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Multinational production and investment provisions in preferential trade agreements

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Abstract

Using a novel database on multinational production (MP), this article investigates the impact of preferential trade agreements on foreign affiliates' production activities. We find that trade agreements with investment provisions have a positive effect on MP. On average, signing an agreement including investment provisions is associated with increased MP up to 26% in the manufacturing sector and 34% in the services sector. Our findings suggest that investment provisions increase MP by facilitating multinationals operations in foreign markets, especially for activities requiring the proximity of suppliers and consumers, and by helping multinationals joining global value chains.

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1. Introduction

What is the impact of trade agreements on the activities of multinational enterprises (MNEs)? How does the accession of countries to regional trade agreements affect MNEs' decision to set up affiliates and produce in global value chains (GVCs)? These crucial questions have not received sufficient attention in the literature on preferential trade agreements (PTAs). The empirical literature on PTAs and GVCs has focused mostly on the impact on trade flows, paying less heed to the effect of PTAs on investment patterns of MNEs and the output of their foreign affiliates.

MNEs are fundamental players in today's global economy, coordinating trade and GVCs. Currently, MNEs and their network of foreign affiliates account for almost two-thirds of world exports, leaving only one-third for independent firms not involved in multinational production (MP).[1] In particular, foreign affiliates have a disproportionate role, being responsible for 30% of global exports. Moreover, MNEs' foreign affiliates play a vital part in trading services cross-border, especially for services requiring the proximity

1 Figures based on the OECD Analytical AMNE database for the year 2016.

of suppliers and consumers (Christen and Francois, 2017).[2] However, despite the economic importance of MNEs, empirical evidence on the impact of PTAs on MNEs is scarce since data on MNE activities are only available for a subset of countries.

This article investigates the impact of PTAs on MP, defined as the production carried out by firms outside of their country of origin (Ramondo et al., 2015). MP involves foreign direct investment (FDI) as firms need to establish affiliates in order to produce or sell abroad. MP is part of a global strategy where MNEs decide from which countries they source inputs, in which countries they produce and which markets they serve (Bernard et al., 2018). As such, PTAs that are 'deep', covering not only trade liberalisation for goods but also services, investment, competition, intellectual property and a variety of other regulatory issues, are expected to have an impact on MP. As described by Baldwin (2011), 21st-century regionalism is less about tariff preferences and more about governing the whole trade-investment-IP-service nexus. In particular, this article focuses on the impact on MP of trade agreements that include investment provisions. While representing one of the fastest growing type of provision covered in PTAs, investment provisions aim at giving access to MNEs to foreign markets and facilitating their operations. These provisions give the right to MNEs to create foreign affiliates, reduce the cost of establishment (similarly to tariff reductions for trade costs), protect foreign investment and ensure national treatment (i.e. non-discriminatory treatment post-establishment).

Our empirical analysis relies on a novel bilateral dataset with information on foreign affiliates' output for a comprehensive set of countries and industries. This dataset also includes inter-country input-output (ICIO) tables split according to firm ownership. These tables enable to discern the type of activities that foreign affiliates perform. Thanks to the granularity of our data, this article makes four empirical contributions. First, using a structural gravity model and the variation in the membership and timing of trade agreements, we investigate the extent to which PTAs affect foreign affiliate production. Secondly, we distinguish between foreign affiliates operating in the manufacturing and service sectors. Due to the paucity of services data, the majority of research on the impact of trade agreements looks at trade in goods; only few recent papers examine trade in services, leaving much to be discovered about the effect of PTAs on MP of services. Thirdly, we look at the heterogeneous effect of investment provisions in PTAs using a novel categorisation of foreign affiliates' activities based on our input-output tables split according to ownership. Fourthly, we test two mechanisms at play behind the relationship between investment provisions and MP by looking at whether the impact of investment provisions is stronger for industries that are highly fragmented internationally and require proximity between suppliers and consumers.

