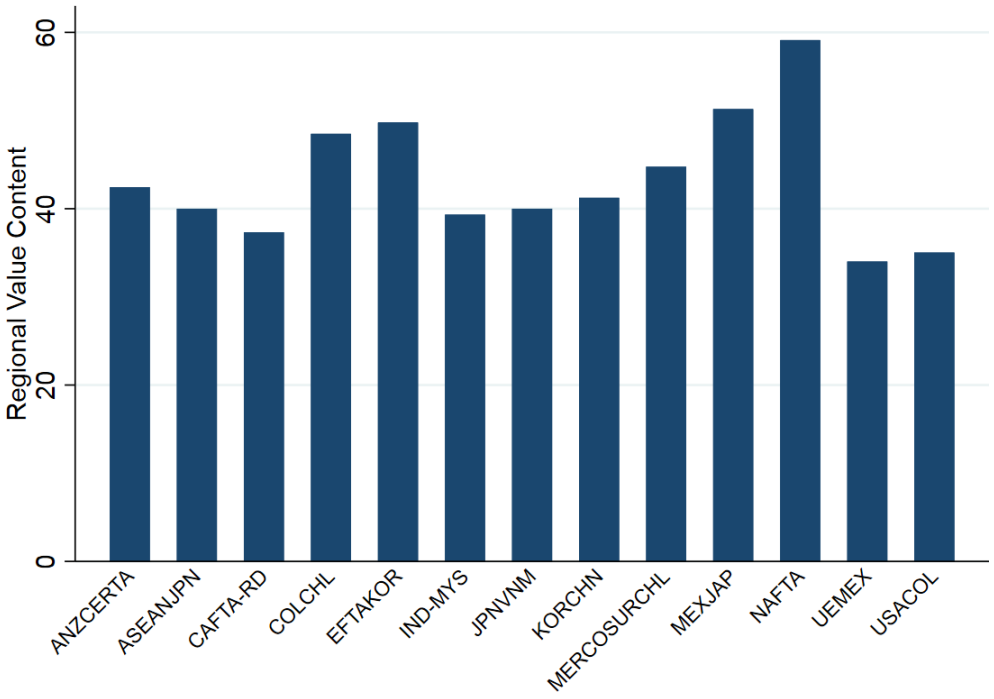


Fig. 3.3. RVC Distribution across agreements



3.2 Regime Wide Rules of Origin

Besides Product Specific Rules of Origin (PSR's), trade agreements contain RoO's at the regime wide level that determine the mechanisms by which all PSR's will be implemented. These provisions act as auxiliary instruments to complying with the PSR's. I present here the most relevant Regime Wide Rules of Origin. In Table 3.1, I present the different types of Regime Wide Rules of Origin that are present in some major trade agreements. As it will become clear from the explanations provided, these types of rules of origin are particularly relevant for two reasons: they make compliance with the Product Specific Rule easier (e.g. through the de minimis threshold, exemption provisions, or extending the cumulation area) and relieve some of the related administrative costs (e.g. through the certification, drawback, or verification schemes included). Cadot et al. (2002), for example, determine that in the case of NAFTA, RoO-related administrative goods account to 2% of the value of the final merchandise. These provisions, could therefore affect a firm's choice from trading under a particular agreement.

- **Cumulation**
  Cumulation refers to which materials, which processes, and from which countries, the PTA members can source from without losing the originating status of the final goods. There are generally four types of cumulation schemes (which themselves could cover the materials, processes, or both).
  An agreement would typically include Bilateral Cumulation which means that the materials and processes that are sourced between any of the Parties of the Agreement would count towards conferring origin to the final good. Under Diagonal Cumulation, Parties of the Agreement may cumulate with a third country if they both share a PTA with equivalent RoO's with that country. Under Cross Cumulation, the Parties may cumulate with a third country if they both have a PTA with that country, even if the RoO's are

not equivalent for that Agreement. Under Full Cumulation the Parties of the Agreement can cumulate with certain non-Parties without the need to have a common PTA between them. Cumulation schemes could therefore have a strong impact on the ability to comply with Rules of Origin. Augier et al. (2005) estimate that trade among PTA partners would be up to 52% lower if there is no cumulation scheme.

- **De minimis**
  This is a provision that allows compliance of the PSR as long as the non-originating amount of materials that do not undergo transformation does not exceed the established threshold. This provision therefore makes it easier for third Party inputs to qualify as originating when incorporated into the final product. The higher the threshold, the more flexible the Rule of Origin. A shirt, for example, of which the materials are subject to a Change in Tariff Classification rule (CTC), could be considered as originating if the fabric of the shirt complies with the CTC rules even if the buttons were non-originating, as long as the latter do not exceed the de minimis threshold.

- **Certification**
  This provision refers to who holds the burden of proof for providing the information about the origin of the good. The certificate of origin could be issued by the government authority, which would be the most burdensome procedure. There could be an authorised exporter scheme whereby certain certified producers and exporters are allowed to issue their own certificate of origin. Or there could be more business friendly schemes such as certification by the exporter, or the importer. The more administrative burden involved, and the higher the cost of the certificate, the less likely a trading partner will request preferential treatment under a PTA. Self certification, therefore is considered a more flexible scheme than an authorised exporter scheme, which in turn is considered more flexible than a certification by authority scheme.

- **Exemptions**
  This provision is normally presented as a maximum threshold, of the value of the good, for which there would not be a requirement to demonstrate a certificate of origin, in order for the good to be considered originating. This provision could be particularly beneficial for small and medium enterprises exporting smaller parcels which would not be required to go through a burdensome certification process.

- **Validity period**
  Given that there might be a considerable period between the time a company makes a purchasing order to the time the goods are actually delivered at customs; the validity period could affect the utilisation rate of the Agreement. A longer validity period would allow enough time for the importation process to be concluded smoothly, taking into account any setbacks that may arise, without the good losing the "originating" status.

- **Duty Drawback**
  This provision establishes that the tariff duties levied on the materials which are later incorporated into exported goods can be waived or refunded. As such, this provision provides an additional incentive for producers to export to their PTA partners, as opposed to selling the same product domestically.(Paradoxically, De Melo et al. (2001) find a protectionist bias related to this provision in the case of Mercosur.)

- **Fungible Goods**
  Fungible goods are defined as those goods that are interchangeable for commercial purposes, and whose properties are physically identical. With this provision, producers are not required to stock those materials separately in order to trace their origin, but are permitted to merely keep an inventory management method in accordance to the Generally Accepted Accounting Principles.

Table 3.1: Regime Wide Provisions

agreement	cumulation	verification	certification	transshipment	de minimis	validity	exemption
NAFTA	Bilateral	Both	Self	Not allowed	7	48	1000
ECOWAS	Diagonal	Indirect	Authority	Not allowed	0	10	0
China - Pakistan	Bilateral		Authority	Allowed	0	10	0
ASEAN-Australia-New Zealand	Bilateral	Direct	Authority	Not allowed	10	12	200
EU - Papua New Guinea - Fiji	Cross	Indirect	Authority	Allowed	15	10	560
Dominican Republic - Central America	Diagonal	Direct	Self	Allowed	10	12	1500
Korea - United States	Bilateral	Direct	Self	Not allowed	10	12	1000
EFTA - Hong Kong, China	Diagonal	Indirect	Authorised Body	Allowed	10	12	0
EU - Central America	Diagonal	Indirect	Authorised Body	Allowed	10	12	0
Malaysia - Australia	Cross	Direct	Authority	Allowed	10	12	200
Mexico - Central America	Bilateral	Direct	Self	Allowed	10	12	1000
EFTA - Central America	Cross	Indirect	Authority	Allowed	10	12	0
Pacific Alliance	Bilateral	Indirect	Authority	Allowed	10	12	1000
ASEAN-Korea	Bilateral	Indirect	Authority	Allowed	10	6	200
Korea - India	Bilateral	Indirect	Authority	Allowed	10	12	0
Trans-Pacific Partnership	Bilateral	Indirect	Self	Allowed	10	12	1000

3.3 Rules of Origin Worldwide

In order to understand the diversity of Rules of Origin, it is useful to understand the regional context in which the different trade agreements were negotiated.

In the Americas, Garay & Cornejo (2001) identify four main families of rule of origin schemes. One such scheme is the rules of the Latin American Integration Agreement (ALADI). Under Resolution 78 of the ALADI, members can enter into partial scope agreements (generally only certain sectors of goods are included, and services are generally excluded) establishing an economic cooperation area between them. The general rule of origin in ALADI is a Change in Tariff Heading, or a 50 % Regional Value Content.

The other family is NAFTA, and NAFTA type agreements in the region. Entering into force in 1994 between Mexico, USA, and Canada; NAFTA was the first agreement to include a separate product specific rule for each product in its tariff schedule. All products have a Change in Tariff Classification Rule (either at the subheading, heading, or chapter level) and some include an additional Regional Value Content requirement. Similar schemes were negotiated on

US-Chile, Mexico-Costa Rica, Mexico-Northern Triangle, and Chile-Canada, for example.

The other two types of schemes are Mercosur type schemes and the Central American Common Market (CACM) scheme. In terms of restrictiveness, they both fall between the lax ALADI scheme and the strict NAFTA scheme. Mercosur, Mercosur-Chile, Mercosur-Bolivia, for example, are based on a general Change in Tariff Heading Rule either as a stand alone rule, or accompanied by an alternative Regional Value Content or Technical Requirement. The CACM rules of origin are generally based on a Change in Tariff Classification rule (either at the Subheading, Heading, or Chapter level) but are not as stringent as those required by the NAFTA.

In Europe, the RoO schemes are complex, given the large number of countries participating, but they are very similar across Agreements; both those Agreements signed by the European Union with its trading partners and those signed by the European Free Trade Association and its partners. The Product Specific RoO's vary across the tariff schedule but are generally defined at the Chapter or Heading level (a single rule for all products under that particular section[3]) with exceptions for each rule, and a few others products are subject to a Regional Value Content rule. The uniformity across the schemes is generally due to the Pan-European system (PANEURO) which aimed to have identical RoO's across all trade Agreements negotiated by Europe in order to enable diagonal cumulation between them (Estevadeordal & Suominen, 2004).

In the rest of the world, notably Asia and Africa, the rules of origin are much less complex and easier to comply with. The association of South East Asian Nations (ASEAN) which was signed in 1967 by Indonesia, Malaysia, Philippines, Singapore and Thailand, generally requires a uniform Regional Value Content rule with each of its trading partners. ASEAN-China FTA, for example requires a 40% RVC requirement. In Africa, the schemes are even simpler. Namibia-Zimabwe FTA requires a 25% RVC requirement, whereas the Economic Community of West African States (ECOWAS) requires a 50% RVC requirement, or alternatively a Change in Tariff Subheading.

