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Preferential Trade Agreements and Multinational Production

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Abstract

This paper investigates the impact of deep integration in preferential trade agreements (PTAs) on multinational production (MP), i.e. the production carried out by firms outside of their country of origin. Using a structural gravity model, we find that tariff reductions have a positive impact on MP of goods. This effect is stronger for foreign affiliates trading intermediate inputs or serving the final demand. However, while deep provisions have no significant impact on foreign affiliates that produce goods, we find that deep integration provisions positively affects foreign affiliates operating in the service sector. These results suggest that the proliferation of PTAs with deep integration provisions has contributed to the growth of multinational production and facilitated the participation of foreign affiliates in global value chains.

Keywords

Preferential trade agreements; multinational production; deep integration; services; investment.

JEL codes: F12, F14, F15, F23, L23

1. Introduction*

Multinational production (MP) is the production carried out by firms outside of their country of origin (Ramondo, et al., 2015). It involves foreign direct investment (FDI) as firms need to establish affiliates (or in some cases branches) in order to produce abroad. But MP is part of a global strategy where multinational enterprises (MNEs) decide from which countries they source inputs, in which countries they produce and which markets they serve (Bernard et al., 2018). As such, preferential trade agreements (PTAs) that are 'deep' and cover not only trade liberalisation for goods but also services, investment, competition, intellectual property and a variety of other regulatory issues that can influence firms' decisions are expected to have an impact on MP. As described by Baldwin (2011), 21st century regionalism is less about tariff preferences and more about addressing the trade-investment-service nexus.

Using a new dataset on activities of foreign affiliates, this paper studies for the first time the impact of PTAs on MP for a large set of developed and emerging economies. We investigate the extent to which deep provisions that go beyond tariff reductions affect foreign affiliate production in the manufacturing and service sectors. Additionally, we use a value-added approach to better understand the implications of PTAs on foreign affiliates' sourcing strategies in the context of global value chains.

The impact of deep provisions[1] on trade has been studied in a series of papers (World Trade Organization, 2011; Mattoo, et al., 2017; Dhingra, et al., 2018; Lee, 2018). However, this literature has not yet explored the impact on MP, due to data limitations (namely, the lack of data on the activity of foreign affiliates). Some papers have looked at the impact of deep trade agreements on global value chains (Orefice and Rocha, 2014) but rather focusing on trade flows related to international production networks and not on production by foreign-owned firms. More related to the question of multinational production are the two papers by Osnago et al. (2015; 2017) that investigate the relationship between deep trade agreements and vertical FDI. The authors find a positive relationship between the depth of PTAs and the offshoring of the supply of inputs. They also study the impact of specific provisions on the choice between outsourcing (trade) and vertical FDI (investment). But only one aspect of multinational production (vertical FDI) is studied.

This paper extends the existing literature by investigating the impact of PTAs on MP, while distinguishing between foreign affiliate activity in the manufacturing and service sectors. This analysis contributes to the literature in three respects. First, using a structural gravity model, we find that tariff reductions have a positive impact on MP of goods. In particular, the effect of tariff liberalisation is stronger for those foreign affiliates trading intermediate inputs or serving the final demand. Second, deep provisions do not affect foreign affiliates that produce goods. This finding is not surprising since trade and investment are in a complex relationship, sometimes acting as substitutes and sometimes being complements. Third, we find that deep integration positively affects foreign affiliates operating in the

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The authors are writing in a strictly personal capacity. The views expressed are theirs only, and do not reflect in any way those of the OECD Secretariat or the member countries of the OECD.

[1] The concept of 'deep integration' applied to regionalism and PTAs comes from Lawrence (1996). The North American Free Trade Agreement (NAFTA) that entered into force in 1994 was the first PTA combining the traditional tariff preferences found in trade agreements with provisions on services, investment, competition and intellectual property. It opened the door to a new wave of PTAs with deep integration provisions negotiated by all major economies. Agreements that are not 'deep' are defined as 'shallow', meaning that they only cover tariff preferences and not the behind-the-border barriers and regulatory issues found in deep integration agreements.

service sector. This evidence is consistent with the proliferation of PTAs including provisions liberalising trade in services through commercial presence.

The impact of PTAs on MP depends on the trade-off between exports and FDI. This relationship is not straightforward and has been long discussed in the literature. Theories of MNEs traditionally distinguish between horizontal and vertical FDI[2]. Horizontal FDI is motivated by the desire to place production close to customers and to avoid trade costs. When there is horizontal FDI, we expect tariff reductions to have a positive effect on the intensive margin of MP and a mixed effect on the extensive margin. The former channel is explained by Kleinert and Toubal (2010). Trade costs affect negatively the volume of each affiliate's sales when production requires intermediates, which must be imported at a high cost from the home country. Instead, the effect on the firm decision to serve a foreign market through trade or FDI is ambiguous. On the one hand, when trade costs becomes smaller than all costs associated with FDI, the multinational will decide to trade rather than setting up a foreign affiliate (Brainard, 1997; Helpman et al., 2004). However, deep provisions (services, investment, competition, etc.) might have a positive impact on the extensive margin of MP by lowering the set-up costs associated with FDI.

When firms establish an affiliate to supply inputs or access resources as part of their global sourcing strategy (vertical FDI), trade and investment are in a complementary relationship (Helpman, 1984; Antràs and Helpman, 2004). We expect tariff liberalisation to have a positive effect on MP, particularly through the channel of reduced costs to move inputs and processed goods across countries. Moreover, deep provisions in PTAs may increase or decrease vertical FDI, depending on whether they improve the contractibility of inputs provided by the headquarters (partner countries) or by the suppliers (Antràs and Helpman, 2008).