We find that trade agreements with investment provisions seem to have a large and positive impact on MP. On average, signing a deep agreement is associated with increased MP up to 26% in the manufacturing sector and 34% in the service sector. The fact that the effect is stronger for MP of services than of goods may be consistent with the nature of services that may require production to be closer to final consumers. Moreover, our results show that the entire economic effect of investment provisions cannot be fully captured in a single year. It takes on average at least 2 years for PTAs with such provisions to increase MP of goods and services. To rule out that our results are primarily driven by omitted

2 In the General Agreement on Trade in Services, MP in services is described as Mode 3 trade in services, that is, trade through 'commercial presence'. According to Andrenelli et al. (2018), the ratio of Mode 3 to cross-border trade in services (in gross terms) is above 1 for most countries, making MP of services the most prevalent mode to trade services.

variables, we follow the gravity literature by including country-pair fixed effects (Baier and Bergstrand, 2007). In addition, we control for the presence of other provisions in trade agreements and bilateral investment treaties (BITs). To test for the presence of reverse causality (i.e. countries with higher MP signing PTAs with investment provisions), we include lead variables to capture future levels of investment provisions, providing with an informal test for the 'strict exogeneity' of investment provisions (Bergstrand et al., 2015). We also run a falsification test randomising the allocation of investment provisions across country pairs with a trade agreement. Finally, we propose an original instrument for investment provisions to account for both a potential omitted variable and reverse causality problem. Our combined evidence is consistent with the importance of investment provisions in driving MP of goods and services, and no other factors seem to be driving our results.

We also explore possible mechanisms at play behind the observed positive relationship between investment provisions and MP. To provide further evidence that the proximity of suppliers and consumers matters in explaining this relationship, we study how the impact of investment provisions on MP varies with the necessity of working directly with the public. We find that the effect of investment provisions on MP is stronger for industries where working with the public is more important. This result suggests that one channel through which investment provisions help increase MP entails facilitating multinationals' activities in industries where a commercial presence (i.e. establishment) is crucial. This novel finding, combined with the fact that working directly with the public is twice more important for services than manufacturing, confirms our conjecture that investment provisions facilitate MP, especially in the services sector.

In addition, we provide evidence consistent with the prominent narrative that deep agreements facilitate countries' participation in GVCs. First, we find that the effect of investment provisions is stronger for foreign affiliates engaged in exporting activities, hinting at a complementary relationship between trade and MP. The combination of trade and investment provisions in PTAs, providing both lower operational costs for foreign affiliates and lower trade costs for their imports and exports, could explain the positive impact of deep agreements.[3] Secondly, we study how the impact of investment provisions on MP varies with an industry measure of the fragmentation of production in GVCs. This analysis is motivated by the recent body of literature showing the crucial role of deep agreements in increasing trade in GVCs (Mattoo et al., 2017; Lee, 2019; Dhingra et al., 2021). We find that investment provisions tend to increase MP, particularly for industries that are more fragmented internationally. This finding suggests that including investment provisions in trade agreements may facilitate countries' participation in GVCs.

This article is related to two strands of literature. First, recent empirical work has examined the relationship between PTAs and MNEs (among others, Baltagi et al., 2008; Blanchard and Matschke, 2015; Osnago et al., 2019; Kox and Rojas-Romagosa, 2020). Overall, these studies show that trade and investment agreements affect and are affected by FDI/offshoring. However, while FDI data have the advantage of being largely available since they are collected in the Balance of Payments, a number of significant shortcomings

3 This finding is consistent with several theoretical frameworks present in the literature. One example is the 'knowledge-capital' model of MNEs introduced by Bergstrand and Egger (2007). In the model of Kleinert and Toubal (2010), which incorporates intermediate inputs trade into the proximity-concentration model, trade costs negatively affect the volume of foreign affiliates' sales when intermediate inputs are imported from the parent country. The model of Ito (2013) also implies that firms will choose export-platform FDI over other types of FDI when trade costs are decreasing and the costs of fragmenting production are low.

arise when using these data to analyse the economic activities of MNEs. Because of differences in concepts and statistics, FDI data represent a biased measure of foreign affiliate activity (Beugelsdijk et al., 2010; Ali-Yrkko and Leino, 2014; Blanchard and Acalin, 2016; Cadestin et al., 2018b).[4] As a result, some recent works have assembled bilateral datasets on MP (Fukui and Lakatos, 2012; Ramondo et al., 2015; Federico, 2016; Alviarez, 2019). We contribute to this literature by developing a dataset on MP which provides a comprehensive coverage of the manufacturing and services sector for a wide set of countries. Moreover, we are the first to use input-output tables split according to ownership to account for differences in sourcing strategies and input mix between foreign- and domestic-owned firms. Finally, for the first time we use intra-national production to shed light on the diversion effects of PTAs from domestic- to foreign-owned firms.

