Maastricht University

UNITED NATIONS UNIVERSITY

UNU-MERIT

Working Paper Series

#2019-012

The breadth of preferential trade agreements and the margins of exports

Rod Falvey and Neil Foster-McGregor

Maastricht Economic and social Research institute on Innovation and Technology (UNU-MERIT)
email: **info@merit.unu.edu** | website: **http://www.merit.unu.edu**

Boschstraat 24, 6211 AX Maastricht, The Netherlands
Tel: (31) (43) 388 44 00

UNU-MERIT Working Papers
ISSN 1871-9872

Maastricht Economic and social Research Institute on Innovation and Technology
UNU-MERIT

UNU-MERIT Working Papers intend to disseminate preliminary results of research carried out at UNU-MERIT to stimulate discussion on the issues raised.

April 2019

The Breadth of Preferential Trade Agreements and the Margins of Exports

Rod Falvey

Neil Foster-McGregor

Abstract

We use recently available data on the core economic provisions of PTAs to identify which (types of) provisions seem to promote bilateral exports and the intensive and extensive margins of exports. Our evidence suggests that measures applied at the border tend to be aimed at expanding existing trade, while measures applied behind the border are aimed at creating trade in new products. Preferential measures tended to increase bilateral total exports and bilateral exports at the intensive margin, but have no significant effect on bilateral exports at the extensive margin. Measures applied on an MFN basis are unlikely to provide improved market access for PTA partners. When included individually we find that no provision has a statistically significant effect of the same sign on both trade margins, confirming the view that existing and potential exporters have opposing interests in PTA formation. Finally, we provide estimated effects for selected PTAs.

JEL Codes: F10, F15
Keywords: PTA Breadth, Trade Margins, Gravity Equation

1. Introduction

An indication of the extent to which Preferential Trade Agreements (PTAs)[1] have proliferated in the last three decades is provided in Figure 1, which plots the number of country-pairs with a PTA along with the number of country-pairs that formed a PTA in each year from 1970 to 2015. The share of world trade among PTA members has increased from 22% in 1965 to 60% in 2010, while the share of World Trade Organisation (WTO) members with PTAs rose from 2% in 1965 to more than 25% in 2010 and their corresponding trade share within the WTO rose from 30% to 60% (Limao, 2016). Although average tariffs have been negotiated down, there remain a wide range of non-tariff barriers to be negotiated away. With no prospect of full multilateral liberalisation in the foreseeable future, PTAs have become the most important source of trade policy 'liberalisation' for most countries, almost by default.

The membership of PTAs has also changed over this period, both in terms of the number of countries involved and their diversity in income levels and geographical proximity (Falvey & Foster-McGregor, 2018).[2] Accompanying this has been an expansion in the 'breadth' of PTAs in terms of the coverage of their provisions.[3] Our evidence for this draws on the database of Hofmann et al (2017), which contains information on the inclusion of 52 policy areas and their legal enforceability for 279 trade agreements signed between 189 countries in the period 1958 to 2009. In Figure 2 we list the fraction of these agreements that contain each of the 18 'core' economic provisions in 1980 and in 2010. All provisions appear in a higher proportion of PTAs in 2010, except those relating to competition policy, state aid and antidumping.

[1] In what follows we take Preferential Trade Agreements (PTAs) to mean any preferential access for members of such an agreement.

[2] For example, the US has signed agreements with Israel (1985), Jordan (2002), Australia (2004), Morocco (2005) and Peru (2009), while the EU has signed agreements with Turkey (1996), the Faroe Islands (1997), the Palestinian Authority (1997), Tunisia (1999), South Africa (2000), Morocco (2000), Israel (2000), Mexico (2000), Chile (2004), Algeria (2006) and Cote d'Ivoire (2008).

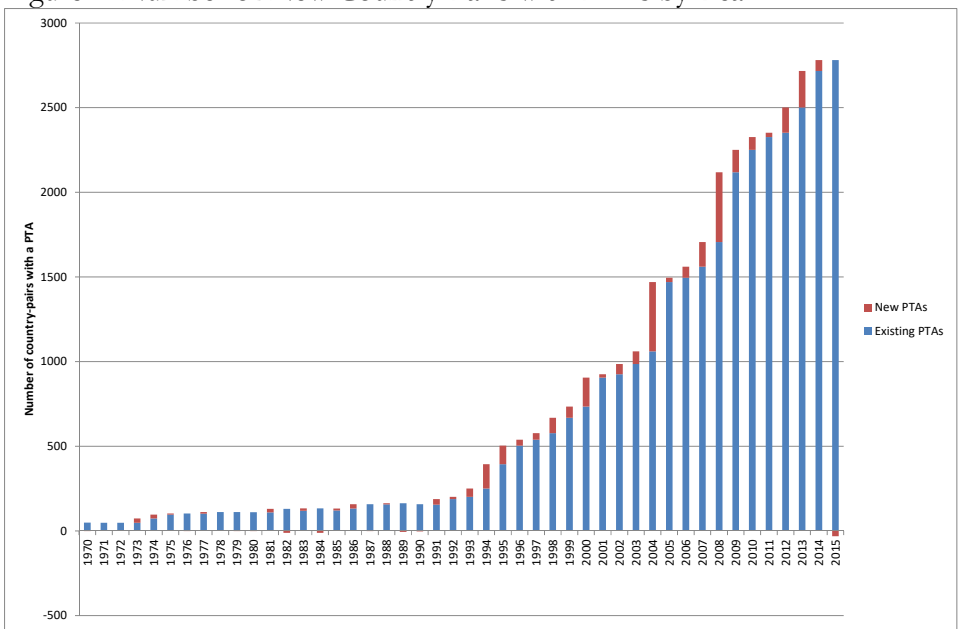
[3] This may not be coincidental. In Falvey & Foster-McGregor (2018) we find a trade-off between the likelihood of a country-pair forming a PTA and the breadth of any PTA they do form. Thus, more distant countries are less likely to form a PTA, but if they do it is likely to be broader; while sharing a common language or a common border makes a PTA more likely, but it will be narrower in scope on average.

The proliferation of PTAs has prompted a significant empirical literature primarily aimed at determining whether a PTA creates trade between its members and, less frequently, whether this trade has been diverted from non-members. The bulk of this analysis has employed some variant of the 'gravity equation', interpreted as a reduced form equation which can be generated by a range of models explaining bilateral trade flows. The typical approach has been to include a dummy variable indicating whether or not a bilateral trade flow was covered by a PTA and to interpret the estimated coefficient on this dummy as indicating the average effect of a PTA. Results from this literature suggest that PTAs have a positive impact upon trade flows. But there is considerable heterogeneity in the outcomes,[4] with PTA effects varying across time (Baier & Bergstrand, 2009), across agreements (Eicher & Henn, 2011), and by trade partner (Eicher & Henn, 2011; Cheong et al, 2014; Baier et al., 2016).[5]

[4] See Cipollina & Salvatici (2010) and World Bank (2005) for meta-analyses of the trade effects of PTAs. World Bank (2005), for example, considers 362 estimates of a PTA dummy from 17 studies that cover different PTAs, time periods and equation specifications. One-third of the estimates are statistically insignificant, over 10% are negative and significant, and only just over 50% are positive and significant. The mean estimate is 0.79 but the standard error is 1.3.

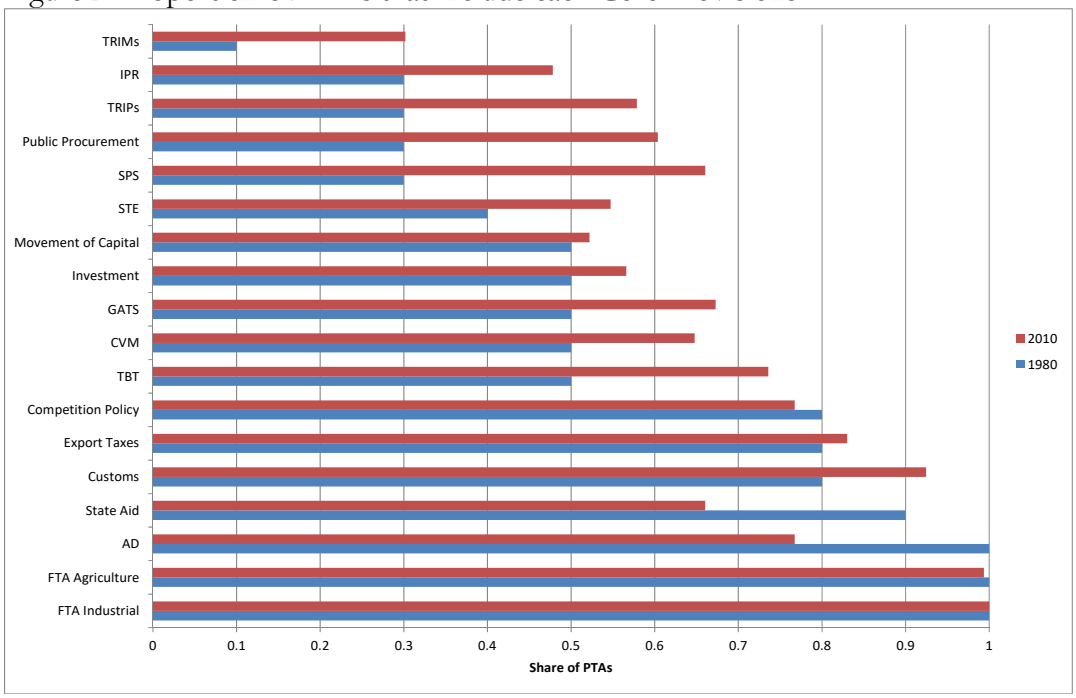
[5]Studies have also attempted to examine the potential trade diversion effects of PTAs by including binary variables that take the value one if only one member of a country pair belongs to a PTA (see for example Frankel, Stein & Wei, 1996). The results of such studies are mixed depending upon the sample, the time period, the specification of the gravity equation and the particular PTAs considered.