By lowering trade costs between parties, preferential trade agreements (PTAs) are therefore expected to have an impact on multinational production, creating new opportunities for vertical FDI or reducing the incentives for horizontal FDI. Trade diversion and creation effects, as identified in the literature on the economic impact of PTAs (Viner, 1950) can also become FDI creation and diversion effects (either in the same direction or in the opposite direction, depending on the prevalence of complementary and substitution effects between trade and investment).

In addition, while deep provisions in PTAs are generally expected to increase trade between parties of the PTA, trade agreements increasingly include investment provisions (Miroudot and Lesher, 2007; Kotschwar, 2009; Chornyi et al., 2016). When agreements cover trade in services and follow the model of the General Agreement on Trade in Services (GATS), they generally have disciplines on trade through commercial presence (mode 3) which is MP through a foreign affiliate in services industries. In addition, comprehensive trade agreements have investment chapters that extend to goods the disciplines covered in services chapters and add investment protection provisions both for goods and services. Such provisions are also expected to have an impact on investment decisions by firms, particularly when their enforcement is warranted by specific mechanisms such as an investor-state dispute settlement.

Beyond the core trade and investment provisions, other provisions of trade agreements may have an impact on MP. In the context of offshoring and global value chains, the nature of the problem that a trade agreement must solve is different and involves a wider set of policies going beyond market access (Antràs and Staiger, 2012). Some of these provisions are aimed at improving the business environment, facilitating the operations of firms, providing guarantees against different types of policy risks or policy reversals, as well as organising some co-operation between governments to harmonise rules or mitigate the impact of regulatory differences. All these provisions may also influence firm strategies and therefore MP.

[2] However, the reality of MNEs has become more complex than this horizontal – vertical dichotomy: most MNEs are engaged both in horizontal and vertical investments abroad (Alfaro and Charlton, 2009) and most MNE affiliates have both horizontal and vertical characteristics (Herger and McCorriston, 2013; Ray, 2016).

This paper looks at the impact of deep trade agreements on MP, taking advantage of a new dataset developed at the OECD, the analytical AMNE database (Cadestin et al., 2018a). In this dataset, MP is measured by the output of foreign-owned firms, with data harmonised across countries and made consistent with national accounts. The dataset covers the period 2000-2014 and builds on the OECD Activities of Multinational Enterprises (AMNE) statistics and the World Input-Output Database (Timmer et al., 2015). In addition to providing data on the output of foreign affiliates, the dataset includes global input-output tables that have been split according to ownership, distinguishing the contribution to trade and output of domestic-owned and foreign-owned firms. With such data, we can introduce a value-added analysis of the output of foreign affiliates (Andrenelli et al., 2018) and distinguish within the production of these affiliates the value-added derived from manufacturing or services inputs. It allows us to test more specifically the impact of deep integration provisions on goods or services and the role of services in MP of manufacturing firms and vice-versa.

In order to capture the deep provisions found in PTAs, the analysis relies on the Design of Trade Agreements Database (DESTA) as described in Dür, Baccini and Elsig (2014). The dataset has information on more than 620 agreements and covers all PTAs in force in our period of interest. It includes not only a broad set of provision categories but it distinguishes between substantive provisions and shallow provisions. The database also has information on some aspects of PTA enforcement, such as dispute mechanisms.

The paper is organized as follows. The empirical strategy is described in Section 2 and the data in Section 3. Section 4 presents the results of the econometric analysis, together with some robustness checks. Section 5 concludes.

2. Empirical strategy

2.1 Theoretical framework

Although the gravity model was developed to study trade in goods and has only recently been applied to trade in services (Kimura and Lee, 2006; Anderson, Milot and Yotov, 2014) and FDI (Bénassy-Quéré, Coupet and Mayer, 2007; Kleinert and Toubal, 2010; Anderson, Larch and Yotov, 2017), recent literature has extended its range of applications to MP (Alviarez, 2014; Ramondo, Rodríguez-Clare and Tintelnot, 2015). Our empirical model is based on the standard structural gravity framework. We define MP of a parent country *j* controlling foreign affiliates in destination country *i* as

$$MP_{ij} = G\, S_i\, M_j\, t_{ij}\ ; \tag{1}$$

where G is a 'gravitational constant', S_i and M_j captures host and partner country's characteristics, respectively, and t_{ij} denotes bilateral frictions (investment and trade costs) between partner and host country.

Kleinert and Toubal (2010) show that benchmark models of multinational firms yield gravity equations of the form in Equation 1. For instance, a model of monopolistic competition with heterogeneous firms (as in Helpman et al., 2004) generates a similar gravity equation. This model also assumes heterogeneous fixed costs, since fixed costs increase with distance by the fact that distance increases upfront search costs and organization costs. This model predicts that in equilibrium only the most productive firms become multinationals and that their entry decreases with distance. In a panel framework, the log-linear of the MP gravity equation is

$$\ln MP_{ijt} = \ln G + \ln S_{it} + \ln M_{jt} + \ln t_{ijt}. \tag{2}$$

Following the empirical trade gravity literature (Yotov and Piermartini, 2017), we control for potential omitted variables through partner-time and host-country-time fixed effects (δ_{jt} and ψ_{it}, respectively). These country-time fixed effects control for country-specific time-varying factors that

may influence MP, such as output, price levels and multilateral resistances (Anderson and van Wincoop, 2003). Moreover, country-pair fixed effects, γ_{ij}, address the issue of endogeneity of trade policy variables (Baier and Bergstrand, 2007), while controlling for time-invariant country-pair observable characteristics (such as geographical distance, cultural and linguistic proximity), as well as unobservable bilateral factors that may influence MP between the two countries. Finally, we can decompose bilateral frictions as follows: $t_{ij} = PTA_{ij} + \gamma_{ij}$, where PTA_{ij} is equal to one when countries *j* and *i* have a trade agreement in place at time *t*. As a result, our gravity model of MP is:

$$\ln MP_{ijt} = \alpha + \beta PTA_{ijt} + \delta_{jt} + \psi_{it} + \gamma_{ij}. \quad (3)$$