The different rule of origin schemes mentioned above are depicted in graph 3.4 and graph 3.5 which are elaborated with information from the OECD Rule of Origin Database. In graph 3.4 we can observe a clear tendency for stricter RoO's in the Americas than in the Asian region, which in turn are more strict than in the African region. In graph 3.5 we can observe the imposition of the PANEURO scheme (intra-Europe on first graph) across different regions.

[3]In the OECD Rules of Origin Database I use, these rules are conveniently disaggregated and coded at the product specific level which allows me to incorporate them in the calculation of the Restrictiveness Index presented in the next section.

Fig. 3.4. RoO Distribution within Regions

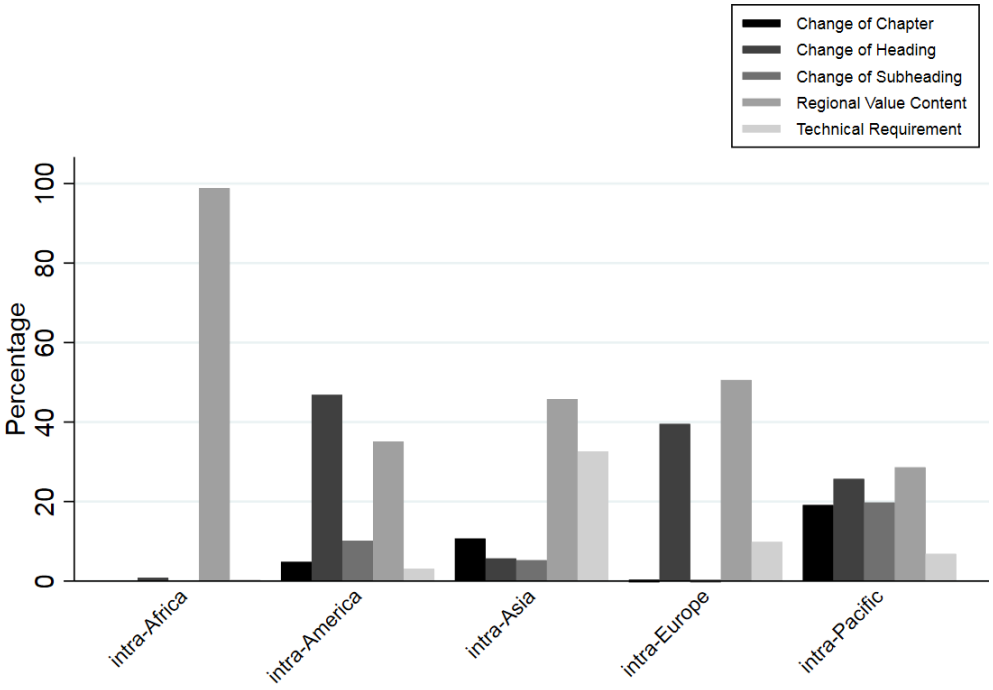
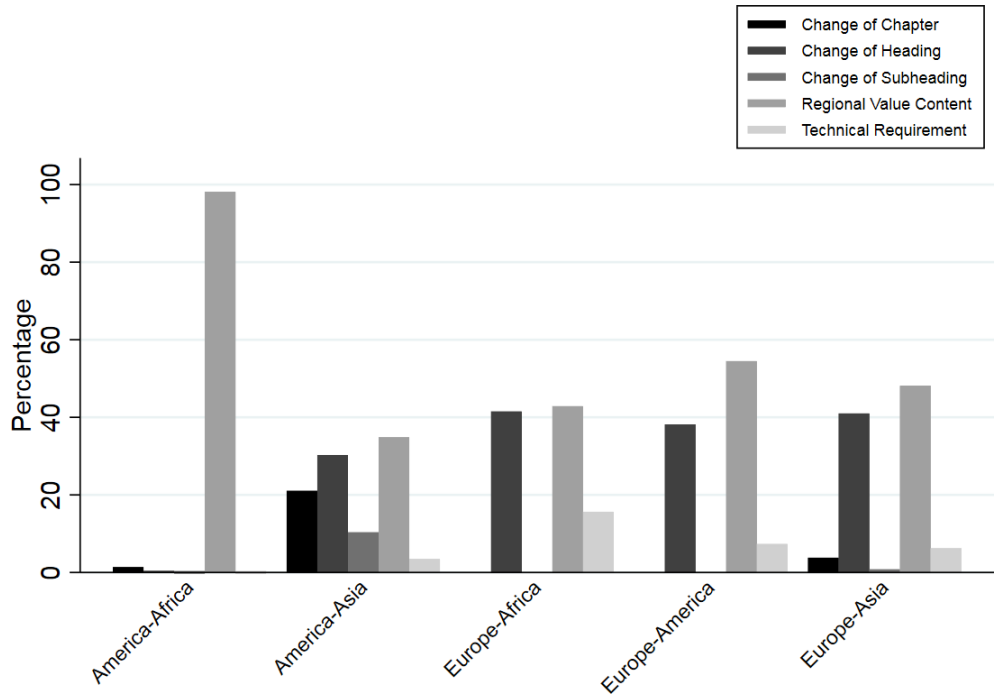


Fig. 3.5. RoO Distribution across Regions



4 Rules of Origin Index

In order to properly assess the degree of restrictiveness provided by the many types of product specific rules of origin and its combinations presented in the previous section, I construct a categorical index for rule of origin restrictiveness based on a few classification principles. After presenting the index, I argue why this Index is superior to the two main Indexes in the existing literature, namely Estevadeordal (2000) and Harris (2007). To counter the index of restrictiveness of PSR, I present a flexibility index that captures the regime wide rules of origin provisions that apply for the entire Agreement.

4.1 A Restrictiveness Index for Product Specific Rules

The main idea behind the index is that within each category of Product Specific Rule of origin, there is an implied degree of restrictiveness. By restrictiveness I mean how substantially a product's foreign inputs need to be transformed in order for the final product to be considered originating, and how much a rule might affect producers' decisions. A Change in Tariff Chapter, for example, would on average require a more substantial transformation than a Change in Tariff Heading for that same product. Equivalently, a 65% Regional Value Content (RVC) requirement would on average be harder to comply with than a 20% RVC (which permits up to 80% of third Party inputs to be included in the final product). The index ranges from 1 (least restrictive) to 7 (most restrictive). I assign a separate level of restrictiveness to each of the three main categories of Rules of Origin depending on their requirements (Change of Tariff Classification, Regional Value Content, Technical Requirement). These are then assigned a higher level of restrictiveness if they apply cumulatively with another rule, or if there is an explicit exception in the rule. They are assigned a lower level of restrictiveness if a pair of RoO's apply alternatively, as illustrated in Table 4.1.

Table 4.1: Restrictiveness Index

Index	**Main Rule of Origin**			**Refinements**		
	Tariff Classification	Regional Value Content	Technical Requirement	Cumulatively	Alternatively	Exclusion
7						
6	CC	> 40%		max RoO + 1	min RoO - 1	RoO + 1
5			TR	max RoO + 1	min RoO - 1	
4	CH			max RoO + 1	min RoO - 1	
3				max RoO + 1	min RoO - 1	
2	CSH	< 40%		max RoO + 1	min RoO - 1	
1						

We analyse all RoO's at their most dissagregate level (HS6 level). For Change of Tariff Classification Rule, the most common RoO, implying the average requirement for a final product to be considered originating when foreign inputs are used is a Change of Tarif f Heading Rule (a change at the HS4 level). To this rule, I assign a value of 4 out of 7. A Change of Tarif f Subheading would imply a less substantial transformation (a change at the HS6 level), and is therefore given a value of 2 out of 7. A Change of Chapter would imply a more substantial transformation, and is therefore given a value of 6 out of 7. Any of these rules could include specific Exclusions of particular Subheadings, Headings, or Chapters, respectively, in which case a value of 1 is added to the previously determined value.

For rules of Regional Value Content (RVC), the most common threshold is 40%, implying this is the mean substantial transformation expected for a product to be considered originating. In fact, the ASEAN Free Trade Area has a horizontal RoO of 40% RVC for all products. To this RoO we assign a value of 4 out of 7. RVC thresholds higher than this, imply a more substantial transformation, so to >40% RVC RoO, I assign a value of 6 out of 7. RVC thresholds lower than this imply a less substantial transformation and so to <40% RVC RoO's, I assign a value of 2 out of 7.

Rules of Technical Requirement have much more variation as they are specific to the particular product in question and may contemplate the process, the materials, or both used in the final good. They, however, generally require a more specific process than would be implied by the average Change of Heading Rule, but not so complicated as to be akin to a Change of Chapter Rule. I therefore assign a general value of 5 out of 7 to these type of RoO's.

Any of these RoO's could also apply cumulatively with other rules, or alternatively to other rules. If a RoO applies cumulatively with other RoO, the value I assign is the maximum value between the separate RoO's plus 1, given that the requirement will be higher than what is implied by the strictest stand alone rule included. If a RoO applies alternatively to another RoO, the value I assign is the minimum value of the separate RoO's minus 1, given that this would add a layer of flexibility to the RoO each producer finds the least restrictive.

This methodology would result in a single index per product at the HS6 level. For my main analysis, I construct three different bilateral country level indexes for PSR restrictiveness. The first index is a simple average of the rules of origin under the agreement. The second index is weighted by the products traded under each particular agreement. The idea being that the RoO assigned to those products which are not traded do not affect the Index, whereas the products that are traded the most have a bigger weight. The third index is weighted by tariff duties collected (which I calculate as trade value ◊ ad valorem tariff). The idea here is that a producer would have no incentive to comply with a particular Rule of Origin is the MFN tariff of that product is already zero. Conversely, a producer would have more incentives to comply with the RoO if the MFN tariff is higher (and the benefits from trading under the Agreement are therefore higher).

Additionally, many countries have several trade agreements in force with the same country (e.g. Mexico and Chile have a bilateral agreement between them, they are both members of the Pacific Alliance, and are both members of TPP). For purposes of the construction of the index, in those cases I assume the country would opt for the agreement offering the least restrictive RoO when trading with that particular partner.

In table 4.2 I present a bloxplot diagram of my index across different PTA's, to illustrate their level of restrictiveness and their variation across products within those agreements. The line in the middle of the box represents the median of the index of the PTA, and the lower and upper part of the box represent the 25th and 75th percentiles respectively. The lower and upper part of the lines are the minimum and maximum adjacent values, respectively. The agreements Colombia-Chile, and the Gulf Cooperation Council-Singapore, for example, have an index of 4 (indicating either a Change of Tariff Heading, or 40% Regional Value Content across the board)

with a few outliers. NAFTA, in contrast, has one of the highest restrictiveness indexes in the sample but there is some some variation across products.