Figure 1: Number of New Country-Pairs with PTAs by Year



Source: Falvey and Foster (2018)

Figure 2: Proportion of PTAs that include each Core Provisions



Notes: This figure reports the share of all PTAs that include the relevant provision as a legally enforceable commitment in the text of the agreement. TRIMs refer to trade related investment measures; IPR to intellectual property rights; TRIPs to the trade related aspects of intellectual property rights agreement; SPS to sanitary and phytosanitary standards; STE to state trading enterprises; GATS to the general agreement on trade in services; CVM to counter-veiling measures; and TBT to technical barriers to trade; and AD to anti-dumping duties.

One straightforward response to this heterogeneity is to acknowledge that PTAs are not homogenous and to construct individual dummies for specific PTAs. But even this does not produce consistent results. Aitken (1973), Abrams (1980) and Brada & Mendez (1983), for example, found membership in the European Community to have a positive and significant effect on trade flows among members, while Bergstrand (1985) and Frankel et al (1995) found insignificant effects. Frankel (1997) finds a positive impact of MERCOSUR membership, insignificant effects from membership in the Andean pact, and occasionally negative effects from membership in the European Community. A 'deeper' investigation of the 'trade liberalisation' provided by PTAs therefore appears necessary if we are to resolve these ambiguities.[6]

In order to meet their WTO obligations, PTA members must remove barriers on substantially all trade. One can infer from Figure 2 that this requirement is met if a PTA has provisions dealing with tariff liberalisation and the elimination of non-tariff barriers on industrial goods, as these provisions are present in all agreements. But a glance at the list of other provisions in Figure 2 reveals that while some (e.g. IPRs and GATS) may be aimed at inducing increased economic interaction among the members, they are not necessarily going to increase international trade in goods. Indeed, the opposite may be the case (Falvey & Foster-McGregor, 2018), if, for example, goods trade and services trade are substitutes.

Even the trade provisions of PTAs may have different impacts depending on whether they are aimed at expanding the volume of existing exports (the intensive margin) or at creating opportunities for the export of new products (the extensive margin). The bilateral negotiations over PTAs are typically motivated by governments seeking better market access for their exporters. The actual mix of PTA provisions will reflect the competing lobbying efforts of

[6] One approach has been to distinguish between different types of PTAs (i.e. customs unions, free trade agreements, etc). This is the approach taken by Vicard (2009) for example. Including indicators for four different types of PTA – i.e. preferential arrangement, free trade agreement, currency union and common market – in a gravity equation, he finds that while all types of agreement raise bilateral trade there are no significant differences in the size of the effects once self-selection has been controlled for.

existing and potential exporters.[7] Existing exporters may seek improved access, particularly where foreign competitors are already benefiting from such access through other PTAs. Improving their access may require the removal of barriers behind-the-border. But potential exporters, in particular, are likely to seek the elimination of both border and behind the border barriers. In a sense we can infer the success of these two competing groups from the estimated trade effects at the two margins. Increased trade at the intensive margin following the formation of the PTA signals the success of existing exporters in obtaining better market access. Similarly, increased trade at the extensive margin signals the success of new exporters.

Considerable attention has been paid to these margins in recent empirical contributions in international trade.[8] Partly this reflects the relatively recent availability of disaggregated data, but it also recognises the key role new products may play in the dynamic gains from trade (Kehoe & Ruhl, 2013; Kehoe et al., 2013).[9] Several contributions have examined the impact of specific trade liberalisations or PTAs on the volume and variety of traded goods. Klenow & Rodriguez-Clare (1997) show the liberalisation of Costa Rica between 1986 and 1992 was accompanied by a surge in import variety. Hillberry & McDaniel (2002) and Feenstra & Kee (2007) provide evidence that US tariff liberalisation due to NAFTA has increased export variety from Mexico. Goldberg et al (2008a, 2008b and 2009) found that India's liberalisation during the 1990s dramatically increased Indian firms' access to new imported inputs. Debaere & Mostashari (2010) conclude that changing US tariffs and tariff preferences over the period 1989-2000 increased the variety of goods exported to the US from 'preferred' sources, but also had a trade diverting effect by reducing the variety of products exported to the US from excluded countries.[10]

---

[7] Competing because of the limited concessions willing to be offered by the trading partner.

[8] Fernandes et al. (2019) focus on firms defining the extensive margin as the number of exporting firms and the intensive margin as the average size of an exporter. They find that variation in exports is about evenly split between the two margins.

[9] See Rivera-Batiz & Romer, 1991 and Grossman & Helpman, 1991. Recently, Feenstra & Kee (2008) have shown that the variety of exports is also related to country productivity in a sample of 48 countries.

[10] While most of the above studies consider the effects on a single country or a specific liberalisation episode, others have considered the impact of liberalisation on a broader sample of countries. Kehoe & Ruhl (2003) consider the

There are three relatively recent papers that use the gravity equation to explore the impact of PTAs on aggregate trade flows, intensive (goods) margins, and extensive (goods) margins for a large number of goods, country pairs, and years. Frensch (2010) examines the relationship between import margins and trade liberalisation for 36 countries in a gravity framework. The results indicate that the main effect of liberalisation occurs along the extensive margin of imports, with the effects on intermediate and capital imports being stronger than those on consumer goods. Similarly Foster et al (2011) find that PTAs tend to work largely by impacting upon the extensive margin of trade. However Kehoe et al (2014) reach the opposite conclusion finding that PTAs tend to impact upon the intensive margin to a greater extent than the extensive margin.

One explanation for these apparently contradictory results could lie in differences in the 'depth' of the PTAs examined. Dür et al (2013) construct a measure of depth of PTAs and find that deeper integration agreements tend to have larger impacts on trade flows than shallower agreements. Baier et al (2014) draw a similar conclusion. Most recently, Falvey & Foster-McGregor (2018) used the 'horizontal depth' indicator constructed by Hoffman et al (2017) and a dose response model to examine the impact of PTA depth on trade flows. Results indicate a non-linear effect of PTA depth on trade, which could be loosely traced back to the composition of the provisions in those agreements.[11]

---

impact of six major trade liberalisations in 18 countries on the extensive margin of trade using bilateral data. They find using detailed trade data that the goods that were traded least before liberalisation account for a disproportionate share in trade following the reduction of trade barriers. They further show that large increases in the extensive margin of trade coincide with trade liberalisation.

[11] In Falvey & Foster-McGregor (2018) we used the 2010 data to separate our PTA country pairs into 4 strata based on the 'depth' of their PTAs. We then calculated the expected probability of each provision appearing in a PTA between a country pair located in each stratum and subtracted it from the actual frequency with which that provision appears in that stratum. This gave us a measure of 'provision intensity' for each of the strata. If the actual frequency exceeds the expected then the PTA country pairs in the corresponding stratum are 'intensive' in that provision. We found that the lowest stratum was intensive in agricultural and industrial tariff liberalisation and produced no significant increases in trade flows The highest stratum, which also produced no significant trade increase in trade flows, was intensive in provisions relating to IPRs, the movement of capital, investment, TRIPS, GATS, TRIMs, state aid, state enterprises and technical barriers to trade. The middle strata, where the positive effects for trade were found, were intensive in provisions relating to countervailing measures, antidumping, export taxes and customs - i.e. provisions directly relating to goods trade flows.

In this paper we extend a recent literature interested in identifying and explaining the heterogeneous effects of PTAs (e.g. Baier et al, 2016; Cipollina & Salvatici, 2010; Eicher & Henn, 2011). We do this by using data on the breadth of PTAs to examine their impact on aggregate trade (export) flows, and on the intensive and extensive margins of exports. Specifically we are interested in identifying, if we can, (i) which core PTA provisions promote goods trade in general and which appear to be aimed at broader economic interactions; and (ii) which provisions affect exports at the intensive margin and which at the extensive margin.

Our results indicate that measures applied at the border tend to be aimed at expanding existing trade, while measures applied behind the border are aimed at creating trade in new products. Preferential measures tended to increase bilateral exports in total and at the intensive margin but have no significant effect at the extensive margin. Measures applied on an MFN basis are unlikely to provide improved market access for PTA partners. When included individually we find that no provision has a statistically significant effect of the same sign on both trade margins, confirming the view that existing and potential exporters have opposing interests in PTA formation.

The remainder of the paper is set out as follows. Section 2 discusses our empirical methodology and describes the data used; Section 3 discusses our main results; while Section 4 concludes.

2. Methodology and Data

Our empirical analysis begins with a standard gravity-type regression of the form:

$$\ln EXP_{ijt} = \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln POP_{it} + \beta_4 \ln POP_{jt} + \beta_5 \ln DIST_{ij} + \beta_6 LANG_{ij} + \beta_7 ADJ_{ij} + \beta_8 LOCK_{ij} + \beta_9 PTA_{ijt} + \varepsilon_{ijt} \quad (1)$$

where $\ln EXP$ is (the natural log of) our measure of exports from country i to country j in time t, GDP refers to Gross Domestic Product, POP to population, $DIST$ is the great circle distance between capital cities of countries i and j, $LANG$ is a dummy taking the value if i and j share a

common language, ADJ is a dummy taking the value one if i and j share a common border, $LOCK$ is a variable taking the value 0,1,2 depending on whether none, one or both of i and j are landlocked respectively, and PTA is our indicator of the presence of a PTA, which we describe further below.

2.1 Econometric Issues

In recent years the empirical implementation of the gravity equation has been modified to deal with a number of issues. When Anderson & van Wincoop (2003) derived a gravity equation from the CES expenditure system, they highlighted that trade between two countries is decreasing in their bilateral trade costs *relative* to the average of the costs of the two regions to trade with all their partners, rather than to absolute trade barriers. This they refer to as multilateral resistance (MR). Baldwin & Taglioni (2006) argue that including time-varying importer and exporter fixed effects will capture time-varying MR terms in panel data. But we follow an alternative, and less computationally intensive approach, proposed by Baier & Bergstrand (2009), which involves including GDP-weighted exogenous variables as multilateral resistance controls, with distance, common language, common border and landlockedness being used in our analysis below.