2.2 Empirical specification

To investigate the role of deep provisions in affecting MP beyond tariff reductions, we estimate the following reduced-form specification on a panel dataset covering the years 2000 to 2014:

$$MP_{ijt} = \exp\left(\alpha + \beta_1 PTA_{ijt} + \beta_2 Provision_{ijt} + \delta_{ij} + \psi_{it} + \sigma_{jt}\right) + \varepsilon_{ijt}; \quad (4)$$

where MP_{ijt} denotes MP of goods or services in country *i* controlled by a parent company in country *j* at time *t*. We estimate this specification for several categories of MP: first, gross output which is further disaggregated between gross exports and domestic sales, as well as between intermediate and final sales; second, gross output is decomposed in foreign value added (FVA) and domestic value added (DVA) in gross exports and domestic sales. PTA_{ijt} is 1 if countries *i* and *j* have a free trade agreement or customs union in place at time *t*. $Provision_{ijt}$ is a vector of dummy variables, each equal to 1 if the trade agreement between country *i* and *j* has a specific provision category in place at time *t*. The coefficient of each provision category is equivalent to an interaction variable with the PTA variable since there are no observations where a country-pair has a provision without having a PTA. In addition, with the inclusion of country-pair fixed effects, the identifying variation in this regression is provided by the entry into force of a new PTA or the addition of a new provision category into pre-existing PTAs. This would be the case when a country pair already has a PTA in goods and later becomes part of another PTA (perhaps with different members involved), or when a country pair signs a PTA for goods and services but the date of entry into force is different for the two (Lee, 2018).

Following the gravity literature, to allow for adjustments in MP in response to changes in trade agreements, we use 2-year intervals instead of estimating the specification using annual data.[3] We estimate our gravity specification using both the ordinary least squares (OLS) and the Poisson Pseudo Maximum Likelihood (PPML) estimator proposed by Silva and Tenreyro (2006). The PPML estimator has the advantage of accounting for potential heteroscedasticity in foreign affiliate activity and to deal with sample selection, since it keeps zero observations by allowing to include the dependent variable in level.[4] In all estimations, the standard errors are clustered by country pairs.

3. Data

3.1 Foreign affiliate activity

The variables for multinational production are taken from the OECD analytical AMNE database.[5] In this dataset, multinational production is measured by the output of foreign-owned firms, with data harmonised across countries and made consistent with national accounts. The dataset covers the period

[3] Contrary to the literature which uses 3-,4- or 5-year intervals, we use 2-year intervals given our shorter panel. Results for 4-year intervals are available in the Appendix.

[4] The zero observations make up for around 5 per cent of the sample.

[5] http://www.oecd.org/sti/ind/analytical-amne-database.htm

2000-2014 and builds on the OECD Activities of Multinational Enterprises (AMNE) statistics and the World Input-Output Database (Timmer et al., 2015). In addition to providing data on the output of foreign affiliates, the dataset includes global input-output tables that have been split according to ownership, distinguishing the contribution to trade and output of domestic-owned and foreign-owned firms.[6] This novel global database of foreign affiliate (FA) production covers 43 host and partner countries and 43 sectors (including primary, manufacturing and services). In other words, each observation in the database provides information on the gross output of foreign affiliates in a host country *i* controlled by a partner country *j*. Several alternative projects have assembled similar bilateral datasets on MNE production (Fukui and Lakatos, 2012; Alviarez, 2014; Ramondo et al., 2015; Federico, 2016), but not at the same level of disaggregation of countries and industries.

Gross measures of the output of foreign affiliates include the value-added of the firms exporting or producing locally as well as the use of intermediate inputs. These intermediates generate some double counting when aggregating data across industries or countries, since the same intermediate input can be counted several times. Inter-country input-output tables allow for the tracking of value-added across sectors and countries and for the removal of this double counting. This is especially a concern for the output of foreign affiliates because double counting is prevalent (Andrenelli et al., 2018). We thus decompose foreign affiliate gross output into its domestic (DVA) and foreign value added (FVA) components, allowing to determine the value added which is created domestically as opposed to the value-added sourced from other countries. The decomposition follows the methodology developed by Miroudot and Ye (2018).

Since 2000, FA activity has been rapidly increasing, reaching almost 20 trillion US$ in 2014.[7] Table 1 disaggregates the type of MP into output sold domestically and output exported. In the manufacturing sector, export motives are important and increasing over time, making up 43 per cent of foreign affiliate production in 2014. Conversely, in the services sector, the lion's share of MP activity is dedicated to serving domestic markets, with domestic activity accounting for more than 80 per cent of multinational production.

Table 1. Share of type of activity in total MP, 2000-2014

GOODS	2000	2005	2010	2014
FA dom int	0.37	0.34	0.35	0.35
FA dom final	0.23	0.20	0.18	0.17
FA exp int	0.22	0.25	0.25	0.27
FA exp final	0.19	0.21	0.22	0.21

SERVICES	2000	2005	2010	2014
FA dom int	0.48	0.49	0.48	0.47
FA dom final	0.41	0.39	0.36	0.35
FA exp int	0.07	0.08	0.10	0.12
FA exp final	0.04	0.05	0.05	0.06

Note: *FA dom int* indicates foreign affiliate production of intermediates sold domestically; *FA dom final* foreign affiliate production of finals sold domestically; *FA exp int* foreign affiliate export of intermediates; and, *FA exp final* foreign affiliate export of finals.