In table 4.2 I present a more dissagregate view of the restrictiveness index for a set of representative products across PTA's, sorted by HS code. We can see a lowering of the index as we move across the Harmonised System, representing not only the particular structure of the Harmonised System (going from less processed to most processed products, beginning with the agricultural sector), but probably also a reflection of the powerful protectionist lobbies in the agricultural sector (Krueger, 1993).

Fig. 4.1. Boxplot of Restrictiveness Index

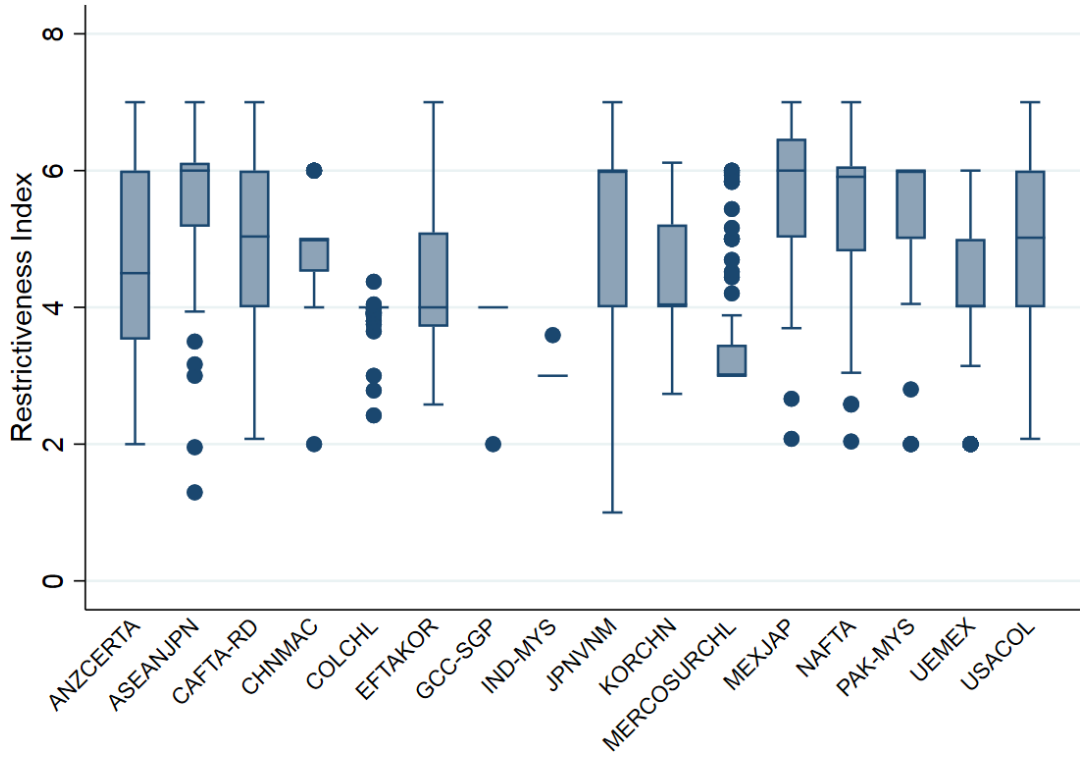


Table 4.2: Index across products

Products	ANZ-CERTA	ASEAN-JPN	CAFTA-RD	COL-CHL	EFTA-KOR	JPN-VNM	MERCO-SUR-CHL	MEX-JAP	NAFTA	EU-MEX
Live Animals	6	6	6	4	6	6	3	6	6	6
Dairy Products	3.1	6	6.7	4	6	6	4.4	6	7	6
Vegetables	5.4	6	6	4	6	6	3	6	6	6
Coffee and Tea	6.0	5.5	3.4	3.8	6	5.9	3	6	4.1	5.3
Food Preparations	6	6	6	4	6	6	3	6	6	6
Beverages	3.0	5.0	5.6	3.9	4.5	5.0	3.7	6.0	4.5	5.9
Organic Chemicals	2.5	6.2	2.5		3	1.1	3		4.4	2
Plastics	3.4		4.8		3	2.1	3.9	6.5	7.0	3.1
Soaps and Waxes	2.7		2.6	4	3		3.3	6.6	3.0	2
Wood Products	4	4.2	4		4.3	4.2	3	4.1	4	4
Books	4		6	4	4.1		3.7	6	6	4
Paper	3.2		4	3.8	4	6	3	6	6	4
Silk	4.7	4.9	4.8	3.8	4	5.1	3	4.8	4.8	4.5
Cotton	6.8	5.2	5.8		3.4	5.2	3	5.0	5.8	4.9
Footwear	5	6	4.0	4	4	6	5.8	6.9	6.9	3.4
Glass	4.9	6	4.7	4	4.1	6	3.5	4.8	4.8	4.8
Iron and Steel	4.7	3	4.4	3.9	4	3.2	4.5	6	4.4	4
Machinery	2.8	3.2	2.8	4	3.3	1.1	5.2	5.4	5.2	4.2
Vehicles	4.3		3.2	4	3.0	3.5	6	6.8	6.5	4
Works of Art	3.4		3.4	4	4		3	6	6	4
Average	4.3	5.2	4.5	3.9	4.3	4.6	3.7	5.8	5.4	4.4

4.2 Comparison with other Indexes

Estevadeordal (2000) argues that Rules of Origin are primary instruments in a trade agreement negotiation process, and not merely as complementary instruments to tariffs which was the common viewpoint in previous literature. In order to analyse the relationship of the negotiated tariffs with the rules of origin, he creates a restrictiveness index to measure it against the agreed tariff phase-outs of the NAFTA. The index he creates is the following:

Fig. 4.2. Estevadeordal (2000)

$y = 1$ if $y^* \leq$ CTH (Item)

$y = 2$ if CTH (Item) $< y^* \leq$ CTH (Sub-heading)

$y = 3$ if CTH (Sub-heading) $< y^* \leq$ CTH (Sub-heading) & RVC

$y = 4$ if CTH (Sub-heading) & RVC $< y^* \leq$ CTH (Heading)

$y = 5$ if CTH (Heading) $< y^* \leq$ CTH (Heading) & RVC

$y = 6$ if CTH (Heading) & RVC $< y^* \leq$ CTH (Section)

$y = 7$ if CTH (Section) $< y^* \leq$ CTH (Section) & TECH

The first major difference with my Index is that the main criteria for Estevadeordal's is the Change in Tariff Classification rule. My index accounts separately for Change in Tariff Classification (CTC) rules, Regional Value Content (RVC) rules, and Technical Requirements. Under Estevadeordal's methodology, RVC would only increase the index by one extra point from the main criteria regardless of the threshold. Given that the NAFTA includes a CTC requirement

for all products, regardless if there is an additional RVC requirement, this methodology is understandable. However, it is still important to account separately for the RVC thresholds.

To illustrate my point, I give the following example: Chocolate (1806.10) under NAFTA requires a Change in Tariff Heading plus a 35% RVC. Automobiles (8703.10) require a Change in Tariff Heading plus a 60% RVC. Under Estevadeordal's index both products would account to a restrictiveness level of 5. Under my methodology, the chocolate would have a restrictiveness of 4, and the automobiles a restrictiveness of 7, which I believe is a more accurate reflection of the substantial transformation required from these products to confer origin.

Additionally, Estevadeordal's index does not provide separate scores for alternative or cumulative rules of origin. And it provides a score of 7 to any technical rule. However, technical rules tend to be less strict than Change in Chapter rules, which implies that they should be located below a score of 6 under Estevadeordal's index. In my methodology, I provide a score of 5 to Technical Rules, with variations if they apply alternatively or cumulatively.

Harris (2007) presents an index of restrictiveness that aims to improve on Estevadeordal (2000). His index takes the following form:

Fig. 4.3. Harris (2007)

Change of classification points:	
ΔI	+2
ΔS	+4
ΔH	+6
ΔC	+8
ΔS/ΔH w/AI[46]	+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[47]	+8

Value Test Points:	
>0% and ≤40%	+5
>40% and ≤50%	+6
>50% and ≤60%	+7
>60%	+8
Net Cost	+1

Technical Requirement Points: +4

Notably Harris accounts separately for different Regional Value Contents, and includes the rare Addition points (essentially the opposite of an exception on a CTC rule, but from his examples perhaps a misinterpretation of the actual rule). His methodology, however, seems to result in a very heterogeneous Index, potentially receiving a score anywhere from -3 to 36. The index also results in inconsistencies: he uses as an example "A change to heading 12.34 from subheading 1256.78 or any other chapter." It is implied that this particular rule should be more restrictive than a Change in Subheading rule (Score of 4 under Harris) but less restrictive than a Change in Chapter rule (Score of 8 under Harris). However, as it includes an "addition", it results on a score of 6-6 = 0, which would be inconsistent with the rest of his criteria. In my index, this rule would have a score of 3, which I believe is a more accurate reflection of its restrictiveness.

4.3 Flexibility Index for Regime Wide Rules

The Product Specific Rules of Origin (PSR's) are not the sole determinant of the restrictiveness of trading goods under a particular PTA. The regime wide rules of origin could also affect the restrictiveness of all the PSR's in an agreement through several mechanisms. I intend to capture the aggregated effect of such mechanisms with a categorical flexibility index for regime wide rules of origin. The index is based on 11 criteria presented in Table 4.1, and ranges from 0 (least flexible) to 9 (most flexible). The weighing of the provisions for my index are based on the importance given to each of them in the existing literature, e.g. Garay & Cornejo (2001), and I briefly explain them below. The provisions with the highest weights are indeed the ones that demonstrate a positive and significant coefficient in Section 6. The distribution of the Flexibility Index across a set of major trade agreements is depicted in figure 4.4 .

Table 4.3: Flexibility Index

Provision	Type	Score
Cumulation	Full / Cross / Diagonal / Bilateral / None	2 / 1.5 / 1 / 0.5 / 0
De minimis	≥ 7% / < 7% / 0	1 / 0.5 / 0
Duty Drawback	Allowed / Not Allowed	1 / 0
Certification	Self / Certified Body / Authority	1 / 0.5 / 0
Validity	≥ 1 year / < 1 year	0.5 / 0
Exemption	≥ 1,000 $ / < 1,000 $ / 0	0.5 / 0.25 / 0
Verification	Direct / Indirect	1 / 0
Fungibles	Allowed / Not Allowed	0.5 / 0
Advanced Rulings	Allowed / Not Allowed	0.5 / 0
Transhipment	Allowed / Not Allowed	0.5 / 0
Review and Appeal	Allowed / Not Allowed	0.5 / 0

The first criteria is the Cumulation scheme. Bilateral Cumulation, which provides origin cumulation, only between Parties of the Agreement is assigned a score of .5, Diagonal Cumulation which allows cumulation with third Parties if they have a trade agreement with the same RoO's is assigned a score of 1, Cross Cumulation requiring only that they share a PTA with a third Party is assigned a score of 1.5, and Full Cumulation which requires no PTA to cumulate with a third Party a score of 2.