Country self-selection into PTAs is likely to provide an additional source of endogeneity. Countries with large (potential) bilateral trade flows are more likely to join in such agreements. To account for such endogeneity recent studies addressing the trade-creating effects of PTAs have used panel models with fixed effects as suggested by Baldwin & Taglioni (2006) as well as Heckman control functions (Baier & Bergstrand, 2002; Magee, 2003; and Baier et al, 2008). More recently, studies have dealt with endogeneity using matching econometrics (Egger et al, 2008; Baier & Bergstrand, 2009; Falvey & Foster-McGregor, 2018).

A final issue is the potential bias introduced by failing to take account of observations where reported trade is zero. Helpman et al (2008) note that around half of country-pairs do not trade with each other and that the majority of trade growth since 1970 has been among countries that

traded with each other in 1970 rather than the formation of new trading relationships.[12] Since the dependent variable in the gravity equation is usually expressed in log form it is not possible to include observations for which reported trade is zero, but their omission can lead to biased coefficient estimates (Santos-Silva & Tenreyro, 2006; Helpman et al, 2008). Santos-Silva & Tenreyro (2006) propose the Poisson-pseudo maximum likelihood estimator to deal with this problem, while Helpman et al (2008) suggest a modified two-stage Heckman approach.[13]

In this paper we take account of these issues by modifying equation (1) to include both time and country-pair fixed effects, and to control for multilateral resistance using the approach of Baier & Bergstrand (2009). Our preferred specification can then be expressed as:

$$\ln EXP_{ijt} = \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln POP_{it} + \beta_4 \ln POP_{jt} + \beta_9 PTA_{ijt} + \sum_{l=1}^{l} \vartheta_l MR_{lijt} + \tau_t + \alpha_{ij} + \varepsilon_{ijt} \quad (2)$$

Where τ_t and α_{ij} refer to time and country-pair fixed effects respectively and MR are the multilateral resistance terms. Note that the inclusion of country-pair fixed effects means that it is not possible to estimate coefficients on time-invariant country-pair specific variables such as distance, common language and contiguity.[14] We address the issue of zero observations by using the Poisson-pseudo maximum likelihood estimator proposed by Santos-Silva & Tenreyro (2006).[15]

2.2 Measuring the Margins of Trade

We employ two approaches to the measurement of the intensive and extensive margins of exports. Firstly, we follow Kehoe & Ruhl (2002) in adapting the decomposition of Hummels &

[12] Indeed, this is an alternative definition of the intensive and extensive margin, with the extensive margin being the development of new trading relationships and the intensive margin the intensity of existing trading relationships.

[13] Other approaches are discussed in Frankel (1997) and include the use of Tobit estimation or using $(T_{ij} + 1)$ as the dependent variable. Both of these approaches are likely to lead to inconsistent estimates of the parameters however.

[14] But we include the GDP weighted distance, contiguity, common language and landlockedness as multilateral resistance controls as suggested by Baier & Bergstrand (2009).

[15] While both approaches have come in for some criticism, the Santos & Tenreyro (2006) approach is slightly easier to implement and also controls for heteroscedasticity which is inherent in the approach.

Klenow (2005) to apply to a single bilateral trade relationship. In particular, the extensive margin (EM) is defined as[16],

$$EM_{ij} = \frac{\sum_{n \in N_{im}} v_{kjn}}{\sum_{n \in N} v_{kjn}}, \quad (3)$$

where N_{ij} is the set of observable categories in which exporting country i has positive exports to j, and v_{kjn} is the value of units of good n exported from reference country k to country j. Reference country k has positive exports to j in all N categories. Following the approach of Frensch (2010) we define a reference "country" that does not vary across time or countries. In particular, v_{kjn} is the value of exports of the world to country j in good n averaged across the years 1962-2000.

The extensive margin can be thought of as a weighted count of i's categories relative to k's categories, where the goods are weighted by their importance in world exports to importing country j. If all categories are equally important then the extensive margin is simply the fraction of categories in which i exports to j. Hummels & Klenow (2005) discuss the advantages and disadvantages of this measure of the extensive margin. In particular, they note that measuring the extensive margin without reference to i's exports prevents a category appearing important solely because i (and no other country) exports a lot of that product to j. They note that a disadvantage of the approach is that a country may appear to have a large extensive margin because it exports a small amount in categories in which k exports a lot, an outcome that could also arise were we to use a simple count of the categories of goods exported.

The intensive margin (IM) compares nominal shipments for country i and k in a common set of goods, and is given by,

$$IM_{ij} = \frac{\sum_{n \in N_{ij}} v_{ijn}}{\sum_{n \in N_{ij}} v_{kjn}} \quad (4)$$

[16] We drop time subscripts where they are not necessary for the explanation. It should be kept in mind however that these variables are calculated for each year in the sample.

IM_{ij} equals i's nominal exports relative to k's nominal exports in those categories in which i exports to $j(N_{ij})$.

It can be shown that the ratio of country i to country k exports to j equals the product of the two margins, that is,

$$EXPRAT_{ij} = \frac{\sum_{n \in N_{ij}} v_{ijn}}{\sum_{n \in N} v_{kjn}} = IM_{ij} EM_{ij} \quad (5)$$

In the regression analysis that follows we use the natural log of this ratio as our dependent variable, rather than the natural log of exports of country i to country j, which is commonly included in gravity regressions. The reason for employing this ratio as one of our dependent variables is that since OLS is a linear operator it will decompose the effects of PTAs on the export ratio along the extensive and intensive margins, allowing us to quantify the contribution of the two margins to the change in this ratio following PTA membership.[17]

In addition to this decomposition we further test the robustness of the results to a simple alternative decomposition where we define the extensive margin as the total number of products exported by exporter j to importer i, denoted as N_{ijt}, and the intensive margin as the average value of exports of each product exported by j to i, denoted as $\bar{M}_{ijt}$. Exports can then be defined as:

$$EXP_{ijt} = N_{ijt} \bar{M}_{ijt} \quad (6)$$

Taking logs we have:

$$\ln EXP_{ijt} = \ln N_{ijt} + \ln \bar{M}_{ijt} \quad (7)$$

which, given that OLS is a linear operator again allows us to decompose the increase in exports along the intensive and extensive margins.

[17] Note that since we fix the denominator of the export ratio we can interpret the coefficients on the PTA variable as estimates of the trade creating effects of PTAs. If the value of exports of the reference country were to vary across time and countries this would not be the case. In such a case, the finding of a positive effect of PTAs on the above ratio could be the result of the partner country exporting more supplanting production in the importing country (trade creation) or because the partner country exported more at the expense of non-member countries not receiving preferential tariffs (trade diversion). By forcing the reference country's value of exports to be constant across time and countries we eliminate this latter possibility.

2.3 Data

Data on trade flows are taken from Feenstra et al (2005), which reports imports and exports at the SITC four-digit level over the period 1962-2000. We use UN COMTRADE to update this data to 2015 using the mirror flow to construct bilateral exports (i.e. we use imports into the partner country to measure exports from the reporter) when it is available. When the mirror flow is not available we use the raw export data to fill in the gaps. A concordance is used to make the more recent data compatible with the SITC classification used by Feenstra et al (2005).

Data on our explanatory variables comes from a variety of sources. The GDP and population of the importer and exporter are taken from the World Development Indicators (2008) dataset. Data on distance, common language and adjacency are from CEPII[18]. Data on PTAs are taken from the recent work of Hoffman et al. (2017) who develop a database that lists the coverage and legal enforceability of the provisions included in the entire set of PTAs in force and notified to the WTO as of 2015 (i.e. 279 agreements signed by 189 countries between 1958 and 2015). This database contains information on the inclusion of up to 52 policy areas, which the authors categorise in various ways. For our purposes the most useful category is that containing the 18 'Core' provisions which the authors describe as those "that the literature identifies as more meaningful from an economic point of view." (Hoffman et al., 2017, p3.).

The subject areas of these core provisions are listed in Table 1. Figure 2 indicates changes in the breadth of coverage by listing the fraction of the agreements that contain each core provision in 1980 and 2010. All provisions appear in a higher proportion of PTAs in 2010 than in 1980, except those relating to competition policy, state aid and antidumping.[19] These 18 provisions relate to: (i) free trade in industrial goods (Ind); (ii) free trade in agricultural goods (Ag); (iii) Customs administration (Cust); (iv) Export taxes (ETx); (v) Anti-dumping measures (AD); (vi) Competition policy (ComP); (vii) Technical barriers to trade (TBT); (viii) Sanitary and

[18] http://www.cepii.fr/anglaisgraph/bdd/distances.htm

[19] Hoffman et al. (2017) also draw a distinction between those provisions which are 'legally enforceable' and those which are not. Here we restrict attention to legally enforceable provisions.

phytosanitary standards (SPS); (ix) State aid (SAid); (x) GATS; (xi) Counter-veiling measures (CVM); (xii) TRIPs; (xiii) Public procurement (PubP); (xiv) Investment measures (Inv); (xv) Movement of capital (Cap); (xvi) State trading enterprises (STr); (xvii) IPRs; and (xviii) TRIMs.

We capture the breadth of PTAs in several ways. In 'Breadth 18' we calculate for each country-pair and at each point in time the proportion of these 18 core provisions that are included in a PTA. Thus 0 indicates no PTA and 1 indicates a PTA that includes all of the core provisions. This 'provision count' measure effectively weights each type of provision equally in the index. We then subdivide the core provisions into 'border' and 'behind the border' provisions, depending on whether the policies that the provision regulates are applied at the border or not (Limao, 2016). The allocations of provisions into these two categories are shown in Table 1, and are used to generate two provision count measures (B and BtB). An alternative categorisation, from Hoffman et al. (2017), is based on whether the provisions can be applied in a preferential or a non-discriminatory manner. Preferential provisions only apply to the members of the PTA while the other provisions are generally non-discriminatory in nature leading to a presumption that they will be applied on an MFN basis. The corresponding allocation of provisions to these categories is also shown in Table 1 and leads to two further provision-count measures (Pref and MFN).