3.2 The Design of Trade Agreements (DESTA) database

Our source of information on trade agreements and their provisions is the Design of Trade Agreements (DESTA) database by Dür, Baccini and Elsig (2014).[8] This dataset builds on the list of agreements notified to the WTO, providing the widest coverage of trade agreements available. The major assumption in the construction of the data is that when there is more than one bilateral trade agreement in place, we add up the provisions included in each agreement based on the *lex specialis derogat legi generali*. This doctrine states that if two laws govern the same factual situation, a law governing a

6 For further details on the construction of the analytical AMNE database, see Cadestin et al. (2018a).

7 For more information on MP patterns across time, regions and industries, see Cadestin et al. (2018b).

8 Our variables enter the model at the date of entry into force of an agreement, instead at the date of signature.

specific subject matter (*lex specialis*) overrides a law governing only general matters (*lex generalis*). This implies that a bilateral agreement with a substantive provision on services overrules an agreement without any commitment on services.

Table 2 shows the share of each provision category across all country pairs in our dataset. Overall, there has been a rapid increase in economic integration in the 2000-2014 period. In 2014, 61 per cent of the country pairs in the dataset have either a partial scope agreement, free trade agreement, or customs union in place (i.e. *PTA*). In addition, 51 per cent of country pairs have a trade agreement including a substantive provision on trade in services (*Serv prov*); 48 per cent a competition chapter (*Comp prov*) and 48 per cent an investment chapter (*Inv prov*). Finally, 50 per cent of the country pairs have a bilateral investment treaty (*BIT*)[9] in place in 2014.

However, as shown in Table 3, provisions on services, investment and competition are highly collinear among themselves. To avoid any problem of multicollinearity, we group services, investment, and competition provisions into a deep integration variable or we include each provision as a stand-alone category in the specification (as in Dhingra et al., 2018).

Table 2. Share of each provision category in the bilateral dataset, 2000-2014

	2000	2005	2010	2014
PTA	0.51	0.57	0.58	0.61
Serv prov	0.34	0.45	0.47	0.51
Inv prov	0.15	0.34	0.41	0.48
Comp prov	0.33	0.39	0.41	0.48
Proc prov	0.28	0.45	0.47	0.50
SPS prov	0.47	0.53	0.55	0.59
TBT prov	0.45	0.53	0.55	0.59
IPR prov	0.16	0.38	0.44	0.51
BIT	0.46	0.48	0.50	0.50

Note: *Serv prov* denotes trade agreements including a substantive provision stipulating the liberalisation of trade in services; *Comp prov* including a competition chapter; and, *Inv prov* including an investment chapter within or beyond a services chapter. The other provision categories identify trade agreements containing concrete provisions on public procurement (*Proc prov*), a chapter or a provision on sanitary and phytosanitary measures (*SPS prov*) and technical barriers to trade (*TBT prov*). Finally, *IPR prov* denotes a trade agreement including a substantive provision on protecting intellectual property rights and *BIT* stays for bilateral investment treaties.

Table 3. Correlation matrix for PTA provisions, 2000-2014

	PTA	Serv prov	Inv prov	Comp prov	Proc prov	SPS prov	TBT prov	IPR prov
PTA	1.00							
Serv prov	0.77	1.00						
Inv prov	0.63	0.80	1.00					
Comp prov	0.71	0.91	0.88	1.00				
Proc prov	0.75	0.86	0.71	0.77	1.00			
SPS prov	0.93	0.83	0.67	0.76	0.80	1.00		
TBT prov	0.93	0.83	0.67	0.76	0.80	0.98	1.00	
IPR prov	0.67	0.75	0.83	0.72	0.75	0.72	0.72	1.00

[9] Data on bilateral investment treaties come from the World Trade Institute.

4. Results of the econometric analysis

4.1 Deep integration and MP of goods

We first look at the relationship between deep integration in PTAs and MP for goods, i.e. the impact of PTA provisions on the output of foreign affiliates in manufacturing industries. The main results are shown in Table 4, with a comparison between shallow integration (the impact of the PTA variable) and deep integration (the impact of services, investment and competition provisions, as well as other types of provisions going beyond trade liberalisation).

The econometric analysis starts with an OLS estimation of the gravity model with two-year interval data.[10] The empirical specification includes traditional gravity variables, such as distance, common language, contiguity and colonial ties. Two main findings of the OLS estimates reported in column (1) of Table 4 stand out. First, the estimates of the effects of the standard gravity variables indicate that higher trade costs negatively affect multinational production. This is consistent with a complementary relationship between trade and investment where for example FA activity requires importing intermediates from the home country or the output of affiliates is exported back. In this case, higher trade costs discourage fragmentation and affiliates' production. Second, the results suggest that PTAs play a negative role in promoting MP. One possible explanation is that this specification does not account properly for the potential endogeneity of PTAs.

To control for potential heteroscedasticity in MP data, column (2) estimates the same gravity specification with the PPML estimator. The estimates become non-significant, reinforcing the previous interpretation. To address the potential endogeneity of PTAs, we follow the gravity literature (Baier and Bergstrand, 2007) by including country-pair fixed effects. The PPML estimation results with pair fixed effects are reported in column (3). The coefficient of the PTA variable is statistically significant and positive and suggests that PTAs increase MP between parties by about 21 per cent[11].