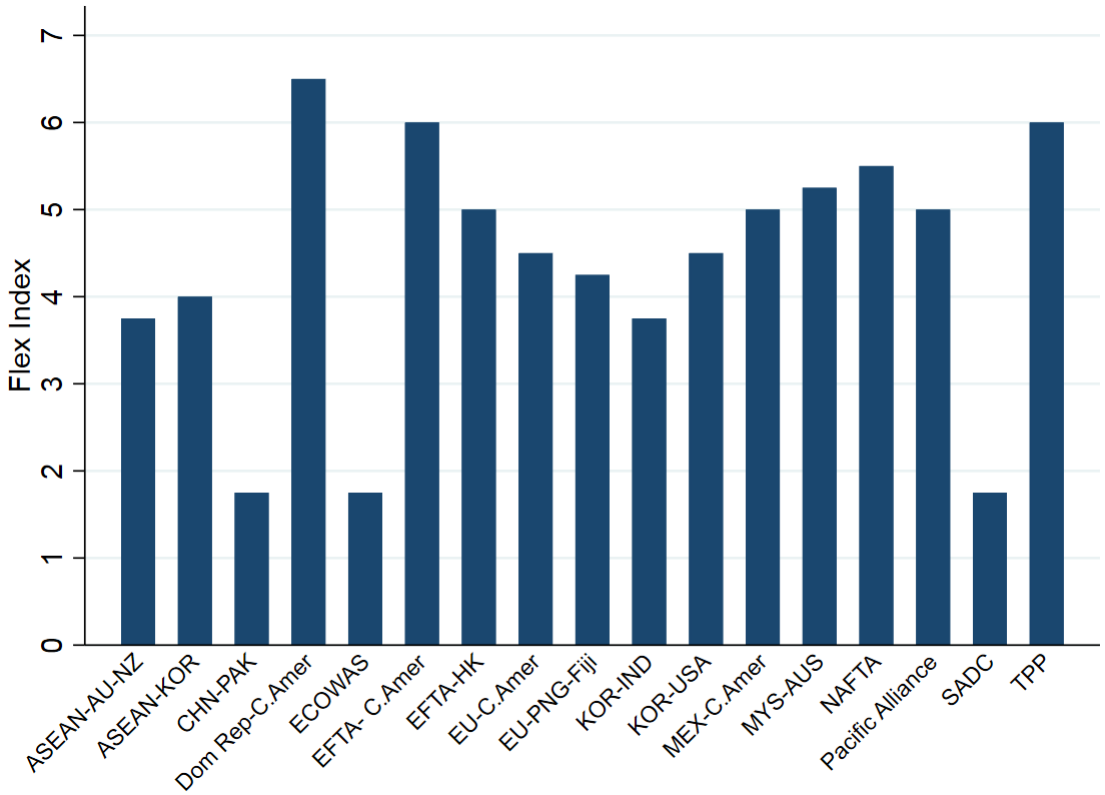
The De Minimis, which is the threshold of tolerance under which a product can still be considered "originating" despite not complying entirely with the PSR is assigned a score of 1 if it is above 7 %; a score of 0.5 if it is between 0 and 7 %, and a score of 0 if there is no tolerance. Duty Drawback provides a score of 1 if it is allowed, given that it incentivises companies to export rather than sell locally, and 0 if it is not allowed.

Certification provides a score of 1 if it is self-certification (by the importer or exporter) given that it is the more business friendly scheme; a score of 0.5 if it is through a certified body, or through an "authorised exporter" scheme; and a score of 0 it is requires Certification by the authority, as it is the most burdensome scheme. A Validity period for the certificate over 1 year provides a score of 0.5, and 0 otherwise. An Exemption for the need to present a certificate of origin at customs is assigned a score of 0.5 if the threshold is over 1,000 USD, and 0 otherwise.

The Verification of origin scheme of the traded goods provides a score of 1 if it is of "Direct" fashion and solely requires a written request for information, or 0 if it is "Indirect" and requires a verification visit to the premises by the customs authorities. If the origin status of Fungible goods can be determined in accordance to accounting principles, as opposed to physical segregation, a score of 0.5 is provided; and 0 otherwise. If Advanced Rulings, which ensures the commercial partners beforehand that their merchandise will be considered originating, are allowed then a score of 0.5 is assigned.

Transhipment allows a good to be transported through a third Party territory and not lose its originating status so long as the goods remain under control of the customs administration of said territory. This provision gives a score of 0.5. If transhipment is not allowed and goods can only retain their originating status by direct transport, then a score of 0 is assigned. Review and Appeal to the determination of origin of goods provide transparency to the importation process by allowing the importer to request a second review from the determination of the customs authorities. If this provision is included in the Agreement, a score of 0.5 is provided, and 0 otherwise.

Fig. 4.4. Flexibility Distribution



5 Data and Methodology

5.1 Databases

At the time of writing, the OECD databases on Rules of Origin are not yet published and are still in the process of being completed and cleaned. The working version of the **Product Specific Database** that I use for this study (dated April 2018) contains all product specific rules of origin for 159 preferential trade agreements, dating from 1973 to 2017, all coded at the HS6 product level. In total, the database contains 509,421 product specific rules of origin. The database is organised by the agreement name, the HS6 code of the product, followed by 19 dichotomous variables (e.g. "wholly obtained", "Substantial Transformation", "Cumulatively", "Change in Heading", etc.) and 3 variables for the threshold of Regional Value Content, if applicable. The 23 variables jointly determine the exact PSR of each product. In order to use this database for my trade analysis, I need to manually incorporate every possible bilateral relationship represented by each PTA (e.g. 2 combinations for every product traded under the Mexico-Chile FTA, 6 for every product traded under NAFTA, and so on). The expanded database includes 21,692,304 product specific rules of origin at the bilateral country level.

The **Regime Wide Rules of Origin Database** contains 310 Trade Agreements (some of which are Customs Unions, and some have been discontinued) dating from 1958 to 2018. The Database contains the agreement name followed by 35 dichotomous variables (e.g. "Diagonal cumulation" "certification by authority", "Duty Drawback allowed") and 3 numeric variables (validity period, exemption period, de minimis threshold if applicable), which jointly determine the particular Regime Wide scheme of each Agreement. In order to use this database for my analysis, I manually incorporate all the possible bilateral relationships represented by each agreement. The expanded database includes 38,408 regime wide schemes at the bilateral country level. All variables from the Databases are depicted in Appendix A.1. with their respective descriptive statistics.

5.2 Construction of Indexes

For the construction of the restrictiveness index, I first expand the original PSR database to include every possible bilateral relationship for the agreements in the database and the year of entry into force of the agreement. All PSR's for all agreements are duplicated for every year after the entry into force of the agreement. After this, I compute the HS6 level index for every product, according to the methodology presented in Section 4.1. Whenever there is more than one trade agreement in force between two countries applicable to a particular product, I assume the trading partners would opt for the most flexible rule and therefore I drop the stricter rules of that country-product relationship for that year from the database. In order to incorporate this index into the gravity model, I average it at the bilateral country level.

My second index is a restrictiveness index which has been weighted by trade, in order to have a more realistic depiction of the actual restrictiveness under the different trade agreements. To this end, I gather HS6 level trading data from the Base pour l'Analyse du Commerce International **(BACI)** of the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).

It is regarded as the database with the most accurate trading data, gathering information from the United Nations Statistical Division (COMTRADE Database) and reconciling declarations of the exporter and the importer. The BACI contains bilateral values at the HS6 level of disaggregation of more than 5000 products, for more than 200 countries since 1995, reported in thousands of US Dollars. This results in more than 9.3 million observations. The idea behind this index is to give a lesser weight to those products for which there is low trade or are not traded at all, and a higher weight to those products that are traded the most. This, in order to approach the true level of restrictiveness under each PTA.

My third index is weighted by the total customs taxes recollected (which I compute as value of trade X ad valorem tariff). The idea behind this index is that firms would not have an incentive to go through the burden of complying with the rule if the MFN tariff is already zero. Conversely, they would have a higher incentive to comply with the rule if the MFN tariff is higher, and therefore the benefits from trading under the Agreement are higher. I obtain my product level tariff data from the WTO website.

The flexibility index was constructed similarly to the restrictiveness index. I first expand the Regime Wide database to include every possible bilateral relationship for every agreement included. I duplicate every agreement for every year after its entry into force. After this I compute the flexibility index according to the methodology presented in Section 4.3. Whenever there is more than one agreement in force for any country pair, I assume the trading partners would opt for the agreement with the highest flexibility index (and therefore easier to comply with) and I drop the rest of the agreements for that year for that country pair.

5.3 Gravity Model

For the gravity model itself, I aggregate country level trade flows from the BACI database. The GDP, population, and tariff data I obtain from the **World Development Indicators** database of the World Bank (which itself takes data from the OECD National Accounts data files and WTO). The GDP data is reported in millions of US Dollars, and the tariff data in ad valorem equivalents. For the other key gravity variables, I obtain the data from the **CEPII GeoDist** database which includes distance, language spoken, if the country is landlocked, colonial links, etc. The restrictiveness and flexibility index I construct myself from the OECD Rules of Origin Databases. The additional regime wide provisions are taken from the OECD Regime Wide Database. Appendix A.1 contains the descriptive statistics of the databases.

The econometric models used for the analysis of the effect of RoO's on the value of imports from country j to country i are gravity equations, estimated using OLS with Fixed Effects[4]. The baseline specification is the following:

$$\begin{aligned} ln(Trade_{ijt}) = {} & \beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(GDPPC_{it}) + \beta_4 ln(GDPPC_{jt}) + \\ & \beta_5 ln(Dist_{ij}) + \beta_6 Border_{ij} + \beta_7 Lang_{ij} + \beta_8 Coloniser_{ij} + \\ & \beta_9 PTA_{ijt} + \beta_{10} ln(RestIndex_{ijt}) + \beta_{11} ln(FlexIndex_{ijt}) + \epsilon_{ijt} \end{aligned}$$

where,

$Trade_{ijt}$	value of imports from country j to country i
GDP_{it}	exporter's GDP in year t
GDP_{jt}	importer's GDP in year t
$GDPPC_{it}$	exporter's GDP per capita
$GDPPC_{jt}$	importer's GDP per capita
$Dist_{ij}$	distance between the capitals of the two countries
$Border_{ij}$	dummy indicating if the two countries share a land border
$Lang_{ij}$	dummy indicating if the two countries speak the same language
$Coloniser_{ij}$	dummy indicating if both countries have been colonised by the same colonial power
PTA_{ij}	dummy indicating if both countries belong to the same PTA
$RestIndex_{ijt}$	average country level restrictiveness of the product specific Rules of Origin under the PTA
$FlexIndex_{ijt}$	average country level flexibility of the Regime Wide Rules of Origin under the PTA between the two countries. It can take values between 1 and 9
ϵ_{ijt}	normally-distributed error term

Note: I use the unweighted Restrictiveness Index in the analysis to avoid endogeneity problems, e.g. $ln(RestIndex_2) \equiv ln(ResIndex/Trade) = ln(RestIndex) - ln(Trade)$.