Table 1: Description of Provisions; Principal Components' Factor Loadings and Provision Classifications

Provision	Description WTO + Measures	Share of PTAs in 2015 (%) Present/Enforceable	Principal Components[1] PC 1	PC 2	PC 3	Border Measure (X); Behind (O)	Preferential (X); MFN (O)
Ind	Tariff liberalization with regard to industrial goods; elimination of nontariff measures.	100/98.6	0.2391	0.0911	-0.2905	X	X
Ag	Tariff liberalization with regard to agriculture goods; elimination of nontariff measures.	99.6/98.2	0.2416	0.0895	-0.284	X	X
Cust	Provision of information; publication on the internet of new laws and regulations; training. Incl. provisions on trade facilitation.	90.4/81.8	0.2489	0.0533	-0.2152	X	O
ETx	Elimination of export taxes	78.6/76.4	0.2469	0.0235	-0.1966	X	X
SPS	Affirmation of rights and obligations under the WTO Agreement on SPS; harmonization of SPS measures	66.8/52.5	0.2303	0.2677	-0.0601	X	O
TBT	Affirmation of rights and obligations under WTO Agreement on TBT; provision of information; harmonization of regulations; mutual recognition agreements.	70.4/54.3	0.2478	0.0651	-0.1811	X	O
STE	GATT Art. XVII. Establishment or maintenance of a state enterprise in accordance with and affirming provisions of GATT. Non-discrimination regarding production and marketing condition; provision of information.	52.5/49.3	0.2286	-0.3074	0.3405	O	O
AD	Retention of antidumping rights and obligations under the WTO Agreement (Art. VI GATT).	75.7/67.9	0.2493	0.0333	-0.1537	X	X
CVM	Retention of countervailing measures rights and obligations under the WTO Agreement (Art VI GATT).	63.9/58.2	0.2473	0.0245	-0.0141	X	X
SAid	Assessment of anticompetitive behaviour; annual	65.7/57.9	0.2377	-0.1417	0.0628	O	O

	reporting on the value and distribution of state aid given; provision of information						
PubP	Progressive liberalization; national treatment and/or non-discrimination principle; publication of laws and regulations on the internet; specification on public procurement regime.	56.4/42.9	0.2338	-0.2316	0.2828	O	X
TRIMs	Provisions concerning requirements for local content and export performance on FDI. Applies only to measures that affect trade in goods.	32.5/31.1	0.1505	0.7622	0.5158	X	O
GATS	Liberalization of trade in services.	65/50.7	0.2322	0.2137	-0.063	O	O
TRIPs	Harmonization of standards; enforcement; national treatment, most favoured nation treatment. International treaties referenced in TRIPS: Paris Convention, Berne Convention, Rome Convention, IPIC Treaty.	57.1/55.4	0.2354	-0.1048	0.3196	X	O
	WTO-X measures						
ComP	Prescriptions as regards anticompetitive business conduct; harmonization of competition laws; establishment or maintenance of an independent competition authority, among others.	74.6/66.1	0.2445	-0.1199	0.0236	O	O
Inv	Information exchange; Development of legal frameworks; Harmonization and simplification of procedures; National treatment; Establishment of mechanism for the settlement of disputes.	55/38.9	0.2369	-0.0853	-0.0704	O	O
Cap	Liberalization of capital movement; prohibition of new restrictions.	53.9/50.4	0.2402	-0.1204	-0.0881	X	O
IPR	Accession to international treaties not referenced in the TRIPs Agreement.	47.5/39.6	0.2341	-0.2464	0.3231	O	O

Source: Hoffman et al. (2017) Tables 2 and A1. Notes: 1. Italics denotes a provision with a negative loading in this component.

We also follow Hoffman et al. (2017) and examine the Principal Components of these 18 core provisions.[20] We find that the first 3 components explain, respectively, 82.9%, 4.3% and 3.8% of the total variance. The corresponding factor loadings are presented in Table 1. All 18 provisions are given a positive weight on *PC1* and all these weights are very similar (except possibly that on TRIMs). This component therefore captures the general 'breadth' of the PTA, much like Breadth18, and we would expect similar results from these two alternative measures. Broadly speaking, *PC2* has positive weights on the border measures (except Cap and TRIPs) and negative weights on the behind-the-border measures (except GATS), and so could be thought of as capturing the bias of a PTA towards border measures. The factor loadings in *PC3* have the opposite sign patterns to those in *PC2*, with the exception of the three capital/investment provisions (TRIMs, Inv and Cap), which provides some suggestion that PC3 captures the bias of the PTA towards behind-the-border measures. There is no apparent relationship between the weights on provisions in the principal components and whether the provisions are preferential or MFN.[21]

3. Results

3.1. *A single PTA variable*

Table 2 reports results from estimating a regression of the form given by equation 2, albeit with the dependent variable being either the log of the export ratio or the theoretically motivated intensive and extensive margins, while Table 3 reports similar results using either the log of

[20] Other studies employing this provision data have also used principal components, but typically considered all 52 provisions. For example, Orefice & Rocha (2014) investigate the effects of integration on production networks using the five provisions with the highest weights in the first component to create an index of integration agreement 'depth'. These five provisions are TRIPs, IPR, CVM, STE and Cap. Similarly, Osnago et al. (2016) use the same index plus an alternative extended to the ten provisions with the highest weights to consider the effects of trade agreements on vertical FDI. This adds PubP, ComP, AD, Inv and SAid. Note that these ten provisions are all core provisions.

[21] Five out of six preferential provisions have a positive weight in PC2 and a negative weight in PC3, but the weights on the MFN provisions are approximately equally positive and negative on both components.

exports or the alternative indicators of the intensive and extensive margin.[22] These Tables report three sets of results: (i) results including a simple PTA dummy variable (Columns 1-3); (ii) results including Breadth 18 (Columns 4-6); and (iii) results including the Breadth18 and its squared term to test for and highlight the non-linear effects found by Falvey & Foster-McGregor (2018) (Columns 7-9).

Results on the control variables in Table 2 are largely in line with expectations, with coefficients on both GDP and populations tending to be positive and significant. The exception to this is for the population of the exporter when considering the intensive margin. In this case, the coefficient is found to be negative and significant. The coefficient on the PTA dummy variable is positive and significant, which is in line with existing studies, but given our focus on the export ratio rather than the value of exports it is difficult to provide a comparison of the size of the coefficients. Interestingly, we find that PTAs impact positively upon the intensive margin but negatively upon the extensive margin, which suggests that the presence of a PTA between two countries may lead to increased specialisation in their trade flows.[23] Breadth18 yields similar results. In particular, the export ratio is found to be increasing in the breadth of PTAs – consistent with the results of Dür et al (2013) – with the effects on the extensive and intensive margins being negative and positive respectively. Finally, when the squared term is added we find – consistent with Falvey & Foster-McGregor (2018) – that there is a non-linear relationship between PTA breadth and exports, with the effect initially rising with breadth and then falling at a breadth of around 11 (out of 18). This inverse-U relationship between PTA breadth and trade is also found in the case of the intensive margin (with the turning point being somewhat higher than that for the export ratio). In the case of the extensive margin we find no evidence of a non-linear effect, with the impact of PTA breadth on the extensive margin continuing to be negative.

[22] Note, given our focus on Equation (2) in which country-pair fixed effects are included, we cannot estimate the coefficients on time-invariant variables such as landlockedness. These are included in the set of multilateral resistance terms however.

[23] Martincus & Estevadeordal (2009) find evidence in support of both general and preferential trade liberalisation increasing specialisation in the context of Latin American countries.

Table 2: PTAs and Export Margins – Basic Results I

	(1) $\ln EXPRAT$	(2) $\ln IM$	(3) $\ln EM$	(4) $\ln EXPRAT$	(5) $\ln IM$	(6) $\ln EM$	(7) $\ln EXPRAT$	(8) $\ln IM$	(9) $\ln EM$
$\ln GDP_i$	0.689***	0.424***	0.265***	0.688***	0.422***	0.266***	0.691***	0.424***	0.267***
	(0.0254)	(0.0215)	(0.0198)	(0.0255)	(0.0216)	(0.0198)	(0.0254)	(0.0216)	(0.0198)
$\ln GDP_j$	0.739***	0.367***	0.373***	0.739***	0.365***	0.374***	0.741***	0.367***	0.374***
	(0.0208)	(0.0178)	(0.0192)	(0.0208)	(0.0178)	(0.0192)	(0.0208)	(0.0178)	(0.0193)
$\ln POP_i$	0.0343	-0.996***	1.030***	0.0515	-0.950***	1.001***	0.0286	-0.971***	1.000***
	(0.0642)	(0.0567)	(0.0499)	(0.0645)	(0.0571)	(0.0503)	(0.0646)	(0.0571)	(0.0505)
$\ln POP_j$	1.216***	0.913***	0.303***	1.231***	0.956***	0.275***	1.210***	0.936***	0.274***
	(0.0646)	(0.0570)	(0.0473)	(0.0649)	(0.0574)	(0.0478)	(0.0650)	(0.0573)	(0.0479)
PTA	0.334***	0.645***	-0.311***						
	(0.0317)	(0.0312)	(0.0261)						
$Breadth18$				0.0195***	0.0432***	-0.0237***	0.0810***	0.100***	-0.0191**
				(0.00227)	(0.00238)	(0.00176)	(0.0115)	(0.0116)	(0.00929)
$Breadth18^2$							-0.00397***	-0.00367***	-0.000296
							(0.000717)	(0.000734)	(0.000562)
Constant	-55.53***	-27.83***	-27.70***	-55.76***	-28.74***	-27.02***	-55.37***	-28.38***	-26.99***
	(2.516)	(2.267)	(2.120)	(2.528)	(2.281)	(2.129)	(2.525)	(2.278)	(2.130)
Observations	417,589	417,589	417,589	417,589	417,589	417,589	417,589	417,589	417,589
R-squared	0.844	0.693	0.421	0.844	0.693	0.421	0.844	0.693	0.421
country pairs	21,206	21,206	21,206	21,206	21,206	21,206	21,206	21,206	21,206