Secondly, a large body of empirical research finds a positive impact of PTAs on trade flows, especially in the long-run (Baier and Bergstrand, 2007; Bergstrand et al., 2015). In particular, although some recent empirical papers have looked at the impact of deep trade agreements on GVCs, their focus is on trade flows related to international production networks and not on production by foreign-owned firms. This literature has documented several interesting facts. In the first place, deep agreements have a larger impact on trade flows than shallow PTAs (Orefice and Rocha, 2014; Mattoo et al., 2017; Mulabdic et al., 2017). Next, the effect is stronger for intermediate inputs trade and for trade in services (Lee, 2019; Dhingra et al., 2021). Our article complements this literature by looking at the impact on MP and focusing on the role of PTAs with investment provisions, which are expected to have the most influence on MNEs' investment and activity abroad.

The rest of the article is organised as follows. Section 2 provides a conceptual framework to analyse the impact of deep agreements on MP. The data are described in Section 3 and the empirical strategy in Section 4. Section 5 discusses the relationship between investment provisions and MP of goods and services. In particular, we explore the heterogeneous effect of investment provisions across types of MP and industries. The final section offers our conclusions.

2. Conceptual framework

The basic question that the article addresses is how PTAs and their investment provisions can affect the location and production of foreign affiliates. The answer is not straightforward as it depends on the nature of the activity performed by the foreign affiliates and the interaction between trade and investment provisions included in the agreement.

The first key distinction concerns the types of foreign affiliate activity. Theories of FDI traditionally differentiate between horizontal and vertical FDI. Horizontal FDI is motivated by the desire to place production close to customers and avoid trade costs. In this framework, trade and investment are generally regarded as substitutes, directly related to the trade-off between proximity and concentration (Brainard, 1997). When trade barriers are

4 First, FDI statistics provide information on cross-border capital flows that may eventually be sent to other countries without contributing at all to the local economy. This problem is especially the case for so-called special purpose entities (SPEs), which function as a sort of central bank within MNE groups. A large presence of these SPEs in a country typically results in high FDI flows reported for that country without the corresponding economic effects. Accordingly, recent initiatives have been taken to collect and present FDI data without SPEs. Second, FDI only measures part of what foreign affiliates use to finance their activities and excludes the often substantial amount they raise from local sources. Third, as FDI is a financial input, hence excluding the contribution of labour, FDI stocks underestimate MNE activity in countries where labour is relatively more productive.

high, it is more profitable for firms to produce directly in the consumers' market through FDI. But by doing so, firms lose the advantage of concentration, which is related to lower costs when producing in one location (scale economies) and exporting products to all consuming countries.

While horizontal FDI can be thought of as market-seeking, vertical FDI can be thought of as efficiency-seeking (Markusen, 2004). In other words, for vertical FDI the location of production depends more on the local production costs than trade costs. In general, the proliferation of GVCs and the internationalisation of supply chains can be seen as evidence of vertical FDI, where trade and investment are complements instead of substitutes. Nevertheless, when there are large reductions both in trade and investment costs, foreign affiliates can manufacture products for final consumers in the host economy while simultaneously trading within vertical supply chains. Some recent evidence supports this latter view, showing that the reality of MNEs has become more complex than the horizontal-vertical dichotomy: most MNEs are engaged both in horizontal and vertical investments abroad (Alfaro and Charlton, 2009), and most foreign affiliates have both horizontal and vertical characteristics (Baldwin and Okubo, 2012; Herger and McCorriston, 2016; Ray, 2016). The theoretical literature has incorporated these insights into traditional models of FDI. For instance, Kleinert and Toubal (2010) show that adding intermediate inputs into Brainard's (1997) model leads to opposite predictions. In this model, trade costs affect negatively the volume of foreign affiliates' sales when production requires intermediates, assuming that they must be partly imported from the home country.

To account for these developments and clarify the possible mechanisms at play in the relationship between PTAs and MP, we define four categories of activities of foreign affiliates based on the information available in our dataset, that is, the destination and type of output produced:

- *Horizontal MP*: foreign affiliate production of final products sold to the domestic market;
- *Vertical MP*: foreign affiliates exporting intermediate inputs for production activities in other countries;
- *Export-platform MP*: foreign affiliates exporting final products to foreign consumers; and
- *Domestic MP*: foreign affiliate production of intermediate inputs sold to the domestic market.