[4]I capture multilateral resistance terms by incorporating country fixed effects into the gravity model as suggested by Anderson & Van Wincoop (2003).

The second model is an augmented model of the baseline specification, in order to measure the effects of Regime Wide provisions on trade:

$$ln(Trade_{ijt}) = \beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(GDPPC_{it}) + \beta_4 ln(GDPPC_{jt}) + \beta_5 ln(Dist_{ij}) + \beta_6 Border_{ij} + \beta_7 Lang_{ij} + \beta_8 Coloniser_{ij} + \beta_9 PTA_{ijt} + \beta_{10} ln(RestIndex_{ijt}) + \beta_{11} Cumul_{ijt} + \beta_{12} Cert_{ijt} + \beta_{13} Veri_{ijt} + \beta_{14} DeMini_{ijt} + \epsilon_{ijt}$$

where,

$Cumul_{ijt}$	dummy indicating if the PTA allows cumulation with a third country
$Cert_{ijt}$	dummy indicating if the PTA allows for business-friendly certification such as self-certification by the importer or the exporter
$Veri_{ijt}$	dummy indicating if the PTA allows "Indirect" verification
$DeMini_{ijt}$	indicated the de minimis threshold permitted by the PTA

The third model augments the baseline specification by different cumulation provisions:

$$ln(Trade_{ijt}) = \beta_0 + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(GDPPC_{it}) + \beta_4 ln(GDPPC_{jt}) + \beta_5 ln(Dist_{ij}) + \beta_6 Border_{ij} + \beta_7 Lang_{ij} + \beta_8 Coloniser_{ij} + \beta_9 PTA_{ijt} + \beta_{10} ln(RestIndex_{ijt}) + \beta_{11} CumulDiag_{ijt} + \beta_{12} CumulFull_{ijt} + \epsilon_{ijt}$$

where,

$CumulDiag_{ijt}$	dummy indicating if the PTA allows diagonal cumulation with a country with a common PTA
$CumulFul_{ijt}$	dummy indicating if the PTA allows for full cumulation regardless of a common PTA

6 Estimation results

This section presents the main results from incorporating my categorical index into the gravity model in order to operationalise the level of restrictiveness implied by the Rules of Origin under each Agreement. What should we expect to be the effects of Rules of Origin on Trade? On the one hand, we know that the purpose of Rules of Origin is to avoid trade deflection from third countries and promote bilateral trade between the signatory countries by offering preferential tariff rate to regionally produced goods. On the other hand, the stricter the rule of origin is, and the less inputs can be incorporated from third countries, the harder it would be for the producer to comply with such rule and therefore for trade to occur at the preferential tariff rate. We would expect a stricter rule of origin to be related to an increase in trade of intermediate goods, as producers are incentivised to source from within the Free Trade Region, as proposed by Ju & Krishna (1998); and we would expect a stricter rule of origin to be related to a decrease in trade of final goods, as it would be harder to comply with such a rule. Cadot et al. (2002) suggest that early low utilisation rate of the NAFTA (they estimate 64%) could be attributed to the restrictiveness of the Rules of Origin. At the aggregate country level therefore , and maintaining all else constant, we can expect the decrease in bilateral trade of final goods to be greater than the increase in intermediate goods, in line with the findings of Estevadeordal & Suominen (2004).

Table 6.1 presents the regression results of the baseline specification. All control variables typically included in gravity estimations are significant and have the expected sign: *Distance* has a negative effect on trade while *GDP*, *border*, common *language* and *coloniser* have a positive effect on trade. The first three columns include year fixed effects, importer fixed effects and exporter fixed effects. In column 1, we can see that having a *PTA* increases bilateral trade by 0.46%.

In column 2, I incorporate the restrictiveness index, *ln_rooind*, which as expected, has a negative effect on trade and is significant at the 1% significance level. Once I incorporate the restrictiveness index into the model, we also notice that the standalone effect of the *PTA* is reduced. In column 3, I include the flexibility index of the regime wide rules, *ln_indfac* and as expected we see a positive effect on trade and it is significant at the 1% significance level. These are the two first main results of the paper: a rise in the restrictiveness of the product specific rules of origin dampens aggregate trade, whereas a more flexible Regime Wide scheme boosts aggregate trade.

In columns 4 to 6, I use a more strict specification by incorporating Importer-Year Fixed Effects, and Exporter-Year Fixed Effects. Anderson & Van Wincoop (2003) suggest that the use of exporter-time and importer-time fixed effects enable to control the unobservable multilateral resistance, and any other possible characteristics varying over time for both the exporter and the importer . The variables of interest remain unaffected under this specification: the coefficient of the restrictiveness index is negative and significant at the 1% level, and the flexibility index is positive and significant at the 1% level[5].

[5]In column 8, I incorporate all the regime wide provisions into the model. However the results are not significant given that the flexibility index is constructed directly from these provisions, and there is potential high multicollinearity so I test the effect of these provisions on trade separately using my second specification, on Table 6.2.

We can expect the dampening of trade from strict RoO's to reduce over time, due to three phenomena: first, producers become more acquainted with the rule of origin over time, and adjust their production process accordingly; secondly, the establishment of the Free Trade Area promotes investment in intermediate good industries in the region and therefore renders the RoO easier to comply with, as suggested by Estevadeordal et al. (2006); finally, as the Agreement approaches its complete tariff phase out, producers find it more profitable to trade under the PTA, further reinforcing the first two phenomena. In order to test this hypothesis, in column 7, I incorporate the squared of the restrictiveness index, *ln_rooind_sq* which represents the acceleration or deceleration of the index over time[6]. As expected, the Restrictiveness Index remains negative and significant, while the squared index is positive and significant representing a reduction in the negative effect of trade over time. The Flexibility Index remains positive and significant at the 1% significance level.

Table 6.2 presents the results of the second specification which is augmented to measure the effects of the individual flexibility provisions on trade. In all columns, I use Year Fixed Effects, Importer Fixed Effects and Exporter Fixed Effects. The restrictiveness index is again negative and significant at the 1% level. In column 3, we can see that increasing the cumulation scheme, *ln_roocum*, has a positive effect on trade. Column 4 shows that agreements with a more business friendly certification scheme, *ln_roocer*, boost trade. In column 5 we can see that incorporating a more lax verification scheme, *ln_roover*, is beneficial to trade. Finally, we can see in column 6 that increasing the de minimis threshold, *ln_roocum_dm*2, also has a positive effect on trade. This is the third main result of the paper: the inclusion of regime wide provisions has a positive effect on aggregate trade. The flexibility provided by these provisions seems crucial to companies considering that global value chains are an essential feature of our economic reality.

In table 6.3, I present the results from the third model specification. Here I disaggregate the cumulation variable into diagonal cumulation (extending the cumulation area if both Parties share an FTA with a third Party), and full cumulation (extending the cumulation area even if there is not an FTA in common with the third Party). As expected extending the cumulation area for an agreement has a positive effect on trade, and is significant at the 1% level. Column 3 shows that extending diagonal cumulation, *ln_roocum_dia*, is related to a positive increase in bilateral trade flows, and in column 4 we can see that extending this scheme to full cumulation, *ln_roocum_ful*, is related to a furter positive increase in bilateral trade flows.

[6]Here I follow Benz (2017) in the context of measuring the impact of service restrictiveness, through the STRI index, on trade flows using a gravity estimation.

Table 6.1: Estimation Results

VARIABLES	(1) FE01	(2) FE02	(3) FE03	(4) FE11	(5) FE12	(6) FE13	(7) PPML2	(8) FE21
ln_distw	-1.453***	-1.459***	-1.440***	-1.459***	-1.467***	-1.443***	0.103***	-1.422***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.00)	(0.02)
contig	0.777***	0.777***	0.742***	0.772***	0.771***	0.729***	0.156***	0.692***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.00)	(0.11)
comlang_off	0.769***	0.767***	0.757***	0.775***	0.772***	0.760***	-0.012***	0.725***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.00)	(0.04)
colony	0.904***	0.899***	0.898***	0.904***	0.899***	0.898***	0.023***	0.958***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.00)	(0.10)
fta_wto	0.466***	0.216***	0.222***	0.474***	0.166**	0.196***	0.029	0.374***
	(0.04)	(0.07)	(0.07)	(0.04)	(0.07)	(0.07)	(0.02)	(0.06)
ln_gdp_o								0.193***
								(0.03)
ln_gdp_d								0.602***
								(0.02)
ln_gdppc_usd_o								0.631***
								(0.05)
ln_gdppc_usd_d								0.168***
								(0.04)
ln_rooind		-0.458***	-0.395***		-0.567***	-0.452***	-1.050***	0.942
		(0.10)	(0.10)		(0.11)	(0.11)	(0.30)	(0.80)
ln_rooind_sq							0.301***	-0.372
							(0.10)	(0.25)
ln_indfac			0.142***			0.175***	0.016***	0.232***
			(0.02)			(0.02)	(0.00)	(0.08)
ln_roocer								0.090
								(0.11)
ln_roover								-0.204
								(0.16)
ln_roocum								-0.179*
								(0.10)
ln_roodraw								-0.659***
								(0.10)
Observations	491,961	491,961	491,961	491,961	491,961	491,961	491,961	420,434
R-squared	0.738	0.738	0.739	0.754	0.754	0.754	0.974	0.756
Year FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp & Exp FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes
Exp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6.2: Flexibility provisions

VARIABLES	(1) FE01	(2) FE02	(3) FE03	(4) FE04	(5) FE05	(6) FE06
ln_distw	-1.453***	-1.459***	-1.453***	-1.445***	-1.450***	-1.440***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
contig	0.777***	0.777***	0.759***	0.783***	0.745***	0.761***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
comlang_off	0.769***	0.767***	0.759***	0.770***	0.753***	0.764***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
colony	0.904***	0.899***	0.901***	0.893***	0.901***	0.896***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
fta_wto	0.466***	0.216***	0.258***	0.250***	0.245***	0.205***
	(0.04)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
ln_rooind		-0.458***	-0.387***	-0.412***	-0.373***	-0.449***
		(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
ln_roocum			0.214***			
			(0.05)			
ln_roocer				0.348***		
				(0.05)		
ln_roover					0.268***	
					(0.05)	
ln_roo_cum_dm2						0.108***
						(0.01)
Observations	491,961	491,961	491,961	491,961	491,961	491,961
R-squared	0.738	0.738	0.739	0.739	0.739	0.739
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Imp & Exp FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6.3: Cumulation