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

The results for the alternative indicators of the intensive and extensive margins of trade in Table 3 are largely consistent with those reported in Table 2. The coefficient on the PTA dummy when considering the log of exports is positive and significant, and at a value of around 0.35, indicates that exports are expected to increase by around 52%, a value that is somewhat below the values of 100% or more found in some other recent studies. The coefficients on the PTA dummy indicate that membership of a PTA increases exports along the intensive margin but decreases exports along the extensive margin. We find that exports are increasing in the breadth of PTAs, with the effect being positive along the intensive margin and negative along the extensive margin. Finally, we again find a non-linear relationship between PTA breadth and the log of exports, with a turning point approximately equal to that found above. We similarly find an inverse U relationship between PTA breadth and the intensive margin, though the turning point is found at the highest PTA depth. We now also have evidence of an inverse U relationship between PTA breadth and the extensive margin, but the turning point is at a relatively low level of 9 (out of 18), with the effect of PTAs turning negative at a depth of 13. But we should not make too much of this, because it is clearly the *type* rather than the *number* of the core provisions in a PTA

that actually determines its impact on trade and the margins of trade. We use this evidence of non-linearities in the relationship to motivate our exploration of the content of PTAs that follows. Since they yield similar results we confine attention to the export ratio.

Table 3: PTAs and Export Margins – Basic Results II

	(1) $\ln EXP$	(2) $\ln \bar{M}$	(3) $\ln N$	(4) $\ln EXP$	(5) $\ln \bar{M}$	(6) $\ln N$	(7) $\ln EXP$	(8) $\ln \bar{M}$	(9) $\ln N$
$\ln GDP_i$	0.679***	0.367***	0.312***	0.678***	0.366***	0.312***	0.680***	0.366***	0.314***
	(0.0232)	(0.0182)	(0.0118)	(0.0232)	(0.0183)	(0.0118)	(0.0232)	(0.0183)	(0.0118)
$\ln GDP_j$	0.722***	0.346***	0.376***	0.721***	0.345***	0.377***	0.723***	0.345***	0.378***
	(0.0204)	(0.0154)	(0.0116)	(0.0204)	(0.0154)	(0.0116)	(0.0204)	(0.0154)	(0.0116)
$\ln POP_i$	0.0855	-0.490***	0.575***	0.107*	-0.458***	0.565***	0.0874	-0.464***	0.551***
	(0.0581)	(0.0478)	(0.0292)	(0.0586)	(0.0482)	(0.0294)	(0.0588)	(0.0485)	(0.0294)
$\ln POP_j$	0.844***	0.753***	0.0915***	0.864***	0.783***	0.0810***	0.846***	0.777***	0.0684**
	(0.0540)	(0.0412)	(0.0288)	(0.0544)	(0.0416)	(0.0291)	(0.0546)	(0.0417)	(0.0292)
PTA	0.349***	0.387***	-0.0380**						
	(0.0269)	(0.0222)	(0.0175)						
$Breadth18$				0.0219***	0.0278***	-0.00594***	0.0742***	0.0439***	0.0302***
				(0.00169)	(0.00152)	(0.00118)	(0.00929)	(0.00781)	(0.00592)
$Breadth18^2$							-0.00338***	-0.00104**	-0.00234***
							(0.000560)	(0.000484)	(0.000360)
Constant	-29.64***	-11.48***	-18.16***	-30.01***	-12.19***	-17.82***	-29.68***	-12.09***	-17.59***
	(2.372)	(1.811)	(1.268)	(2.386)	(1.820)	(1.271)	(2.384)	(1.821)	(1.269)
				417,589	417,589	417,589	417,589	417,589	417,589
Observations	417,589	417,589	417,589	0.856	0.834	0.602	0.856	0.834	0.603
R-squared	0.856	0.834	0.602	21,206	21,206	21,206	21,206	21,206	21,206

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

3.2 *Aggregated Provision Variables*

In columns (1) to (3) of Table 4 we split Breadth18 into two provision count variables – *B*, capturing the number of border provisions, and *BtB*, capturing the number of behind-the-border provisions. Here we find opposing effects. A larger number of border provisions in a PTA leads to increased bilateral exports, but this occurs through an increase in the intensive margin at the expense of the extensive margin. The opposite holds true for the behind-the-border provisions, where a larger number reduces overall exports and the intensive margin, but increase the number of varieties exported. This is clear evidence of differences in the nature of these provisions in terms of the margin of trade that they aim at. Since a PTA may include provisions of both types, the net outcome will be a balance of these opposing effects. The estimated coefficients suggest that adding a provision of each type will generate a small reduction of total exports, composed of an increase in the intensive margin and a reduction at the extensive margin.

In columns (4) to (6) we use the alternative decomposition of Breadth 18 into *Pref*, capturing the number of provisions that can be applied in a discriminatory fashion in favour of the PTA partner, and *MFN*, capturing the number of provisions that can only be applied in a non-discriminatory way to all trading partners. The results concur with expectations. Preferential provisions provide increased market access to existing exporters, by increasing overall exports through the intensive margin, but have no significant effect on the extensive margin. MFN provisions seem to confer no bilateral market access benefits since they reduce overall exports and the extensive margin, but have no significant effect on the intensive margin.

Finally, we consider the three principal components which are orthogonal weighted combinations of all provisions and which together explain 90% of their variation. Columns (7) to (9) in Table 4 present the results. Recall that in PC1 all weights are positive and similar in magnitude, which allows us to interpret it as capturing the overall breadth of the PTA. As anticipated, its results essentially match those of Breadth18; as PTA breadth increases the export ratio increases as does the intensive margin, but the extensive margin contracts. On the basis of its factor loadings, we expected that PC2 captured the 'border barrier' bias of the PTA and that its results therefore would be similar to those for B. This is indeed the case. A PTA with a higher score on PC2 has a larger export ratio and intensive margin and a smaller extensive margin. The third component, PC3, is a little more difficult to interpret. The estimated coefficients on PC3 in Table 4 are consistently negative and significant. As noted above, its factor loadings have the opposite sign patterns to those in *PC2*, with the exceptions of a positive weight on TRIMs and negative weights on Inv and Cap. One might be tempted to interpret PC3 as the bias of the PTA towards behind-the-border measures, and its effects on both exports and the intensive margin are consistent with this view. But its effects at the extensive margin are also negative. PTAs strong on this component discourage exports overall and at both margins. It appears to be acting as an indicator of the *anti-trade* bias of the PTA, which would suggest that those provisions with a

positive weight in PC3 (i.e. Ste, SAid, PubP, TRIMs, TRIPs, ComP and IPR) themselves contain an element of anti-trade bias.

Table 4: PTAs and Export Margins – Alternative Indicators

	(1) $\ln EXPRAT$	(2) $\ln IM$	(3) $\ln EM$	(4) $\ln EXPRAT$	(5) $\ln IM$	(6) $\ln EM$	(7) $\ln EXPRAT$	(8) $\ln IM$	(9) $\ln EM$
$\ln GDP_i$	0.690***	0.426***	0.265***	0.689***	0.424***	0.265***	0.693***	0.425***	0.268***
	(0.0254)	(0.0216)	(0.0198)	(0.0254)	(0.0216)	(0.0198)	(0.0254)	(0.0215)	(0.0197)
$\ln GDP_j$	0.741***	0.368***	0.372***	0.740***	0.367***	0.373***	0.743***	0.368***	0.376***
	(0.0208)	(0.0178)	(0.0192)	(0.0208)	(0.0178)	(0.0192)	(0.0208)	(0.0178)	(0.0192)
$\ln POP_i$	0.0364	-0.977***	1.013***	0.0392	-0.966***	1.006***	0.0209	-0.967***	0.988***
	(0.0646)	(0.0570)	(0.0503)	(0.0645)	(0.0571)	(0.0503)	(0.0648)	(0.0572)	(0.0505)
$\ln POP_j$	1.217***	0.931***	0.286***	1.220***	0.940***	0.279***	1.203***	0.940***	0.263***
	(0.0648)	(0.0572)	(0.0477)	(0.0649)	(0.0573)	(0.0477)	(0.0650)	(0.0572)	(0.0479)
$Border\ (B)$	0.0759***	0.144***	-0.0680***						
	(0.0115)	(0.0120)	(0.00978)						
BtB	-0.0794***	-0.133***	0.0540***						
	(0.0193)	(0.0204)	(0.0167)						
$Pref$				0.0998***	0.121***	-0.0211			
				(0.0242)	(0.0241)	(0.0193)			
MFN				-0.0283**	-0.00559	-0.0227**			
				(0.0142)	(0.0143)	(0.0111)			
$PC1$							0.0367***	0.0944***	-0.0577***
							(0.00503)	(0.00529)	(0.00360)
$PC2$							0.0872***	0.226***	-0.139***
							(0.0254)	(0.0266)	(0.0205)
$PC3$							-0.156***	-0.0706**	-0.0858***
							(0.0286)	(0.0298)	(0.0249)
Constant	-55.55***	-28.37***	-27.18***				-55.16***	-28.42***	-26.74***
	(2.527)	(2.272)	(2.126)				(2.528)	(2.272)	(2.126)
Observations	417,589	417,589	417,589	417,589	417,589	417,589	417,589	417,589	417,589
R-squared	0.844	0.693	0.421	0.844	0.693	0.421	0.844	0.693	0.421
Country pairs	21,206	21,206	21,206	21,206	21,206	21,206	21,206	21,206	21,206

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

Overall, these results suggest that a PTA whose primary objective is increased market access for existing exporters is likely to focus on border provisions that provide preferential access (i.e. Ind, Ag, ETx, AD, and CVM). The characteristics of a PTA whose primary objective is market access for new exporters is less clear. The results in Table 4 suggest a focus on behind the border measures that provide preferential access (since MFN provisions shrink the extensive margin). However, Table 1 indicates that this category is limited to provisions relating to public procurement (PubP). To better determine those provisions which allow scope for creating market access for new products we examine the core provisions individually in the next subsection.