Since we have no information on bilateral imports of intermediates, we cannot fully identify the vertical specialisation of foreign affiliates. Nevertheless, *Vertical MP* and *Domestic MP* are measures related to the fragmentation of the production process: *Vertical MP* indicates production by foreign affiliates participating in international supply chains, while *Domestic MP* includes foreign affiliates participating in domestic supply chains.[5] Conversely, *Horizontal MP* and *Export-platform MP* represent foreign affiliates that take the products/services forward towards the customers, whether in the domestic market or in foreign markets.

The type of activity matters for the analysis of PTAs as trade and investment are more likely to be complements in the context of the fragmentation of production and substitutes

5 For more information on the involvement of foreign-owned companies in domestic value chains, see Cadestin et al. (2019).

when the proximity with consumers is the objective of MP.[6] Disentangling the destination market of MP is also critical, as some PTAs are attractive because they open a large domestic market to foreign MNEs, while other PTAs can potentially offer access to markets in third countries in the context of export-platform FDI (Ekholm et al., 2007). The latter would have a higher impact on the intensive margin of MP rather than its extensive margin (since trade flows then replace MP).[7]

The second key distinction concerns the nature of the interaction between trade and investment provisions in PTAs. PTAs limited to trade in goods (and described as 'shallow') entail a reciprocal reduction in tariffs that are usually modelled in the literature as a symmetric trade liberalisation among the members of the agreement. Such PTAs may affect MP, though their impact is ambiguous. As shown in Kleinert and Toubal (2010), we expect shallow PTAs to have a positive impact on foreign affiliates importing goods from home through the abolition of tariffs or preferential rates on the imported inputs or final products. In contrast, the effect should be negative when trade liberalisation incentives trade rather than FDI as predicted by the proximity-concentration model.

When PTAs start to include provisions on investment and a broader set of policies in the context of offshoring and GVCs, the nature of the problem they solve goes beyond market access (Antràs and Staiger, 2012). Overall, we would expect deep trade agreements to have an ambiguous impact on MP of goods. PTAs not only have provisions on the establishment of foreign firms similar to market access but also add provisions on investment protection and national treatment (Lesher and Miroudot, 2006; Kotschwar, 2009; Chornyi et al., 2016). Such provisions (which are defined as investment provisions in our empirical analysis) are expected to have a positive impact on MNEs' investment decisions and activities abroad, particularly when their enforcement is warranted by specific mechanisms, such as an investor-state dispute settlement. Other deep provisions may increase or decrease MP, depending on whether they improve the attractiveness of producing via foreign affiliates rather than trading at arm's length. For instance, Osnago et al. (2019) show that deep provisions in PTAs may increase or decrease vertical FDI, depending on whether they improve the contractibility of intermediate inputs or headquarter services, with the former increasing and the latter reducing vertical FDI. Ultimately, the verdict on what forces dominate is empirical and will crucially depend on the content of the trade agreements.

In the case of services, we expect a positive relationship between trade agreements and MP for two reasons. First, some services are difficult to provide cross-border and require the proximity of suppliers and consumers (Christen and Francois, 2017). PTAs with investment provisions (or services provisions covering trade through a commercial presence) should have a large impact on the supply of such services since no proximity-concentration trade-off is at play for these activities. Secondly, while provisions covering cross-border trade in services may incentivise trade rather than MP, those provisions consist of legal bindings and do not remove trade barriers on a preferential basis (Sauvé and Shingal, 2011). While these legal bindings can have a positive impact on trade by reducing uncertainty in the trade regime, they are not comparable to tariff reductions for trade in goods; consequently, they should play a minor role in affecting MP.

6 We further investigate these channels in Section 5.3 by examining differences across industries in terms of fragmentation of production and proximity to consumers.

7 It should be noted, however, that our categories focus on post-establishment foreign affiliate activity rather than the MNE's decision to set up a foreign affiliate, as our dataset (which is not at the firm level) does not allow distinguishing the extensive margin from the intensive margin of MP.