VARIABLES	(1) FE01	(2) FE02	(3) FE03	(4) FE04
ln_distw	-1.453***	-1.459***	-1.443***	-1.456***
	(0.02)	(0.02)	(0.02)	(0.02)
contig	0.777***	0.777***	0.750***	0.774***
	(0.10)	(0.10)	(0.10)	(0.10)
comlang_off	0.769***	0.767***	0.750***	0.769***
	(0.04)	(0.04)	(0.04)	(0.04)
colony	0.904***	0.899***	0.905***	0.898***
	(0.10)	(0.10)	(0.10)	(0.10)
fta_wto	0.466***	0.216***	0.285***	0.235***
	(0.04)	(0.07)	(0.07)	(0.07)
ln_rooind		-0.458***	-0.333***	-0.434***
		(0.10)	(0.10)	(0.10)
ln_roo_cum_dia			0.430***	
			(0.06)	
ln_roo_cum_ful				0.221***
				(0.09)
Constant	20.283***	21.292***	20.880***	21.210***
	(0.17)	(0.27)	(0.28)	(0.28)
Observations	491,961	491,961	491,961	491,961
R-squared	0.738	0.738	0.739	0.738
Year FE	Yes	Yes	Yes	Yes
Imp & Exp FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6.1 Robustness checks

In Appendix A.2, I present different robustness checks. The first and second regressions consist of subsamples of half the year coverage, 1996-2006, and 2007-2017, respectively. The third one consists of a subsample not including the Americas, to verify that the restrictive RoO's in the region and the high level of trade under NAFTA is not driving the results. The fourth consists of a subsample not including Europe, with a similar reasoning as for the Americas. The fifth robustness check consists of including 4 year gaps between periods, following Olivero & Yotov (2012), who propose this methodology in order to allow adjustment in trade flows. Overall, the results remain robust. In the case of the subsample not including Europe, table A.4, the results lose some explanatory power. The results in columns 5 and 6, where we account for multilateral resistance with Importer-Time and Exporter-Time Fixed Effects (as suggested by Anderson & Van Wincoop (2003)) are significant. However, they lose significance with Exporter FE, Importer FE, and Year FE. This might be due to the PANEURO scheme including more extended schemes of cumulation, and therefore rendering the PSR's less effective. However, I leave that question for further research.

More interestingly, and more conclusively, I am able to run the BACI data on the restrictiveness index at the product level, using the most strict specification possible: Exporter-Product-Year Fixed Effects, Importer-Product-Year Fixed Effects, Product-Pair Fixed Effects. The results remain robust: the coefficient of the restrictiveness index is negative and significant. Table 6.5 presents the results from the product level regression, and table 6.4 presents the results with the logged variables.

Table 6.4: Product level regression 1

	(1)
VARIABLES	HS
fta_dum	0.307***
	(0.01)
ln_tariff	-119.029
	(121.94)
ln_rooind	-0.071***
	(0.00)
Observations	59,023,941
R-squared	0.786
Exporter Product Year FE	YES
Importer Product Year FE	YES
Product Pair FE	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6.5: Product level regression 2

	Dependent variable:
	trade
fta_dum	3,527.196***
	(232.880)
tariff	98,038.930
	(424,056.800)
rooind	≠272.346***
	(50.730)
Observations	61,656,433
R^2	0.589
Adjusted R^2	0.479
Residual Std. Error	73,471.820 (df = 48567033)
Exp-Year-Product FE	YES
Imp-Year-Product FE	YES
Exp-Imp-Product FE	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7 Conclusions

In this paper I present an overview of the large spectrum of rules of origin existing around the world. I then present an index that seeks to properly measure the level of restrictiveness of Product Specific Rules of Origin, and an analysis of the levels of restrictiveness across trade agreements. I construct a second index to measure the combined effect of flexibility provided by the different Regime Wide Rules of Origin of each Agreement. I then incorporate these indexes, and a score of regime wide provisions into a gravity model to measure their effect on trade flows. On the one hand, I find evidence that an increase in the level of restrictiveness of product specific rules of origin hampers aggregate trade. On the other hand, I find that an increase in the level of flexibility provided by the regime wide scheme of the agreement increases aggregate trade. Finally, I present a number of regime wide rules of origin, such as the cumulation scheme and the de minimis threshold, that are positively related to an increase in aggregate trade.

Although most economists would agree that preferential trade agreements are highly beneficial for an economy (Rodrik, 2018); these are also, by definition, discriminatory. RoO's are an integral part of any trade agreement. A RoO-less PTA is hard to imagine: the same political forces preventing MFN tariffs to go to zero, would be the ones preventing a PTA to be signed without RoO's. So what advise can be given from the results of this paper? The first advise is that one should broadcast this information. Evidence from strict rules of origin being detrimental to aggregate trade should help countering the lobbying from the industrial sectors and help policy makers in formulating a more beneficial trade agreement. Evidence that a trade agreement with restrictive RoO's hampers trade with a third Party would result in possible violation of Art. XXIV of the GATT, and this in and of itself should serve as an additional argument for policy makers to include less restrictive rules of origin in the FTA. This advise should not be limited to future or ongoing negotiations: unlike the core texts of an agreement which require Congress approval, the modification of the Product Specific Rules of Origin annex is often left under the authority of the Free Trade Commission or the Joint Committee of each FTA (e.g. PSR's under the Mexico-Japan FTA are adopted directly by the Joint Committee; and in the case of the US, the USTR must inform Congress about modifications to PSR's under NAFTA, the Tracks, but does not require approval) and as such are less exposed to political pressures.

The second advise would be to revalue the benefits of the Regime Wide RoO schemes. The flexibility provisions of the regime wide schemes have demonstrated to be positively beneficial for trade, and they are crucial to companies considering that global value chains have become an essential feature of our economic reality. Unlike Product Specific Rules of Origin, there is not a particular group lobbying for or against these provisions. Even the trade dampening effect of an agreement with strict PRS's, could be countered to a degree if the agreement has flexible enough regime wide provisions. Cumulation in particular seems key in fighting the spaghetti bowl of PSR's today, and has been argued for from works of Augier et al. (2005) to Cornejo et al. (2007). Diagonal cumulation schemes have already been partially adopted on PANEURO trade agreements with success, and the rest of the world could follow suit adopting this type of cumulation schemes.

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A Appendix

A.1 Databases

Table A.1: PSR Variables

Variable Name	Variable Description
agreement	Agreement
code_hs6	Code_HS6
SR_psr	Does the agreement contain product-specific Rules of Origin ?
SR_who	Is the product's origin defined as wholly obtained?
SR_stc	Is the product's origin defined through substantial transformation criteria?
SR_ctc	Is the product's origin defined through a change in tariff classification?
SR_cc	Is the product's origin defined through a change in chapter?
SR_ch	Is the product's origin defined through a change in heading?
SR_cs	Is the product's origin defined through a change in sub-heading?
SR_vcr	Is the product's origin defined through a value content requirement?
SR_tr	Is the product's origin defined through a technical requirement?
SR_com	Do two or more origin criteria apply cumulatively?
SR_alt	Do two or more origin criteria apply alternatively?
SR_ctc_exc	Are one or more HS codes or product groups explicitly excluded from being used?
SR_vrc_perc1	What is the percentage of value content required under method 1?
SR_vrc_perc2	What is the percentage of value content required under method 2?
SR_vrc_meth1	What is the method 1 of calculating VC?
SR_vrc_perc3	What is the percentage of value content required under method 3?
SR_vrc_meth2	What is the method 2 of calculating VC?
SR_vrc_meth3	What is the method 3 of calculating VC?
SR_vrc_meth4	What is the method 4 of calculating VC?

Table A.2: PSR Statistics

Variable	N	Mean	SD	Min	Max
code_hs6	509421				
SR_who	509421	0.03	0.17	0.00	1.00
SR_stc	509421	0.97	0.17	0.00	1.00
SR_ctc	509421	0.78	0.41	0.00	1.00
SR_cc	509421	0.16	0.37	0.00	1.00
SR_ch	509421	0.51	0.50	0.00	1.00
SR_cs	509421	0.11	0.31	0.00	1.00
SR_vcr	509421	0.46	0.50	0.00	1.00
SR_tr	509421	0.08	0.28	0.00	1.00
SR_com	509421	0.07	0.25	0.00	1.00
SR_alt	509421	0.30	0.46	0.00	1.00
SR_ctc_exc	509421	0.08	0.28	0.00	1.00
SR_vrc_perc1	235609	44.58	7.53	10.00	94.00
SR_vrc_perc2	12179	48.05	10.70	26.00	60.00
SR_vrc_perc3	75	35.00	0.00	35.00	35.00

Table A.3: Wide RoO Variables

Variable Name	Variable Description
agreement	agreement
entry_year	entry_year
roo_cer_sel	Can the certificate be issued on the basis of self-certification by the exporter or importer?
roo_cer_adm	Does the certificate have to be issued by competent authorities of the exporting country?
roo_cer_two	Is there a possibility to combine self-certification with administrative certification?
roo_cer_val	What is the length of the validity period for the certificate of origin?
roo_cer_rec	What is the length of the record keeping period?
roo_cer_ex1	Is there a certificate exemption?
roo_cer_ex2	What is the threshold for exemption in ?
roo_cer_err	Is there a possibility to amend minor errors?
roo_ver_dir	Is there a direct verification of the certificate?
roo_ver_ind	Is there an indirect verification of the certificate?
roo_ver_two	Is there a combined verification of the certificate?
roo_cum_bil	Does the agreement allow for bilateral or partial cumulation?
roo_cum_dia	Does the agreement allow for diagonal cumulation?
roo_cum_ful	Does the agreement allow for full cumulation?
roo_cum_cro	Does the agreement allow for cross cumulation?
roo_cum_dm1	Does the agreement contain de minimis provisions?
roo_cum_dm2	What is the de minimis percentage?
roo_cum_abs	Does the agreement include absorption provisions?
roo_vcr_psr	Does the agreement contain PSRs?
roo_vcr_rbd	Is the value content requirement calculated as a minimum regional content requirement?
roo_vcr_rbu	Is the value content requirement calculated as a minimum regional content requirement?
roo_vcr_alt	Is more than one calculation method permitted to determine the Regional Value Content requirement?
roo_vcr_imc	Is the value content requirement calculated through import content?
roo_vcr_rec	record
roo_vcr_ric	Is the value content requirement calculated through both regional and import content?
roo_vcr_cst	Is the price basis for the content threshold requirement the ex-works cost?
roo_vcr_fnt	Is the price basis for the content threshold requirement the FOB/net price?
roo_vcr_prc	Is the price basis for the content threshold requirement the ex-works price?
roo_vcr_fob	Is the price basis for the content threshold requirement the FOB (free on board)?