3.3 *Individual Provision Variables*

In Table 5 we present the results from including each provision independently using 18 dummy variables. Essentially this treats each PTA as if it were a selection from the menu of the core provisions, with each provision having clearly defined effects on exports and the margins of trade. Note that while we only report results on the PTA provisions in Table 5 the set of control variables are included in the regression model.

Table 5: PTAs and Export Margins – Individual Provisions

	(1) ln EXPRAT	(2) ln IM	(3) ln EM	(4) ln EXPRAT	(5) ln IM	(6) ln EM	(7) ln EXPRAT	(8) ln IM	(9) ln EM
Ind	2.009***	0.953***	1.056***	0.920***	1.059***	-0.138	0.905***	1.097***	-0.191
	(0.161)	(0.139)	(0.102)	(0.168)	(0.153)	(0.200)	(0.169)	(0.153)	(0.200)
Ag	-1.114***	-0.233	-0.882***	-0.366*	-0.156	-0.210	-0.346*	-0.192	-0.154
	(0.208)	(0.168)	(0.129)	(0.194)	(0.175)	(0.217)	(0.195)	(0.174)	(0.217)
Cust	0.227	0.0200	0.207**	-0.108	-0.00595	-0.102	-0.0711	-0.0221	-0.0490
	(0.199)	(0.154)	(0.0981)	(0.109)	(0.105)	(0.102)	(0.109)	(0.105)	(0.101)
ETx	0.825***	0.207	0.618***	-0.170	-0.368***	0.198**	-0.174	-0.376***	0.202**
	(0.203)	(0.173)	(0.105)	(0.107)	(0.113)	(0.0921)	(0.106)	(0.113)	(0.0915)
SPS	-0.553***	-0.327*	-0.226**	-0.0423	-0.369**	0.326***	-0.0272	-0.360**	0.333***
	(0.200)	(0.168)	(0.107)	(0.128)	(0.150)	(0.116)	(0.127)	(0.150)	(0.115)
TBT	0.908***	0.486***	0.422***	0.0321	0.249	-0.217*	0.0205	0.247	-0.227*
	(0.205)	(0.171)	(0.122)	(0.155)	(0.154)	(0.123)	(0.154)	(0.154)	(0.121)
Ste	-0.890***	-0.164	-0.726***	-0.130	-0.512***	0.382***	-0.110	-0.500***	0.390***
	(0.182)	(0.156)	(0.105)	(0.111)	(0.114)	(0.0930)	(0.110)	(0.114)	(0.0930)
AD	-0.665***	-0.407**	-0.258**	-0.186	-0.318**	0.132	-0.217	-0.286**	0.0683
	(0.242)	(0.194)	(0.128)	(0.144)	(0.133)	(0.125)	(0.143)	(0.132)	(0.125)
CVM	0.389*	0.222	0.166	0.000611	0.101	-0.0999	0.0108	0.0953	-0.0846
	(0.206)	(0.166)	(0.108)	(0.102)	(0.116)	(0.101)	(0.102)	(0.116)	(0.101)
SAid	0.308*	-0.0745	0.383***	-0.0927	-0.281***	0.189**	-0.0273	-0.265***	0.238***
	(0.167)	(0.127)	(0.112)	(0.0928)	(0.0937)	(0.0841)	(0.0922)	(0.0931)	(0.0836)
PubP	-0.772***	-0.418***	-0.355***	-0.0963	-0.0969	0.000571	-0.111	-0.109	-0.00146
	(0.142)	(0.109)	(0.0800)	(0.0851)	(0.0878)	(0.0807)	(0.0843)	(0.0880)	(0.0803)
TRIMs	0.0309	0.772***	-0.741***	0.203***	0.859***	-0.657***	0.164**	0.859***	-0.695***
	(0.123)	(0.116)	(0.0644)	(0.0687)	(0.0759)	(0.0581)	(0.0678)	(0.0758)	(0.0586)
GATS	0.616***	0.206	0.410***	0.0535	-0.0409	0.0944	0.0939	-0.0491	0.143
	(0.189)	(0.146)	(0.111)	(0.141)	(0.132)	(0.117)	(0.140)	(0.132)	(0.116)
TRIPs	-0.896***	-0.439***	-0.458***	0.0868	-0.0474	0.134	0.0433	-0.0498	0.0931
	(0.189)	(0.143)	(0.108)	(0.121)	(0.123)	(0.105)	(0.120)	(0.122)	(0.105)
ComP	-0.171	0.0274	-0.198**	0.382***	0.136	0.246***	0.316***	0.121	0.195**
	(0.170)	(0.147)	(0.0920)	(0.0918)	(0.0910)	(0.0839)	(0.0914)	(0.0903)	(0.0836)
Inv	-0.362***	-0.319***	-0.0430	0.0491	-0.147***	0.196***	0.0244	-0.155***	0.180***
	(0.0848)	(0.0715)	(0.0478)	(0.0458)	(0.0455)	(0.0397)	(0.0454)	(0.0454)	(0.0398)

Cap	0.705***	0.339**	0.366***	-0.0482	0.417***	-0.465***	-0.0160	0.427***	-0.443***
	(0.173)	(0.146)	(0.0929)	(0.115)	(0.107)	(0.0987)	(0.114)	(0.106)	(0.0978)
IPR	-0.154	0.110	-0.264***	-0.0989*	0.559***	-0.658***	-0.141**	0.545***	-0.686***
	(0.147)	(0.154)	(0.0655)	(0.0577)	(0.0672)	(0.0536)	(0.0574)	(0.0672)	(0.0540)
Constant	-33.43***	-10.38***	-23.04***	-63.09***	-20.77***	-42.31***	-55.18***	-27.70***	-27.47***
	(0.369)	(0.306)	(0.190)	(1.779)	(1.569)	(1.436)	(2.542)	(2.293)	(2.132)
Year fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Country-pair fixed effects	no	no	no	yes	yes	yes	yes	yes	yes
Multilateral resistance controls	no	no	no	no	no	no	yes	yes	yes
Observations	417,589	417,589	417,589	417,589	417,589	417,589	417,589	417,589	417,589
R-squared	0.633	0.485	0.497	0.844	0.694	0.421	0.844	0.694	0.422
country pairs				21,206	21,206	21,206	21,206	21,206	21,206

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; additional control variables are included in the regression, but not reported in the table.

We can view these results in several ways. From the perspective of whether or not they increase bilateral exports, we observe, first, that there are five provisions that appear to have no significant effect on overall exports or the level of exports at either margin.[24] These include three border measures Cust, CVM and TRIPs; and two behind-the-border measures, PubP and GATS. Second, three provisions have significant negative effects on some aspect of trade with no corresponding significant positive effects elsewhere - Ag reduces total exports, AD reduces the intensive margin and TBT reduces the extensive margin. Third only five provisions have a significant effect on total exports, of which three have a positive effect: Ind, TRIMs and Comp, and two a negative effect: Ag and IPR[25]. Fourth, eight provisions have significant opposing effects on one or both margins but these effects cancel each other in total exports. These include seven which have a negative effect on the intensive margin and a positive effect on the extensive margin - ETx, SPS, TBT, STE, AD, SAid and Inv; and only Cap with the opposite effects.

[24] One may wonder why negotiators would bother including provisions that appear to have no significant effect. There are at least three possible responses (i) negotiators are unaware of the apparent impotence of these provisions; (ii) these provisions do have significant effects on trade values at the product level, but these effects are too small to be picked up at the aggregate level; and (iii) they have significant effects on other economic interactions (eg. GATS on trade in services) of interest to negotiators.

[25] A stronger IPR regime could discourage some trade through a market power effect. On the relationship between goods trade and the strength of IPR regimes see Smith (1999) and Falvey et al (2009).

From the perspective of investigating whether PTAs are primarily aimed at expanding existing trade or developing trade in new products, however, the most interesting result in Table 5 is that *no* provision has significant effects of the same sign on both margins of trade. This suggests that the choice of provisions does involve a trade-off between the margins. It also allows us to dichotomise provisions into those promoting the intensive margin – Ind, TRIMs, Cap and IPR; and those promoting the extensive margin – ETx, SPS, Ste, SAid, ComP and Inv. Note that this classification is quite distinct from those employed in subsection 3.2. Of those provisions promoting the intensive margin: Ind is applied at the border (B) on a preferential basis (Pref); TRIMs and IPR are applied behind the border (BtB) on an MFN basis; and Cap is B and MFN. Conversely, of those provisions promoting the extensive margin: ETx is B and Pref; SPS is B and MFN; while Ste, Said, ComP and Inv are all BtB and MFN.

Summary: In this and the preceding subsection we have estimated the effects of PTA provisions on total exports and the margins of trade. In section 3.3 we found that exports were promoted by provisions applied at the border on a preferential basis and discouraged by provisions applied behind the border on an MFN basis. Similarly, the intensive margin was promoted by border provisions applied preferentially and discouraged by provisions applied behind the border. Conversely, the extensive margin was promoted by provisions applied behind the border and discouraged by provisions applied at the border on an MFN basis. In this section we have considered the individual effects of these provisions. In Table 6 we indicate those ten core provisions whose estimates yield consistent predictions on the direction of change for a particular trade flow in all three cases (e.g. Ind is a border provision that is applied preferentially and is also estimated to increase both total exports and the intensive margin in Table 5). The other eight provisions yield conflicting estimates (e.g. AD is applied at the border on a preferential basis but is predicted to discourage the intensive margin in Table 5).