3. Data

3.1. MP

Our analysis relies on two novel databases on MP.[8] The first is a bilateral database on MP, with data harmonised across countries and made consistent with national accounts. The dataset covers the period 2000–2014 and builds on the OECD AMNEs statistics and the World Input-Output Database (WIOD). This bilateral database on MP covers 41 countries, accounting for more than 85% of world GDP and 43 industries (across the primary, manufacturing and services sectors).[9] Each observation in the database provides information about the gross output (in US$) of foreign affiliates in a host country i, operating in an industry k, controlled by a partner country j.[10] Our dataset also includes the output of domestic-owned firms, information that we use to account for intra-national production.

Secondly, we split ICIO tables (from WIOD) according to ownership, disentangling the contribution to trade and output of domestic- and foreign-owned firms. This allows us to decompose MP in foreign affiliate production of intermediate inputs and final products and in production sold domestically and exported. Splitting the ICIO according to ownership helps account for the heterogeneity among firms regarding their sourcing strategies. In traditional ICIOs, foreign- and domestic-owned firms share the same production function and rely on the same mix of inputs. However, important differences exist in the way these two types of firms use foreign and domestic inputs. For example, Koopman et al. (2008) find much lower ratios of domestic value added in the exports of foreign-owned firms in China.

Since 2000, FA activity has been rapidly increasing, reaching almost 20 trillion US dollars in 2014.[11] Table 1 disaggregates the type of MP into output sold domestically and output exported, and between intermediates and finals. In the manufacturing sector, export motives are important and increasing over time, making up 48% 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% of MP.

3.2. The Design of Trade Agreements database

Our source of information on trade agreements and their investment provisions is the Design of Trade Agreements database by Dür et al. (2014). This dataset builds on the list of agreements notified to the World Trade Organisation, providing the widest coverage of trade agreements available. The dataset has information on more than 620 agreements and covers all PTAs in force in our period of interest. It includes a broad set of provision categories and distinguishes between substantive provisions and shallow provisions.

The dummy variable that we create for PTAs with investment provisions relies on the information answering the question 'Does this agreement include an investment chapter?'.

8 See Appendix Section C for further details on these two data sources.
9 See Appendix Table A2 for the list of countries and Table A3 for the list of industries.
10 A foreign affiliate is defined as an enterprise resident in a country which is under the control of an institutional unit not resident in the same country. The concept of control refers to a firm controlling 50% or more of the ordinary shares or voting power of another firm.
11 For more information on MP patterns across time, regions and industries, see Cadestin et al. (2018b). To note that when FA activity is measured in gross terms at the world level, there is some double counting involved (Miroudot and Ye, 2020).

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

Goods	2000	2005	2010	2014	Services	2000	2005	2010	2014
FA dom int	0.37	0.34	0.35	0.35	FA dom int	0.48	0.49	0.48	0.47
FA dom final	0.23	0.20	0.18	0.17	FA dom final	0.41	0.39	0.36	0.35
FA exp int	0.22	0.25	0.25	0.27	FA exp int	0.07	0.08	0.10	0.12
FA exp final	0.19	0.21	0.22	0.21	FA exp final	0.04	0.05	0.05	0.06

Note: This table decomposes the gross output (in US$) of foreign affiliates in Years 2000, 2005, 2010 and 2014. In particular, *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.

We regard the provisions as substantive when they go beyond 'endeavors without specific scope' and are not limited to the reference to an existing BIT.[12] We consider investment provisions within and beyond the services chapter since trade agreements generally start with a service chapter covering Mode 3 trade in services (commercial presence) and can reach the full extent of an investment chapter covering both goods and services and addressing investment protection as well as investment liberalisation.

We also regard PTAs as having substantive investment provisions even when investment disciplines are limited to services for the following three reasons. First, most barriers to FDI are found in services industries and these sector-specific regulations create additional costs for multinational firms. Through provisions on services, most of the barriers to MP are already addressed. Secondly, many of the market access and national treatment commitments on services are 'horizontal' and do not distinguish manufacturing firms from service firms. For example, provisions for the temporary movement of people allowing intra-corporate transferees to obtain specific visas on the basis of the PTA are applied to all firms. There is no condition or test to check whether the parent company or the affiliate is in a manufacturing or service industry. While trade agreements distinguish trade in goods from trade in services (on the basis of the products traded), there is no legal basis or such categorisation for most of the domestic laws relevant for the operations of foreign affiliates. Therefore, provisions on services benefit manufacturing firms to a large extent (Cadot et al., 2006). Lastly, the fact that a PTA covers investment in services also implies that manufacturing foreign affiliates will have easier access to the services inputs supplied by their parent company (as the agreement covers all trade in services) or other foreign affiliates in the host economy. Manufacturing firms would also benefit from the services provisions in this case. For instance, foreign suppliers of services are shown to be crucial in providing supporting activities to the functioning of GVCs (Miroudot and Cadestin, 2017).