Wide RoO Variables - continued

Variable Name	Variable Description
roo_vcr_per	What is the percentage of value content required?
roo_vcr_per2	What is the percentage of value content required with alt method?
roo_drb	Does the agreement contain drawback rules?
roo_dba	Does the agreement allow drawback ?
roo_dbp	Does the agreement prohibit drawback ?
roo_fng	Does the agreement allow for joint storage of originating and non-originating in fungible goods?
roo_adr	Does the agreement allow for advance rulings?
roo_trs	Does the agreement contain a transhipment rule?
roo_rev	Does the agreement contain a specific review and appeal mechanisms?

Table A.4: Wide RoO Statistics

Variable	N	Mean	SD	Min	Max
entry_year	310	2003.76	9.75	1958.00	2018.00
roo_cer_sel	310	0.21	0.41	0.00	1.00
roo_cer_adm	310	0.45	0.50	0.00	1.00
roo_cer_two	310	0.32	0.47	0.00	1.00
roo_cer_val	310	9.85	9.15	0.00	48.00
roo_cer_rec	310	3.30	1.58	0.00	7.00
roo_cer_ex1	310	0.63	0.48	0.00	1.00
roo_cer_ex2	310	745.42	779.28	0.00	5000.00
roo_cer_err	310	0.53	0.50	0.00	1.00
roo_ver_dir	310	0.38	0.49	0.00	1.00
roo_ver_ind	310	0.47	0.50	0.00	1.00
roo_ver_two	310	0.05	0.21	0.00	1.00
roo_cum_bil	310	0.86	0.34	0.00	1.00
roo_cum_dia	310	0.14	0.34	0.00	1.00
roo_cum_ful	310	0.08	0.28	0.00	1.00
roo_cum_cro	310	0.05	0.21	0.00	1.00
roo_cum_dm1	310	0.68	0.47	0.00	1.00
roo_cum_dm2	310	6.63	4.62	0.00	15.00
roo_cum_abs	310	0.52	0.50	0.00	1.00
roo_vcr_psr	310	0.57	0.50	0.00	1.00
roo_vcr_rbd	310	0.29	0.45	0.00	1.00
roo_vcr_rbu	310	0.06	0.25	0.00	1.00
roo_vcr_alt	310	0.12	0.33	0.00	1.00
roo_vcr_imc	310	0.40	0.49	0.00	1.00
roo_vcr_rec	310	0.35	0.48	0.00	1.00
roo_vcr_ric	310	0.02	0.13	0.00	1.00
roo_vcr_cst	310	0.01	0.08	0.00	1.00
roo_vcr_fnt	310	0.17	0.38	0.00	1.00
roo_vcr_prc	310	0.31	0.46	0.00	1.00
roo_vcr_fob	310	0.41	0.49	0.00	1.00
roo_vcr_per	310	10.23	19.53	0.00	100.00
roo_vcr_per2	310	0.19	3.41	0.00	60.00
roo_drb	310	0.29	0.46	0.00	1.00
roo_dba	310	0.03	0.16	0.00	1.00
roo_dbp	310	0.23	0.42	0.00	1.00
roo_fng	310	0.62	0.49	0.00	1.00
roo_adr	310	0.39	0.49	0.00	1.00
roo_trs	310	0.80	0.40	0.00	1.00
roo_rev	310	0.48	0.50	0.00	1.00

Table A.5: Gravity Variables

Variable Name	Variable Description
year	Year
iso_o	Exporter
iso_d	Importer
tariffwto	tariff used in weights
flow	BACI aggregated flows
gdp_o	GDP in current USD
gdppc_ppp_o	GDP per capita, PPP
gdppc_usd_o	GDP per capita (constant 2010 US$)
investment_o	Gross capital formation (constant 2010 US$)
population_o	Population, total
tariff_o	Tariff rate, applied, simple mean
gdp_d	GDP in current USD
gdppc_ppp_d	GDP per capita, PPP
gdppc_usd_d	GDP per capita (constant 2010 US$)
investment_d	Gross capital formation (constant 2010 US$)
population_d	Population, total
tariff_d	Tariff rate, applied, simple mean
fta_wto	1=RTA (Source: WTO, 2015) and PTA's in RoO Databases
continent_o	Continent
continent_d	Continent
rooind	(mean) index_final
rooind2	PSR index weighted by trade
rooind3	PSR index weighted by trade*tariff
agreement_psr	Agreement
contig	1 for contiguity
comlang_off	1 for common official of primary language
comlang_ethno	1 if a language is spoken by at least 9% of the population in both countries
colony	1 for pairs ever in colonial relationship
comcol	1 for common colonizer post 1945
curcol	1 for pairs currently in colonial relationship
col45	1 for pairs in colonial relationship post 1945
smctry	1 if countries were or are the same country
dist	simple distance (most populated cities, km)
distcap	simple distance between capitals (capitals, km)
distw	weighted distance (pop-wt, km)
distwces	weighted distance (pop-wt, km) CES distances with theta=-1
agreement_wide	agreement

Gravity Variables - continued

Variable Name	Variable Description
roo_cer_sel	Can the certificate be issued on the basis of self-certification by the exporter or importer?
roo_cer_adm	Does the certificate have to be issued by competent authorities of the exporting country?
roo_cer_two	Is there a possibility to combine self-certification with administrative certification?
roo_cer_val	What is the length of the validity period for the certificate of origin?
roo_cer_rec	What is the length of the record keeping period?
roo_cer_ex1	Is there a certificate exemption?
roo_cer_ex2	What is the threshold for exemption in ?
roo_cer_err	Is there a possibility to amend minor errors?
roo_ver_dir	Is there a direct verification of the certificate?
roo_ver_ind	Is there an indirect verification of the certificate?
roo_ver_two	Is there a combined verification of the certificate?
roo_cum_bil	Does the agreement allow for bilateral or partial cumulation?
roo_cum_dia	Does the agreement allow for diagonal cumulation?
roo_cum_ful	Does the agreement allow for full cumulation?
roo_cum_cro	Does the agreement allow for cross cumulation?
roo_cum_dm1	Does the agreement contain de minimis provisions?
roo_cum_dm2	What is the de minimis percentage?
roo_cum_abs	Does the agreement include absorption provisions?
roo_drb	Does the agreement contain drawback rules?
roo_dba	Does the agreement allow drawback ?
roo_dbp	Does the agreement prohibit drawback ?
roo_fng	Does the agreement allow for joint storage of originating and non-originating in
roo_adr	Does the agreement allow for advance rulings?
roo_trs	Does the agreement contain a transhipment rule
roo_rev	Does the agreement contain a specific review and appeal mechanisms?
indfac	Flexibility Index

Table A.6: Gravity Statistics

Variable	N	Mean	SD	Min	Max
year	498860	2006.89	6.23	1996.00	2018.00
tariffwto	496270	5.46	8.16	0.00	975.05
flow	496270	4.80e+05	4.74e+06	0.00	4.77e+08
gdp_o	480709	4.50e+11	1.54e+12	1.23e+07	1.95e+13
gdppc_ppp_o	472571	18003.08	18534.69	341.00	1.40e+05
gdppc_usd_o	477461	15608.86	18859.84	186.66	94903.19
investment_o	406398	1.41e+11	4.35e+11	-9.50e+11	4.79e+12
population_o	495946	4.91e+07	1.63e+08	9256.00	1.39e+09
tariff_o	388576	7.70	6.04	0.00	45.83
gdp_d	479935	4.40e+11	1.54e+12	1.23e+07	1.95e+13
gdppc_ppp_d	471035	17559.34	18479.48	341.00	1.40e+05
gdppc_usd_d	476061	15144.95	18654.68	186.66	94903.19
investment_d	397518	1.41e+11	4.36e+11	-9.50e+11	4.79e+12
population_d	495929	4.68e+07	1.59e+08	9256.00	1.39e+09
tariff_d	381559	7.89	6.05	0.00	45.83
fta_wto	449698	0.13	0.34	0.00	1.00
rooind	41158	3.96	1.62	1.00	7.00
rooind2	41158	3.93	1.65	0.00	7.00
rooind3	41158	1.85	2.06	0.00	7.00
contig	496270	0.02	0.15	0.00	1.00
comlang_off	496270	0.15	0.36	0.00	1.00
comlang_ethno	496270	0.15	0.36	0.00	1.00
colony	496270	0.02	0.13	0.00	1.00
comcol	496270	0.09	0.29	0.00	1.00
curcol	496270	0.00	0.03	0.00	1.00
col45	496270	0.01	0.10	0.00	1.00
smctry	496270	0.01	0.11	0.00	1.00
dist	496270	7341.05	4467.80	59.62	19904.45
distcap	496270	7321.77	4466.35	59.62	19904.45
distw	491961	7334.40	4452.71	94.27	19735.32
distwces	491961	7306.81	4461.19	92.35	19734.89

Gravity Statistics - continued

Variable	N	Mean	SD	Min	Max
roo_cer_sel	84207	0.03	0.17	0.00	1.00
roo_cer_adm	84207	0.40	0.49	0.00	1.00
roo_cer_two	84207	0.35	0.48	0.00	1.00
roo_cer_val	84207	6.33	5.69	0.00	48.00
roo_cer_rec	84207	2.43	1.48	0.00	7.00
roo_cer_ex1	84207	0.53	0.50	0.00	1.00
roo_cer_ex2	84207	598.08	661.35	0.00	5000.00
roo_cer_err	84207	0.53	0.50	0.00	1.00
roo_ver_dir	84207	0.09	0.29	0.00	1.00
roo_ver_ind	84207	0.60	0.49	0.00	1.00
roo_ver_two	84207	0.04	0.20	0.00	1.00
roo_cum_bil	84207	0.60	0.49	0.00	1.00
roo_cum_dia	84207	0.41	0.49	0.00	1.00
roo_cum_ful	84207	0.18	0.38	0.00	1.00
roo_cum_cro	84207	0.10	0.30	0.00	1.00
roo_cum_dm1	84207	0.48	0.50	0.00	1.00
roo_cum_dm2	84207	4.89	5.10	0.00	15.00
roo_cum_abs	84207	0.46	0.50	0.00	1.00
roo_drb	84207	0.38	0.48	0.00	1.00
roo_dba	84207	0.08	0.27	0.00	1.00
roo_dbp	84207	0.29	0.45	0.00	1.00
roo_fng	84207	0.23	0.42	0.00	1.00
roo_adr	84207	0.16	0.37	0.00	1.00
roo_trs	84207	0.64	0.48	0.00	1.00
roo_rev	84207	0.26	0.44	0.00	1.00
indfac	84207	3.09	2.17	0.00	7.00