Table 6: Summary

	Exports	Intensive Margin	Extensive Margin
Increase	Ind	Ind	STE, SAid, ComP, Inv
Decrease	IPR	STE, SAid, Inv	TBT, TRIMs, Cap

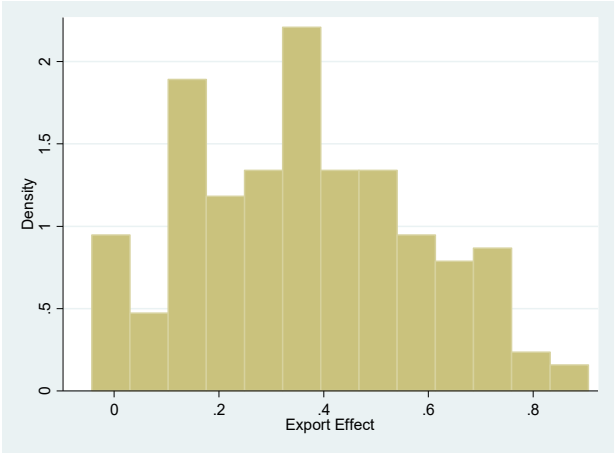
Note: this table summarises the direction of the effect of different provisions on either exports or the two margins of exports.

3.4 The Trade Effects of Selected PTAs

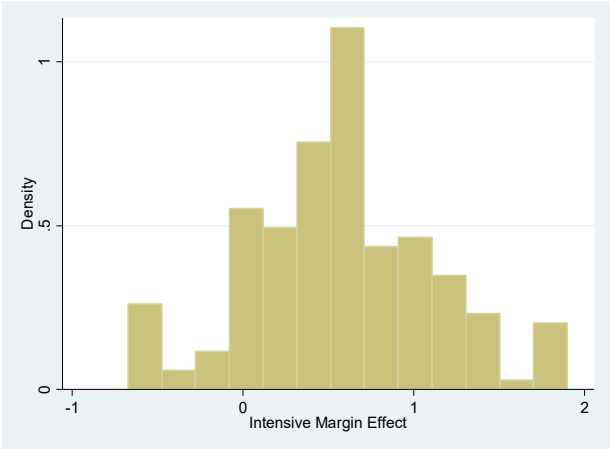
We can combine the significant estimates from columns 4-6 of Table 5 with our data on the composition of specific PTAs to calculate the effects of the latter on bilateral exports (and the export ratio in particular) and the margins of trade. In Figure 3 we present density plots of the estimated effects for all PTAs in our sample. The estimated results for selected PTAs are reported in Table 6. Actual PTAs represent a composite of provisions and the plots reveal that these compositions are all such that the estimated export effects are non-negative. The majority of effects at the intensive margin are also non-negative, presumably reflecting the influence of existing exporters at the time the PTA was formed. In contrast, the majority of effects at the extensive margin are negative, suggesting that the interests of potential new exporters are less likely to be taken into account.

Figure 3: Density Plots of Trade Effects

(a) Overall export effect



(b) Intensive margin effect



(c) Extensive margin effect

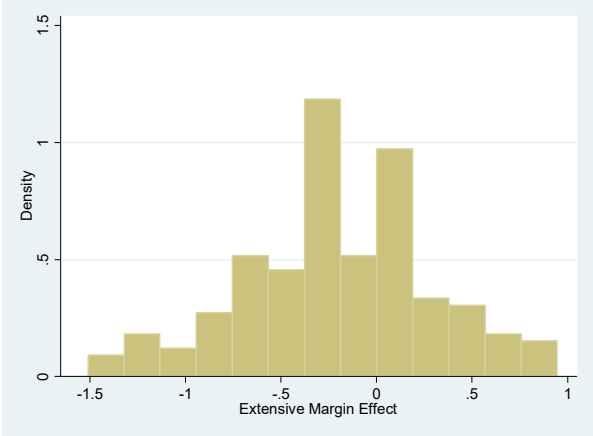


Table 7: Estimated effects of Selected PTAs in 2010

Agreement	Export Effect	IM Effect	EM Effect	# Core Provisions.	# IM Promoting Provisions.	# EM Promoting Provisions.
ASEAN	0.905	1.097	-0.191	1	1	0
SAFTA	0.559	0.905	-0.345	2	1	0
ANZCERTA	0.6569	0.9332	-0.2756	6	1	1
CARICOM	0.4354	0.0722	0.3637	10	2	4
SADC	0.2382	0.1043	0.1338	10	1	2
EAC	0.3737	0.4862	-0.1123	11	2	4
CIS	0.1267	0.6882	-0.5608	11	2	3
Japan-ASEAN	0.7323	1.9001	-1.1673	12	3	3
COMESA	0.3668	-0.0111	0.3793	13	2	5
EEA	0.1733	0.1683	0.00634	17	3	6
MERCOSUR	0.3129	1.1823	-0.86866	17	4	5
NAFTA	0.3373	1.0273	-0.68866	18	4	6

The PTAs selected for inclusion in Table 7 range from ASEAN, which covers only one core provision (Ind) according to Hoffman et al. (2017), to NAFTA which covers all eighteen. Consistent with Figure 3, all selected PTAs have a positive export effect and with the exception of COMESA, they also have a positive effect at the intensive margin. There is more diversity in the effects at the extensive margin, however, with eight PTAs recording a negative effect on trade in new products and only four with a positive effect. From the way in which these estimates are constructed, their different outcomes can, in principle, be linked to their provision composition. For example, both the EEA and MERCOSUR involve provisions in 17 core areas, and both have positive export effects and encourage trade through the intensive margin. But while EEA has an increase in trade in new products, MERCOSUR has a decrease. From Table 6 we can attribute this difference to the fact that EEA includes all EM-promoting provisions, while MERCOSUR excludes Inv which in its case appears to be sufficient for a reduction in trade at the Extensive Margin.

4. Summary and Conclusions

Our aim in this paper has been to extend the literature explaining the heterogenous effects of PTAs by estimating a gravity equation using recently available data on the breadth of their core economic provisions. Our first objective was to identify which (types of) provisions seem to promote goods trade in general (specifically bilateral total exports), and which seem to be aimed at broader economic interactions. Our second objective was to examine which (types of) provisions affected the intensive and extensive margins of trade. If we view the composition of each PTA as partly reflecting the outcomes of lobbying by current exporters (interested in promoting the intensive margin) and potential new exporters (interested in promoting the extensive margin), then the estimated effects of the PTA on these margins provide an indication of which groups were more successful in their lobbying.

We began with aggregated PTA variables, the first involving a simple PTA dummy and the second a provision-count variable which reflected the number of core provisions included in the PTA. Both indicated that a PTA increased bilateral exports in total and at the intensive margin, but reduced exports at the extensive margin. The obvious inference is that the 'typical' PTA serves the interests of existing rather than potential exporters. But we also found evidence of non-linearities in the effects of the provision-count variable, suggesting that beyond some threshold adding further provisions did not lead to increased trade.

This evidence of non-linearities led us to disaggregate the provision-count variable, initially by provision types and then into eighteen individual provision dummies. Disaggregation into separate border and behind-the-border provision-count variables found evidence that provisions relating to measures applied at the border tended to increase exports in total and at the intensive margin, but to decrease the extensive margin. Conversely for provisions applied behind the border. It appears that it is border measures that are aimed at existing trade whose effects are reflected in the aggregate results discussed in the previous paragraph. Measures applied behind the border are aimed at creating trade in new products.

An alternative disaggregation looked at the basis on which each provision can be applied – i.e. whether on a preferential basis solely to exports from the PTA partner, or on an MFN basis to all exports. Again, we found a clear dichotomy. Preferential measures tended to increase bilateral exports in total and at the intensive margin but had no significant effect on at the extensive margin. Conversely, measures applied MFN tended to reduce bilateral exports in total and at the extensive margin, but had no significant effect at the intensive margin. Preferential measures provide improved market access, at least for existing exporters. But it seems that the role of measures applied on an MFN basis in the PTA must lie away from trade in goods.

A slightly different approach was to use the principal components of the core provisions as uncorrelated aggregates of the provisions which we might hope to interpret as reflecting particular characteristics of the underlying agreements. The first component was readily

interpretable as indicating the overall 'breadth' of the agreement. Our results showed that a broader agreement increased total exports and exports at the intensive margin, but decreased exports at the extensive margin. The second component could be interpreted as capturing the bias of the agreement towards border measures and had similar effects to the first component. The third component was more difficult to interpret from inspection of the factor loadings but turned out to capture the anti-trade bias of the agreement in that its estimated coefficients were negative and significant on exports and trade at both margins.

The results so far provided a broad sense of the relevant characteristics of a PTA (overall breadth, mix between border and behind-the-border measures, mix of preferential and MFN measures) and how these characteristics affect exports and its margins. But they had not isolated the effects of specific provisions. This we did by dummy variables indicating the inclusion or absence of each of the core provisions in each PTA. The results allowed us to establish which provisions promoted exports in total and at each of the margins. Perhaps the most interesting outcome was that no provision was found to have a statistically significant effect of the same sign on both margins, which appears to confirm the view that existing and potential exporters have opposing interests in PTA formation.

Our last step was to use the significant estimates from the core dummy regressions to calculate the effects of the PTAs in our sample. The overall distribution of outcomes revealed that (i) no PTA was estimated to have a negative change in total exports; (ii) while there were some negative changes at the intensive margin, the vast majority of changes at this margin were positive; and (iii) there was a mix of positive and negative changes at the extensive margin, with the majority being negative. We conclude that existing exporters have had the dominant influence in most PTA negotiations.

Finally, we have noted that some provisions seem to be aimed at broader economic interactions than just trade in goods. Our results also led us to characterise the third principal component as capturing the anti-trade bias of the PTA, since it was found to reduce exports in total and at both

margins. We see an exploration of how these provisions and their various aggregates affect trade in services and factors of production (labor migration and FDI) as interesting extensions of this paper.[26]

References

Abrams, R. K., 1980. International trade flows under flexible exchange rates. Federal Reserve Bank of Kansas City Economic Review, 65(3), 3–10.