One assumption in the construction of the PTA variables is that when more than one bilateral trade agreement is 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 specific subject matter (*lex specialis*)

12 The fact that we can identify substantive investment provisions is one reason for choosing the DESTA dataset as opposed to other PTA datasets.

Table 2. Share of country pairs with each type of agreement, 2000–2014

Variables	2000	2005	2010	2014
PTA	0.50	0.55	0.57	0.60
Inv Prov	0.14	0.34	0.40	0.46
Serv Prov	0.33	0.43	0.46	0.50
BIT	0.44	0.47	0.49	0.49

Note: *Inv Prov* indicates trade agreements including a substantive investment provision, *Serv prov* including a substantive provision stipulating the liberalisation of trade in services, and *BIT* stands for bilateral investment treaties.

overrides a law governing only general matters (*lex generalis*). The implication is that a bilateral agreement with substantive investment provisions overrules an agreement not covering investment.

Table 2 shows the share of pairs of countries with each type of agreement and with a BIT in our bilateral dataset.[13] Overall, PTAs with investment provisions (*Inv Prov*) have increased rapidly in the 2000–2014 period. In 2014, 46% of country pairs have a trade agreement that includes substantive provisions on investment, compared to only 14% in 2000. Moreover, 50% of country pairs have a trade agreement including a substantive provision on trade in services (*Serv prov*) from only 33% in 2000. In contrast, country pairs with a BIT increased moderately from 44% in 2000 to 50% in 2014. This finding confirms the conjecture that trade agreements have become increasingly popular in dealing with cross-border investments, often replacing BITs or being signed between countries not having a BIT in force.

4. Empirical strategy

To investigate the impact of trade agreements on MP, we use a specification derived from a gravity model. Although the gravity model was developed to study trade in goods, it has recently been applied to trade in services (Kimura and Lee, 2006; Anderson et al., 2014), FDI (Bénassy-Quéré et al., 2007; Kleinert and Toubal, 2010; Anderson et al., 2019) and MP (Ramondo et al., 2015; Alviarez, 2019).

Our empirical model is based on the standard structural gravity framework (see Yotov et al., 2016 for a review). To investigate the role of investment provisions in affecting MP beyond tariff reductions, we thus estimate the following reduced-form specification on a panel dataset covering the years 2000–2014:

$$\mathrm{MP}_{\mathrm{ijt}} = \exp(\alpha + \beta_1 \mathrm{PTA}_{\mathrm{ijt}} + \beta_2 \mathrm{Inv\ Prov}_{\mathrm{ijt}} + \delta_{\mathrm{jt}} + \psi_{\mathrm{it}} + \gamma_{\mathrm{ij}}) + \varepsilon_{\mathrm{ijt}}; \quad (1)$$

where MP_{ijt} denotes MP of goods or services in country i controlled by a parent company in country j at time t. PTA_{ijt} is 1 if countries i and j have a free trade agreement or customs union in place at time t. $Inv\ Prov_{\mathrm{ijt}}$ is equal to 1 if countries i and j have a PTA with

13 These dummy variables equal 1 at the date of entry into force of an agreement instead of the date of signature. Data on BITs come from the World Trade Institute.

investment provisions in force at time *t*. The coefficient of $Inv\ Prov_{ijt}$ is equivalent to an interaction variable with the PTA variable since there are no observations where a country pair has investment provisions without having a PTA in force. Moreover, 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 investment provisions to pre-existing PTAs. As in the case when a country pair already has a PTA limited to trade in goods and later becomes part of another PTA (perhaps with different members involved) with investment provisions or when a country pair signs a PTA covering investment, but the date of entry into force of the investment provisions is different from the rest of the agreement.[14]