Moreover, while BITs are expected to be a positive determinant of FDI, the coefficient of the BIT dummy is not significant. This is consistent with Osnago et al. (2015) who find BITs to be not significant in driving vertical FDI, as well as Baker (2012) who reports that BITs did not attract FDI after the mid-1990s. Moreover, BITs may influence more the volume of FDI than the activities of affiliates once established (i.e. multinational production). There is no good correlation between FDI (flows or stocks) and the sales of foreign affiliates (Beugelsdijk et al., 2010). We expect PTAs to have more impact on the operations of firms (after their establishment) due to provisions affecting the supply of inputs and domestic sales.

However, while country-pair fixed effects allow to control for potential omitted variable bias, the specification in column (3) does not properly account for possible 'reverse causality' between MP and PTAs. This issue arises because countries' participation in PTAs is not random. The more two countries are economically integrated, the greater the incentives to deepen their bilateral/regional agreements. Following Wooldridge (2010) and Baier and Bergstrand (2007), we add a new variable capturing the future level of PTAs, *PTA(t+2)*, to the specification in column (3) in order to assess the 'strict exogeneity' of PTAs. In column (4), the coefficient of the lead PTA variable is not significant, confirming that PTAs are exogenous to multinational production.

Column (5) addresses the possibility that the effects of PTAs change over time. As suggested in Baier and Bergstrand (2007), the entire economic effect of PTAs on trade cannot be fully captured in the current year. In Table 4, the estimated coefficient of the lagged PTA variable is not significant, suggesting that there is no phasing-in effect of PTA on MP of goods.

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[10] The results for 4-year intervals are in the Appendix.

[11] The coefficients (β) in the PPML regressions are interpreted as ($e^{\beta}-1$) percent change in multinational production.

Column (6) shows the interaction between the PTA and EU dummy to test whether the relationship is different for EU countries. The coefficient of the EU dummy is not significant, indicating that the PTA average effect on MP does not differ between intra-EU and extra-EU MP. We believe EU enlargement agreements to be different from other PTAs for two reasons. First, these agreements create free movement of capital and people and are not comparable with the provisions found in traditional PTAs signed between countries that offer preferential treatment but have no intention to fully integrate their markets. Second, enlargement agreements set up a progressive liberalisation based on how ready the country is to join the EU. As a result, they are anticipated by Stabilisation and Accession agreements years before the official accession, already reducing the uncertainty affecting MNE decisions.

The results for the PTA variable with additional robustness checks indicate that having a PTA (shallow integration) has a positive impact on MP of goods. To test the impact of deep components of trade agreements, we then include all the dummy variables accounting for agreements including services, competition, investment, procurement and intellectual property rights provisions. Column (7) in Table 4 shows that the coefficients of these dummies are not significant. Since the specification controls for the existence of a PTA, it means that for FA output in manufacturing industries, the deep provisions do not lead to an additional positive impact on MP.

Table 4. PTAs effects on MP of goods

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	PPML	ENDG	LEAD	PHSNG	EU	DEEP
VARIABLES	FA output	FA output	FA output	FA output	FA output	FA output	FA output
Contiguity	0.910***	0.0864					
	(0.163)	(0.0606)					
Common language	0.231*	0.400***					
	(0.137)	(0.0662)					
Log distance	-0.852***	-0.533***					
	(0.0645)	(0.0416)					
Colony	0.414**	0.206***					
	(0.170)	(0.0586)					
PTA	-0.185*	-0.0555	0.190**	0.168*	0.195**	0.189**	0.185**
	(0.0963)	(0.0955)	(0.0942)	(0.0888)	(0.0898)	(0.0945)	(0.0826)
BIT	-0.0253	0.183**	-0.163	-0.163	-0.163	-0.163	-0.164
	(0.0717)	(0.0714)	(0.118)	(0.116)	(0.118)	(0.118)	(0.117)
PTA(t+2)				0.0575			
				(0.0556)			
PTA(t-2)					-0.00972		
					(0.0574)		
PTA*EU						0.239	
						(0.345)	
Srv&Cmp&Inv							-0.0252
							(0.0970)
Proc prov							0.126
							(0.113)
IPR prov							-0.0522
							(0.0858)
Observations	12,108	13,120	13,112	13,112	13,112	13,112	13,112
R-squared	0.804	0.839	0.982	0.982	0.982	0.982	0.982
Host-year FE	YES	YES	YES	YES	YES	YES	YES
Partner-year FE	YES	YES	YES	YES	YES	YES	YES
Country-pair FE	NO	NO	YES	YES	YES	YES	YES

Note: All estimates are obtained with data for the years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014, and use partner-time and host-time fixed effects. Column (1) applies the OLS estimator and column (2) uses the PPML estimator. Column (3) adds country-pair fixed effects. Column (4) introduces PTA lead. Column (5) allows for phasing-in effects of PTAs. Column (6) accounts for the effect of deep provisions. Finally, column (7) includes an interaction between deep agreements and a dummy for EU Member countries. Standard errors are clustered by country-pair and are reported in parentheses. The p-values read as follow: *** p<0.01, ** p<0.05, * p<0.1.