Aitken, N. D., 1973. The effect of the EEC and EFTA on European trade: a temporal cross-section analysis. *American Economic Review*, 5, 881–892.

Anderson, J. E., & E. van Wincoop, 2003. Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1), 170–192.

Baier, S. L., & J. H. Bergstrand, 2009. Estimating the effects of free trade agreements on international trade flows using matching econometrics. *Journal of International Economics*, 77, 63–76.

Baier, S. L. and J. H. Bergstrand, 2002. On the endogeneity of international trade flows and free trade agreements. Mimeo

Baier, S. L., Bergstrand, J. and M. Feng, 2014. Economic integration agreements and the margins of international trade. *Journal of International Economics*, 93(2), pages 339-350.

Baier, S. L., Bergstrand, J. H., Egger, P. and P. A. McLaughlin, 2008. Do economic integration agreements actually work? Issues in understanding the causes and consequences of the growth of regionalism. *World Economy*, 31(4), 461–497.

Baier, S.L., Yotov, Y.V. and T Zylkin, 2016. On the widely differing effects of Free Trade Agreements: Lessons from twenty years of trade integration. CESifo Working Paper No.6174.

[26] Osnago et al. (2016) provide one piece in this direction by showing that broader trade agreements increase vertical FDI.

Baldwin, R. and D. Taglioni, 2006. Gravity for dummies and dummies for gravity equations. NBER Working Paper no. 12516, National Bureau of Economic Research

Bergstrand, J. H., 1985. The gravity equation in international trade: some microeconomic foundations and empirical evidence. *Review of Economics and Statistics*, 71(1), 143–153.

Brada, J. C. and J. A. Mendez, 1983. Economic integration among developed, developing and centrally planned economies: a comparative analysis. *Review of Economics and Statistics*, 67(4), 549–556.

Cheong, J., Kwak, D. W., & K. K. Tang, 2014. Heterogeneous effects of preferential trade agreements: How does partner similarity matter? *World Development*, 66, 222–236.

Cipollina, M., & L. Salvatici, 2010. Reciprocal trade agreements in gravity models: A meta-analysis. *Review of International Economics*, 18(1), 63–80.

Debaere, P. and S. Mostashari, 2010. Do tariffs matter for the extensive margin of international trade? An empirical analysis. *Journal of International Economics*, 81, 163–169.

Dür, A., Baccini, L., Elsig, M. and K. Milewicz, 2013. The design of international trade agreements: Introducing a new dataset. Mimeo

Egger, P., Egger, H., & D. Greenaway, 2008. The trade structure effects of endogenous regional trade agreements. *Journal of International Economics*, 74(2), 278–298.

Eicher, T. S., & C. Henn, 2011. In search of WTO trade effects: Preferential trade agreements promote trade strongly, but unevenly. *Journal of International Economics*, 83(2), 137–153.

Falvey, R. E. and N. Foster-McGregor, 2018. On the Relationship between the Breadth of PTAs and Trade Flows. *World Economy*, 41(4), 1088-1110.

Falvey, R. E., Foster, N., & D. Greenaway, 2009. Trade, imitative ability and intellectual property rights. *Review of World Economics*, 145, 373–404.

Feenstra, R. C. and H. L. Kee, 2007. Trade liberalisation and export variety: a comparison of Mexico and China. *World Economy*, 30(1), 5–21.

Feenstra, R. C. and H. L. Kee, 2008. Export variety and country productivity: estimating the monopolistic competition model with endogenous productivity. *Journal of International Economics*, 74(2), 500–514.

Feenstra, R. C., Lipsey, R. E., Deng, H., Ma, A. C. and H. Mo, 2005. World trade flows: 1962–2000. NBER Working Paper no. 11040, National Bureau of Economic Research.

Fernandes, A. M., Klenow, P.J., Meleshchuk, S., Pierola, M. D. and A. Rodriguez-Clare, 2019. The intensive margin of trade. CESifo Working Paper No.7540.

Foster, N., Poeschl, J. and R. Stehrer, 2011. The Impact of Preferential Trade Agreements on the Margins of International Trade. *Economic Systems*, 35(1), 2011, 64-83.

Frankel, J., 1997. *Regional trading blocs in the world economic system*. Institute for International Economics, Washington, DC.

Frankel, J., Stein, E. and S-J. Wei, 1995. Trading blocs and the Americas: the natural, the unnatural, and the super-natural. *Journal of Development Economics*, 47, 61–95.

Frankel, J., Stein, E. and S-J. Wei, 1996. Regional trading arrangements: natural or supernatural? *American Economic Review Papers and Proceedings*, 86(2), 52–56.

Frensch, R., 2010. Trade liberalisation and import margins. *Emerging Markets Finance and Trade*, 46, 4–22.

Goldberg, P. K., Khandelwal, A. K., Pavcnik, N. and P. Topalova, 2008a. Multiproduct firms and product turnover in the developing world: Evidence from India. NBER Working Paper no. 14127

Goldberg, P. K., Khandelwal, A. K., Pavcnik, N. and P. Topalova, 2008b. Imported intermediate inputs and domestic product growth: Evidence from India. NBER Working Paper no. 14416

Goldberg, P. K., Khandelwal, A. K., Pavcnik, N. and P. Topalova, 2009. Trade liberalization and new imported inputs. *American Economic Review*, 99(2), 494–500.

Grossman, G. and E. Helpman, 1991. *Innovation and growth in the global economy*. MIT, Cambridge.

Helpman, E., Melitz, M., & Y. Rubinstein, 2008. Estimating trade flows: Trading partners and trading volumes. *Quarterly Journal of Economics*, 123, 441–487.

Hilberry, R. and C. McDaniel, 2002. A decomposition of North American trade growth since NAFTA. Working Paper no 15866, United States International Trade Commission.

Hofmann, C., Osnago, A., & Ruta, M. (2017). Horizontal depth: A new database on the content of preferential trade agreements (World Bank Policy Research Working Paper No. 7981). Washington, DC: The World Bank.

Hummels, D. and P. Klenow, 2005. The variety and quality of a nation's exports. *American Economic Review*, 95(3), 704–723.

Kehoe, T. J. and K. J. Ruhl, 2002. How Important is the New Goods Margin in International Trade? Federal Reserve Bank of Minneapolis.

Kehoe, T. J. and K. J. Ruhl, 2003. How important is the new goods margin in international trade? Staff Report no. 324, Research Department, Federal Reserve Bank of Minneapolis.

Kehoe, T. J. and K. J. Ruhl, 2013. How important is the new goods margin in international trade? Federal Reserve Bank Minneapolis Research Department Staff Report 324.

Kehoe, T. J., Rossbach, J.M. and K. J. Ruhl, 2013. Using the new products margin to predict the industry-level impact of trade reform. NBER working Paper 19692.

Klenow, P. and A. Rodriguez-Clare, 1997. Quantifying variety gains from trade liberalization. Mimeo

Limao, N., 2016. Preferential trade agreements. Chapter 6 In K. Bagwell & R. W. Staiger (Eds.), *Handbook of commercial policy Vol 1B* (pp. 279–367). Amsterdam: Elsevier.

Magee, C., 2003. Endogenous preferential trade agreements: an empirical analysis. *B.E. Journal of Economic Analysis and Policy*, 2(1), 1-19.

Martincus, C. and A. Estevadeordal, 2009. Trade policy and specialization in developing countries. *Review of World Economics*, 145(2), 251-275.

Orefice, G., and N. Rocha, 2014. Deep Integration and Production Networks: An Empirical Analysis. *World Economy*, 37 (1): 106– 36.

Osnago, A., Rocha, N., and M. Ruta, 2016. Do deep trade agreements boost vertical FDI? *World Bank Economic Review*, 20, S119-S125.

Rivera-Batiz, L. A. and P. M. Romer, 1991. International trade with endogenous technological change. *European Economic Review*, 35, 715–721.

Santos-Silva, J. M. C. and S. Tenreyro, 2006. The log of gravity. *Review of Economics and Statistics*, 88, 641–658.

Smith, P. J., 1999. Are weak patent rights a barrier to US exports? *Journal of International Economics*, 48(1), 151-177.

Vicard, V., 2009. On trade creation and regional trade agreements: Does depth matter? *Review of World Economics*, 145(2), 167-187.

World Bank, 2005. Global economic prospects 2005: Trade, regionalism, and development. Washington, DC: The World Bank.

The UNU-MERIT WORKING Paper Series

2019-01 *From "destructive creation" to "creative destruction": Rethinking Science, Technology and innovation in a global context* by Luc Soete
2019-02 *Do young innovative companies create more jobs? Evidence from Pakistani textile firms* by Waqar Wadho, Micheline Goedhuys and Azam Chaudhry
2019-03 *What gains and distributional implications result from trade liberalization?* by Maria Bas and Caroline Paunov
2019-04 *FDI, multinationals and structural change in developing countries* by André Pineli, Rajneesh Narula and Rene Belderbos
2019-05 *The race against the robots and the fallacy of the giant cheesecake: Immediate and imagined impacts of artificial intelligence* Wim Naudé
2019-06 *The middle-technology trap: The case of the automotive industry in Turkey* by Ibrahim Semih Akçomak and Serkan Bürken
2019-07 *The impact of a mathematics computer-assisted learning platform on students' mathematics test scores* by Marcelo Perera and Diego Aboal
2019-08 *Health insurance and self-employment transitions in Vietnam* by Nga Le, Wim Groot, Sonila M. Tomini and Florian Tomini
2019-09 *Knowledge economy and economic development in the Arab region* by Samia Mohamed Nour
2019-10 *Migration of higher education students from the North Africa region* by Samia Mohamed Nour
2019-11 *Job automation risk, economic structure and trade: a European perspective* by Neil Foster-McGregor, Önder Nomaler an Bart Verspagen
2019-12 *The breadth of preferential trade agreements and the margins of* exports by Rod Falvey and Neil Foster-McGregor