A.2 Robustness Checks

Table A.7: Estimation results, 1996 -2006

VARIABLES	(1) FE01	(2) FE02	(3) FE03	(4) FE11	(5) FE12	(6) FE13	(7) PPML2	(8) FE21
ln_distw	-1.425***	-1.428***	-1.396***	-1.425***	-1.430***	-1.397***	0.199***	-1.380***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
contig	0.803***	0.804***	0.757***	0.791***	0.792***	0.745***	0.421***	0.670***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.00)	(0.11)
comlang_off	0.772***	0.771***	0.752***	0.770***	0.769***	0.749***	-0.058***	0.712***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.00)	(0.04)
colony	0.983***	0.982***	0.992***	0.992***	0.989***	1.001***	0.022***	1.064***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.00)	(0.10)
fta_wto	0.461***	0.314***	0.288***	0.502***	0.251**	0.247**	-0.141***	0.425***
	(0.04)	(0.09)	(0.09)	(0.05)	(0.10)	(0.10)	(0.02)	(0.06)
ln_gdp_o								0.099***
								(0.03)
ln_gdp_d								0.498***
								(0.03)
ln_gdppc_usd_o								0.671***
								(0.07)
ln_gdppc_usd_d								0.270***
								(0.06)
ln_rooind		-0.248**	-0.211*		-0.426***	-0.351**	-1.857***	-0.575
		(0.12)	(0.12)		(0.14)	(0.14)	(0.34)	(0.86)
ln_rooind_sq							0.511***	0.130
							(0.10)	(0.27)
ln_indfac			0.225***			0.230***	0.037***	0.442***
			(0.03)			(0.03)	(0.01)	(0.11)
ln_roocer								-1.289***
								(0.26)
ln_roover								-0.533***
								(0.21)
ln_roocum								0.106
								(0.13)
ln_roodraw								0.410*
								(0.23)
Observations	232,061	232,061	232,061	232,061	232,061	232,061	232,061	211,255
R-squared	0.737	0.737	0.738	0.746	0.746	0.746	0.984	0.752
Year FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp & Exp FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes
Exp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.8: Estimation results, 2007-2017

VARIABLES	(1) FE01	(2) FE02	(3) FE03	(4) FE11	(5) FE12	(6) FE13	(7) PPML2	(8) FE21
ln_distw	-1.482***	-1.493***	-1.475***	-1.491***	-1.503***	-1.484***	0.061***	-1.458***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.00)	(0.02)
contig	0.764***	0.760***	0.720***	0.758***	0.755***	0.713***	0.035***	0.670***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.00)	(0.11)
comlang_off	0.775***	0.769***	0.762***	0.781***	0.775***	0.767***	-0.017***	0.720***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.00)	(0.04)
colony	0.809***	0.801***	0.791***	0.816***	0.807***	0.797***	0.047***	0.862***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.00)	(0.11)
fta_wto	0.467***	0.145**	0.175**	0.445***	0.105	0.142**	0.119***	0.300***
	(0.04)	(0.07)	(0.07)	(0.04)	(0.07)	(0.07)	(0.01)	(0.07)
ln_gdp_o								0.009
								(0.04)
ln_gdp_d								0.478***
								(0.04)
ln_gdppc_usd_o								0.834***
								(0.08)
ln_gdppc_usd_d								0.379***
								(0.07)
ln_rooind		-0.622***	-0.511***		-0.655***	-0.534***	-0.744***	2.111**
		(0.11)	(0.11)		(0.11)	(0.11)	(0.22)	(0.88)
ln_rooind_sq							0.229***	-0.774***
							(0.07)	(0.27)
ln_indfac			0.147***			0.151***	0.032***	0.238***
			(0.02)			(0.02)	(0.00)	(0.08)
ln_roocer								0.117
								(0.10)
ln_roover								-0.170
								(0.15)
ln_roocum								-0.180*
								(0.10)
ln_roodraw								-0.733***
								(0.10)
Observations	259,900	259,900	259,900	259,900	259,900	259,900	259,900	209,179
R-squared	0.749	0.749	0.750	0.757	0.758	0.758	0.974	0.764
Year FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp & Exp FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes
Exp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.9: Estimation results, excluding the Americas

VARIABLES	(1) FE01	(2) FE02	(3) FE03	(4) FE11	(5) FE12	(6) FE13	(7) PPML2	(8) FE21
ln_distw	-1.507***	-1.514***	-1.468***	-1.515***	-1.523***	-1.476***	0.125***	-1.363***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.03)
contig	0.821***	0.813***	0.800***	0.816***	0.806***	0.794***	0.176***	0.805***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.00)	(0.11)
comlang_off	0.776***	0.765***	0.754***	0.785***	0.772***	0.761***	0.010**	0.671***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.00)	(0.05)
colony	0.962***	0.959***	0.960***	0.963***	0.959***	0.961***	0.011*	1.037***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.01)	(0.12)
fta_wto	0.085**	-0.311***	-0.257***	0.082*	-0.371***	-0.292***	0.086***	0.530***
	(0.04)	(0.07)	(0.07)	(0.04)	(0.07)	(0.08)	(0.03)	(0.07)
ln_gdp_o								0.154***
								(0.03)
ln_gdp_d								0.522***
								(0.03)
ln_gdppc_usd_o								0.698***
								(0.05)
ln_gdppc_usd_d								0.235***
								(0.05)
ln_rooind		-0.723***	-0.621***		-0.827***	-0.689***	-1.401***	-7.127***
		(0.10)	(0.10)		(0.11)	(0.12)	(0.37)	(0.83)
ln_rooind_sq							0.436***	2.232***
							(0.12)	(0.26)
ln_indfac			0.188***			0.188***	0.019***	0.196**
			(0.02)			(0.03)	(0.01)	(0.10)
ln_roocer								-1.145***
								(0.24)
ln_roover								-0.428**
								(0.19)
ln_roocum								0.343***
								(0.12)
ln_roodraw								0.543***
								(0.21)
Observations	321,619	321,619	321,619	321,619	321,619	321,619	321,619	275,074
R-squared	0.746	0.746	0.747	0.762	0.762	0.763	0.964	0.761
Year FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp & Exp FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes
Exp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.10: Estimation results, excluding Europe

VARIABLES	(1) FE01	(2) FE02	(3) FE03	(4) FE11	(5) FE12	(6) FE13	(7) PPML2	(8) FE21
ln_distw	-1.463***	-1.459***	-1.417***	-1.472***	-1.472***	-1.431***	0.110***	-1.420***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)	(0.03)
contig	0.953***	0.948***	0.850***	0.946***	0.947***	0.852***	0.064***	0.859***
	(0.13)	(0.13)	(0.12)	(0.13)	(0.13)	(0.13)	(0.01)	(0.13)
comlang_off	0.750***	0.747***	0.710***	0.752***	0.752***	0.716***	0.072***	0.597***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.01)	(0.04)
colony	1.417***	1.422***	1.448***	1.406***	1.406***	1.431***	0.092***	1.165***
	(0.39)	(0.39)	(0.39)	(0.41)	(0.41)	(0.40)	(0.02)	(0.34)
fta_wto	0.765***	0.925***	0.474***	0.787***	0.780***	0.341**	-0.042	1.071***
	(0.06)	(0.13)	(0.15)	(0.06)	(0.14)	(0.16)	(0.05)	(0.10)
ln_gdp_o								0.198***
								(0.03)
ln_gdp_d								0.590***
								(0.03)
ln_gdppc_usd_o								0.517***
								(0.06)
ln_gdppc_usd_d								0.041
								(0.06)
ln_rooind		0.229	-0.128		-0.010	-0.345**	-1.203**	5.447***
		(0.15)	(0.16)		(0.16)	(0.17)	(0.55)	(1.21)
ln_rooind_sq							0.361**	-1.655***
							(0.18)	(0.38)
ln_indfac			0.390***			0.384***	0.066***	-0.536***
			(0.05)			(0.05)	(0.01)	(0.11)
ln_roocer								0.785***
								(0.25)
ln_roover								1.207***
								(0.24)
ln_roocum								-0.766***
								(0.20)
ln_roodraw								2.300***
								(0.65)
Observations	254,467	254,467	254,467	254,467	254,467	254,467	254,467	212,523
R-squared	0.691	0.691	0.692	0.710	0.710	0.711	0.979	0.710
Year FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp & Exp FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes
Exp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.11: Estimation results with 4 year gaps

VARIABLES	(1) FE01	(2) FE02	(3) FE03	(4) FE11	(5) FE12	(6) FE13	(7) PPML2	(8) FE21
ln_distw	-1.451***	-1.457***	-1.439***	-1.456***	-1.464***	-1.440***	0.126***	-1.412***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.00)	(0.02)
contig	0.754***	0.754***	0.720***	0.745***	0.744***	0.703***	0.192***	0.684***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.00)	(0.11)
comlang_off	0.760***	0.757***	0.747***	0.767***	0.764***	0.751***	-0.009***	0.707***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.00)	(0.04)
colony	0.922***	0.918***	0.917***	0.923***	0.919***	0.918***	0.023***	0.960***
	(0.10)	(0.10)	(0.10)	(0.11)	(0.11)	(0.10)	(0.00)	(0.10)
fta_wto	0.487***	0.247***	0.245***	0.501***	0.189**	0.209***	0.056***	0.437***
	(0.04)	(0.07)	(0.07)	(0.04)	(0.08)	(0.08)	(0.02)	(0.06)
ln_gdp_o								0.214***
								(0.03)
ln_gdp_d								0.612***
								(0.03)
ln_gdppc_usd_o								0.591***
								(0.06)
ln_gdppc_usd_d								0.236***
								(0.06)
ln_rooind		-0.434***	-0.388***		-0.566***	-0.472***	-1.403***	0.211
		(0.11)	(0.11)		(0.12)	(0.12)	(0.31)	(0.85)
ln_rooind_sq							0.425***	-0.150
							(0.10)	(0.26)
ln_indfac			0.136***			0.170***	0.016***	0.222***
			(0.02)			(0.02)	(0.00)	(0.08)
ln_roocer								0.006
								(0.12)
ln_roover								-0.264
								(0.17)
ln_roocum								-0.204*
								(0.11)
ln_roodraw								-0.554***
								(0.11)
Observations	112,393	112,393	112,393	112,393	112,393	112,393	112,393	103,336
R-squared	0.738	0.738	0.738	0.752	0.752	0.752	0.974	0.753
Year FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp & Exp FE	Yes	Yes	Yes	No	No	No	Yes	No
Imp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes
Exp-Year FE	No	No	No	Yes	Yes	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1