4.2 Mechanisms at work

The results from Table 4 suggest that FA activity in the manufacturing sector benefits from tariff liberalisation but not from provisions on services, competition and investment, i.e. that shallow integration has an impact rather than deep integration. One explanation could be that what is characterised as 'shallow integration' has perhaps more to offer to companies in the manufacturing sector than deep integration provisions. Tariff provisions reduce trade costs through the abolition of tariffs or preferential rates on the manufacturing inputs that are used by foreign affiliates producing goods. Conversely, the services provisions are legal commitments that may not actually liberalise trade. In the trade literature, these provisions are nonetheless found to have a positive impact by reducing the policy uncertainty for exporters (Lamprecht and Miroudot, 2018). But the impact could be lower than the tariff reductions. Moreover, the impact of PTAs may be different when foreign affiliates rely on imported intermediates to serve foreign demand (i.e. market-seeking MP) or when multinationals fragment their production processes internationally (efficiency-seeking MP). We test for these hypotheses in two ways: first, we decompose FA production in intermediates versus final goods and domestically sold versus exported output; second, we look at the effect of PTAs on value-added measures of MP.

Looking at Table 5, the first important finding is that shallow PTAs increase MP of goods for the foreign affiliates that serve the final demand, either by exporting or selling domestically final goods. This suggests that signing a shallow PTA positively affects demand-seeking MP through lowering the costs of importing intermediate inputs and exporting final products to the parties of the PTA. A second finding is that deep provisions do not seem to have any impact on MP of goods all across the different types of goods and activities of affiliates. The only significant coefficient in the analysis is negative for the impact of services, investment and competition provisions on FA producing final products that are exported. The core tariff provisions are maybe more important for manufacturing affiliates despite the important use of services inputs in the value chain.

Table 5. PTA effects on MP of goods: further results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ENDG	DEEP	ENDG	DEEP	ENDG	DEEP	ENDG	DEEP
VARIABLES	FA dom int	FA dom int	FA dom fin	FA dom fin	FA exp int	FA exp int	FA exp fin	FA exp fin
PTA	0.206	0.213*	0.331***	0.485***	0.155**	0.179*	0.198***	0.317**
	(0.126)	(0.125)	(0.119)	(0.168)	(0.0732)	(0.102)	(0.0609)	(0.127)
Srv&Cmp&Inv		-0.116		-0.268		0.0171		-0.260*
		(0.184)		(0.219)		(0.156)		(0.140)
Proc prov		0.224		0.214		-0.0688		0.0108
		(0.143)		(0.153)		(0.118)		(0.109)
IPR prov		-0.0193		-0.0252		-0.00935		0.144
		(0.138)		(0.169)		(0.122)		(0.107)
BIT	-0.122	-0.124	-0.355*	-0.358*	-0.128	-0.127	-0.175	-0.177
	(0.126)	(0.124)	(0.211)	(0.209)	(0.105)	(0.105)	(0.133)	(0.131)
Observations	13,112	13,112	13,104	13,104	13,112	13,112	13,112	13,112
R-squared	0.984	0.985	0.980	0.980	0.975	0.975	0.977	0.977
Host-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Partner-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Country-pair	YES	YES	YES	YES	YES	YES	YES	YES

Note: All estimates are obtained with data for the years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014, and use partner-time, host-time and country-pair fixed effects. Column "DEEP" accounts for the effect of deep provisions. Standard errors are clustered by country-pair and are reported in parentheses. The p-values read as follow: *** p<0.01, ** p<0.05, * p<0.1.

Finally, we assess the importance of deep provisions for FA participation in global value chains, by focusing on the 'foreign value added' (FVA) component of FA domestic output and exports. This means that we decompose the output or exports of foreign affiliates and look at the origin of value-added, identifying whether it is domestic or foreign. The dependent variable is then only the foreign value-added which is embodied in the foreign intermediate inputs used by the foreign affiliates. Table 6 shows that shallow PTAs have a positive and significant impact on the FVA components of FA activity. This confirms that PTAs help foreign affiliates importing intermediate inputs to serve their domestic and export markets.

Table 6. PTA effects on the foreign value-added in the output of foreign affiliates

	(1)	(2)	(3)	(4)
	ENDG	DEEP	ENDG	DEEP
VARIABLES	FVA in FA dom	FVA in FA dom	FVA in FA exp	FVA in FA exp
PTA	0.252**	0.377***	0.167**	0.248**
	(0.112)	(0.140)	(0.0674)	(0.110)
Srv&Cmp&Inv		-0.232		-0.103
		(0.184)		(0.128)
Proc prov		0.0922		-0.140
		(0.137)		(0.103)
IPR prov		0.0567		0.110
		(0.144)		(0.103)
BIT	-0.165	-0.172	-0.152*	-0.151*
	(0.127)	(0.127)	(0.0887)	(0.0897)
Observations	13,112	13,112	13,112	13,112
R-squared	0.971	0.971	0.973	0.973
Host-year FE	YES	YES	YES	YES
Partner-year FE	YES	YES	YES	YES
Country-pair	YES	YES	YES	YES

Note: All estimates are obtained with data for the years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014, and use partner-time, host-time and country-pair fixed effects. Column "DEEP" accounts for the effect of deep provisions. Standard errors are clustered by country-pair and are reported in parentheses. The p-values read as follow: *** p<0.01, ** p<0.05, * p<0.1.

4.3 Deep integration and MP of services

So far, we have only looked at the impact of MP on FA operating in the manufacturing sector. We now turn to the impact of deep and shallow integration on MP of services. Table 7 includes similar specifications to the ones provided in Table 4 but this time the dependent variable is the output of services FAs.