We follow the gravity literature (Baier and Bergstrand, 2007) and control for potential omitted variables through partner-time, destination-time and country-pair fixed effects (δ_{jt}, ψ_{it} and γ_{ij}, respectively). However, there could be some omitted time-variant bilateral variables which may not be captured by our set of fixed effects. We partly address this concern by controlling for the presence of other deep provisions that may drive the relationship between investment provisions and MP. Unfortunately, deep provisions are highly collinear among themselves (as shown in Appendix Table A5). To tackle this issue, we either include each provision as a stand-alone category in the specification or we add a measure of trade agreement depth, based on the number of provisions embedded in a given trade agreement (as in Mattoo et al., 2017). To test for the presence of reverse causality, we include lead variables of *Inv Prov* as proposed by Bergstrand et al. (2015). Finally, to account conclusively for both the potential omitted variable and the reverse causation problem, we propose an instrument for investment provisions. Section 5.1.3 discusses the construction of the instrument and the results of the control function approach using the instrument.

When estimating (1), we include the case where country *i* and country *j* are the same, that is, production by domestic-owned firms. As summarised in Yotov (2021), accounting for intra-national production is crucial when comparing country pairs with a PTA and without a PTA. The standard gravity framework using only MP data estimates the effect of trade agreements on MP between a given pair of countries relative to the effect of trade agreements on MP for a pair of countries without a trade agreement. Instead, to appropriately estimate the effect of trade agreements, we should also consider the effect of PTAs relative to the corresponding effects within national markets. The underlying assumption is that domestic-owned and foreign-owned firms are directly competing to serve consumers or firms within a country, and including intra-national production allows to explicitly account for the diversion effects of PTAs from domestic towards international production. As shown in the gravity trade literature, not including intra-national trade flows is inconsistent with the theoretical basis of the gravity model (Yotov, 2021), leading to underestimated gravity variables (Dai et al., 2014).

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.[15] We estimate our gravity specification using the Poisson pseudo-maximum likelihood (PPML) estimator pro-

14 The list of treaties providing the identifying variation in Equation 1 is provided in Table A1.

15 While the gravity literature suggests using 3-, 4- or 5-year intervals (Yotov et al., 2016), we use 2-year intervals to retain a larger number of observations. Recent work by Egger et al. (2020) lends support to this approach, showing that using annual data improves the efficiency of the estimates due to the use of more data points.

posed by Silva and Tenreyro (2006).[16] The PPML is our chosen estimator because it has the advantage of accounting for potential heteroscedasticity in foreign affiliate activity and dealing with sample selection, since it keeps zeroes in observations by allowing inclusion of the dependent variable in level.[17]

5. Investment provisions and MP

Using the empirical strategy described in the previous section, we study the relationship between MP and investment provisions in PTAs. We first analyse how patterns of MP vary with the entry into force of deep agreements before exploring the channels through which investment provisions can increase MP. In particular, we investigate how the effect of investment provisions on MP varies across types of MP and industries. We present evidence suggesting that investment provisions increase MP, especially in industries where working directly with the public is necessary and those that are more fragmented internationally. We also show that the impact of investment provisions on MP tends to be stronger for foreign affiliates' exporting activities.

5.1. Results for MP of goods and services

In this section, we examine the relationship between trade agreements and MP of goods and services, that is, the impact of PTAs on the output of foreign affiliates in the manufacturing and services sectors. Table 3 presents the results from estimating (1). Columns 1–5 show the coefficients for MP of goods and Columns 6–10 for MP of services.

Columns 1 and 6 display results from a specification including only the PTA dummy. This coefficient is positive and large, indicating that signing a PTA increases MP of goods and services between parties by about 30 and 26%, respectively.[18] To test the role of investment provisions, we include in Columns 2 and 7 a dummy variable, *Inv Prov*, accounting for the presence of a substantive investment provision included in the treaty. The average effect is identified from country pairs that entered into a PTA with investment provisions or first had a PTA in force and later had a PTA with investment provisions. The coefficients suggest that the entry into force of a PTA including an investment provision increases on average MP of goods and services by 36% and 52%, respectively. As expected, the effect of investment provisions is larger for MP of services than goods, hinting at the particular importance of proximity to customers for services. Another reason is that many of the barriers to foreign investment and foreign affiliate activity, such as foreign equity limits, discriminatory licensing conditions or the non-recognition of qualifications earned abroad, are found in the services sector (Andrenelli et al., 2018). Interestingly, the coefficient of shallow PTAs becomes insignificant when including *Inv Prov*, indicating that investment provisions make up for all the impact of deep trade agreements on MP in the period considered.[19]

To disentangle the effect of investment provisions from other provisions in deep agreements and policy variables, we augment our baseline specification by adding a control for

16 The PPML regressions are implemented in STATA using the command *ppmlhdfe* developed by Correia et al. (2020) to deal with high-dimensional fixed effects.