Table 7. PTA effects on MP of services

VARIABLES	(1) OLS FA output	(2) PPML FA output	(3) ENDG FA output	(4) LEAD FA output	(5) PHSNG FA output	(6) EU FA output	(7) DEEP FA output
Contiguity	0.834***	0.206***					
	(0.172)	(0.0534)					
Common language	0.344**	0.382***					
	(0.158)	(0.0531)					
Log distance	-0.927***	-0.386***					
	(0.0782)	(0.0320)					
Colony	0.556***	0.213***					
	(0.187)	(0.0488)					
PTA	-0.279**	0.0938	0.166**	0.150*	0.0970	0.169**	0.238*
	(0.129)	(0.0605)	(0.0780)	(0.0769)	(0.0904)	(0.0788)	(0.129)
BIT	-0.177**	-0.0675	0.195	0.193	0.202	0.195	0.194
	(0.0886)	(0.0574)	(0.171)	(0.171)	(0.171)	(0.171)	(0.174)
PTA(t+2)				0.0356			
				(0.0512)			
PTA(t-2)					0.112		
					(0.0777)		
PTA*EU						-0.279	
						(0.416)	
Srv&Cmp&Inv							-0.314*
							(0.169)
Proc prov							0.101
							(0.165)
IPR prov							0.142
							(0.155)
Observations	12,439	13,120	13,080	13,080	13,080	13,080	13,080
R-squared	0.706	0.878	0.972	0.972	0.973	0.972	0.973
Host-year FE	YES	YES	YES	YES	YES	YES	YES
Partner-year FE	YES	YES	YES	YES	YES	YES	YES
Country-pair FE	NO	NO	YES	YES	YES	YES	YES

Note: All estimates are obtained with data for the years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014, and use partner-time and host-time fixed effects. Column (1) applies the OLS estimator and column (2) uses the PPML estimator. Column (3) adds country-pair fixed effects. Column (4) introduces PTA lead. Column (5) allows for phasing-in effects of PTAs. Column (6) accounts for the effect of deep agreements. Finally, column (7) includes an interaction between deep agreements and a dummy for EU members. Standard errors are clustered by country-pair and are reported in parentheses. The p-values read as follow: *** p<0.01, ** p<0.05, * p<0.1.

Table 7 indicates that for MP of services, there is also a positive effect of shallow trade agreements. But in contrast to the results for manufacturing affiliates, there is now a significant negative coefficient for the effect of services, investment and competition provisions. To better understand this result, we deepen our analysis in two ways. First, we introduce lagged variables for the deep integration provisions to test whether the impact depends on the time at which we are trying to observe it. Second, we investigate the heterogeneous effect of deep agreements by type of provision.

Table 8 is based on the specification used in column (7) of Table 7. The most interesting finding is that the coefficients for the deep integration variables become positive and significant when the variables are lagged by two years. This implies that it takes two years for deep agreements to increase MP of services, which is consistent with the evidence that reforms of behind-the-border measures take time to be implemented (Mattoo, Mulabdic and Ruta, 2017).

This result is observed for the *Srv&Cmp&Inv* variable but also when introducing separately dummy variables for the three types of provisions: services, investment and competition. Investment provisions are those driving the negative and significant coefficient for the current year deep integration dummy. Maybe because of the possible substitution between trade and investment, investment provisions are first having a negative impact on MP of services with firms being able to export rather than producing through foreign affiliates. But then there could be a positive impact once firms have had sufficient time to establish and start to produce due to the investment liberalisation.

The fact that we observe positive and significant coefficients (with a lag) for MP of services and not for goods is consistent with the fact that many of the barriers to foreign investment and FA activity, such as foreign equity limits, discriminatory licensing conditions applying to foreign investors or the non-recognition of qualifications earned abroad, are found in services sectors.

In addition, while services, investment and competition provisions have a positive impact on MP of services after two years, the effect of 'shallow' agreements loses significance and magnitude in the specifications with only services and competition dummies.

Table 8. PTA effects on MP of services: further results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ENDG	ENDG	DEEP	DEEP	DEEP	DEEP	DEEP	DEEP
VARIABLES	FA output	FA output	FA output	FA output	FA output	FA output	FA output	FA output
PTA	0.329**	0.325**	0.0274	0.0149	-0.0734	-0.0936	0.328**	0.323**
	(0.142)	(0.140)	(0.0928)	(0.0957)	(0.217)	(0.215)	(0.142)	(0.140)
Srv&Cmp&Inv	-0.204	-0.310*						
	(0.167)	(0.182)						
Srv&Cmp&Inv(t-2)		0.172**						
		(0.0716)						
BIT	0.194	0.203	0.194	0.202	0.188	0.193	0.194	0.203
	(0.176)	(0.173)	(0.168)	(0.165)	(0.165)	(0.162)	(0.176)	(0.173)
Serv prov			0.175*	0.0816				
			(0.103)	(0.106)				
Serv prov(t-2)				0.172***				
				(0.0649)				
Comp prov					0.262	0.193		
					(0.237)	(0.241)		
Comp prov(t-2)						0.139**		
						(0.0642)		
Invest prov							-0.202	-0.308*
							(0.166)	(0.182)
Inv prov(t-2)								0.172**
								(0.0716)
Observations	13,080	13,080	13,080	13,080	13,080	13,080	13,080	13,080
R-squared	0.972	0.973	0.972	0.973	0.972	0.973	0.972	0.973
Host-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Partner-year FE	YES	YES	YES	YES	YES	YES	YES	YES
Country-pair	YES	YES	YES	YES	YES	YES	YES	YES

Note: All estimates are obtained with data for the years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014, and use partner-time, host-time and country-pair fixed effects. Column "DEEP" accounts for the effect of deep provisions. Standard errors are clustered by country-pair and are reported in parentheses. The p-values read as follow: *** p<0.01, ** p<0.05, * p<0.1.

5. Concluding remarks

This paper has investigated the impact of deep integration provisions in PTAs on MP of goods and services. The results suggest that unlike what is observed for (cross-border) trade, deep integration PTAs have mixed effects on the output of foreign affiliates. On the one hand, we find that shallow integration (or tariff liberation) has a positive impact on MP of goods with no additional effects from deep integration provisions. On the other hand, we find that deep integration provisions impact MP of services, but with a lag.

These results are not surprising since trade and investment are in a complex relationship, sometimes acting as substitutes and sometimes being complements. Also, firms create foreign affiliates for different purposes, not all of which can benefit from deep integration provisions.

Therefore, the analysis of the impact of PTA provisions on MP may have to depart from the shallow/deep integration dichotomy introduced for the trade impact of PTAs. While it makes sense to refer to a shallow and deep integration when only the latter has a positive and significant impact on trade, new categories will have to emerge to describe the types of provisions that benefit MP, especially if what is 'shallow' has more of an impact than what is 'deep'.

An area where our results are however promising and can lead to further research is that the value-added decomposition of the output of foreign affiliates can help to identify where the trade provisions of PTAs matter and to distinguish different types of motives for MP. Further analysis could investigate how different types of sourcing strategies and participation in international production networks are impacted by PTA provisions.

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Appendix

Table A1. 4-year intervals: MP of goods

VARIABLES	(1) OLS FA output	(2) PPML FA output	(3) ENDG FA output	(4) LEAD FA output	(5) PHSNG FA output	(6) EU FA output	(7) DEEP FA output
Contiguity	0.895***	0.0968					
	(0.166)	(0.0875)					
Common language	0.235*	0.439***					
	(0.141)	(0.0928)					
Log distance	-0.882***	-0.556***					
	(0.0646)	(0.0541)					
Colony	0.383**	0.173**					
	(0.173)	(0.0793)					
PTA	-0.205**	-0.148	0.163*	0.168*	0.177**	0.161*	0.125
	(0.0988)	(0.119)	(0.0944)	(0.0932)	(0.0895)	(0.0950)	(0.131)
BIT	-0.0287	0.156	-0.205*	-0.200*	-0.203*	-0.205*	-0.204*
	(0.0748)	(0.106)	(0.122)	(0.118)	(0.120)	(0.122)	(0.122)
RTA(t+4)				0.0852*			
				(0.0495)			
RTA(t-4)					-0.0910		
					(0.0790)		
RTA*EU						0.327	
						(0.369)	
Srv&Cmp&Inv							0.0604
							(0.175)
Proc prov							0.0733
							(0.121)
IPR prov							-0.0857
							(0.150)
Observations	6,063	6,560	6,552	6,552	6,552	6,552	6,552
R-squared	0.802	0.833	0.985	0.985	0.985	0.985	0.985
Host-year FE	YES	YES	YES	YES	YES	YES	YES
Partner-year FE	YES	YES	YES	YES	YES	YES	YES
Country-pair FE	NO	NO	YES	YES	YES	YES	YES

Note: All estimates are obtained with data for the years 2000, 2004, 2008 and 2012, and use partner-time and host-time fixed effects. Column (1) applies the OLS estimator and column (2) uses the PPML estimator. Column (3) adds country-pair fixed effects. Column (4) introduces PTA lead. Column (5) allows for phasing-in effects of PTAs. Column (6) accounts for the effect of deep provisions. Finally, column (7) includes an interaction between deep agreements and a dummy for EU Member countries. Standard errors are clustered by country-pair and are reported in parentheses. The p-values read as follow: *** p<0.01, ** p<0.05, * p<0.1.

Table A2. 4-year intervals: MP of services

VARIABLES	(1) OLS FA output	(2) PPML FA output	(3) ENDG FA output	(4) LEAD FA output	(5) PHSNG FA output	(6) EU FA output	(7) DEEP FA output
Contiguity	0.840***	0.207***					
	(0.170)	(0.0767)					
Common language	0.340**	0.351***					
	(0.160)	(0.0755)					
Log distance	-0.909***	-0.392***					
	(0.0801)	(0.0454)					
Colony	0.605***	0.262***					
	(0.186)	(0.0690)					
PTA	-0.285**	0.108	0.184*	0.185*	0.154	0.194*	0.210
	(0.138)	(0.0910)	(0.101)	(0.100)	(0.109)	(0.103)	(0.183)
BIT	-0.224**	-0.0645	0.257	0.256	0.268	0.256	0.261
	(0.0933)	(0.0804)	(0.201)	(0.201)	(0.200)	(0.202)	(0.204)
RTA(t+4)				0.0103			
				(0.0618)			
RTA(t-4)					0.139		
					(0.0890)		
RTA*EU						-0.704	
						(0.490)	
Srv&Cmp&Inv							-0.313
							(0.243)
Proc prov							0.295
							(0.229)
IPR prov							0.0379
							(0.230)
Observations	6,219	6,560	6,536	6,536	6,536	6,536	6,536
R-squared	0.698	0.880	0.974	0.974	0.974	0.974	0.974
Host-year FE	YES	YES	YES	YES	YES	YES	YES
Partner-year FE	YES	YES	YES	YES	YES	YES	YES
Country-pair FE	NO	NO	YES	YES	YES	YES	YES

Note: All estimates are obtained with data for the years 2000, 2004, 2008 and 2012, and use partner-time and host-time fixed effects. Column (1) applies the OLS estimator and column (2) uses the PPML estimator. Column (3) adds country-pair fixed effects. Column (4) introduces PTA lead. Column (5) allows for phasing-in effects of PTAs. Column (6) accounts for the effect of deep provisions. Finally, column (7) includes an interaction between deep agreements and a dummy for EU Member countries. Standard errors are clustered by country-pair and are reported in parentheses. The p-values read as follow: *** p<0.01, ** p<0.05, * p<0.1.

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