17 The observations equal to zero make up around 5% at the bilateral country level. Instead, at the sectoral level, the observations equal to zero make up around 60% of our sample.

18 The coefficients (β) in the PPML regressions are interpreted as ($e^{\beta} - 1$) % change in MP.

19 These findings are robust to alternative specifications. See Appendix section B for the results.

Table 3. PTA effects on MP of goods and services

	Dependent variable: aggregate MP									
	Goods					Services				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PTA	0.265***	0.0388	−0.168	−0.0444	0.0376	0.231***	−0.115	−0.331**	−0.236*	−0.115
	(0.0866)	(0.0843)	(0.116)	(0.107)	(0.0842)	(0.0494)	(0.0936)	(0.152)	(0.123)	(0.0934)
Inv prov	–	0.309***	0.230**	0.288***	0.309***		0.418***	0.295**	0.359***	0.418***
	–	(0.0941)	(0.0954)	(0.0946)	(0.0938)		(0.0982)	(0.118)	(0.105)	(0.0981)
Depth	–		0.0504**	–	–	–	–	0.0597*	–	–
	–	–	(0.0207)	–	–	–	–	(0.0325)	–	–
Serv prov	–	–	–	0.107	–	–	–	–	0.193*	–
	–	–	–	(0.0853)	–	–	–	–	(0.108)	–
BIT	–	–	–	–	0.140	–	–	–	–	0.250*
	–	–	–	–	(0.106)	–	–	–	–	(0.132)
Observations	13,440	13,440	13,440	13,440	13,440	13,408	13,408	13,408	13,408	13,408

Note: The dependent variable in Columns 1–5 is MP of goods and in Columns 6–10 is MP of services. All specifications are obtained with data for Years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014; all include partner-time, host-time and partner-host fixed effects and are estimated using PPML. *Serv prov* denotes trade agreements including a substantive provision stipulating the liberalisation of trade in services. *Depth* goes from 0 to 6, covering the following provisions: services, competition, sanitary and phytosanitary measures, technical barriers to trade, public procurement and intellectual property rights. Standard errors are clustered by country pairs. The p-values read as follows: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

the depth of PTAs (in Columns 3 and 8),[20] a dummy variable accounting for the presence of services provisions (in Columns 4 and 9) and a dummy variable indicating whether the country pair have a BIT in place (in Columns 5 and 10). The coefficients of investment provisions remain positive and statistically significant. While the magnitudes decrease when we control for the depth of trade agreements, the coefficient of investment provisions is still sizeable: the entry into force of a PTA including an investment provision increases on average MP of goods and services by 26% and 34%, respectively. Instead, the coefficient of services provisions is not significant for MP of goods and remains significant, but only at the 10% level, for MP of services. This finding is consistent with Lee (2019), suggesting that services provisions are crucial in increasing international trade at the expense of MP. Another potential explanation is that services provisions are often non-discriminatory in nature. Services liberalisation should therefore reduce the costs of production for all firms, benefiting both those foreign- and domestic-owned. In contrast, investment provisions concern more the policy regime applied to foreign firms only.

Finally, the coefficient of BIT is also not significant for MP of goods and only significant at the 10% level for MP of services. This result is in line with previous literature finding mixed results for the impact of BITs on FDI at the aggregate level (Busse et al., 2010; Egger and Merlo, 2012; Falvey and Foster-McGregor, 2017). Furthermore, Osnago et al. (2019) find BITs to be unimportant in driving vertical FDI in the period 2003–2011

20 On average, the number of provisions in trade agreements steadily increased from 2 provisions in 2000 to 3 in 2014.

using firm-level data for Germany, Japan and the USA. Finally, while BITs are expected to be a positive determinant of FDI, their effect on the activities of foreign affiliates once established is unclear. In conclusion, our findings suggest that investment provisions are associated with higher MP, and no other relevant policy variable seems to be driving our results.

5.1.1. Dynamic effect of investment provisions

A concern with the previous results is that country-pair fixed effects do not properly account for the 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. To address this concern, we include 2-year lead variable of *Inv Prov* to capture future levels of trade agreements, providing an informal test for the 'strict exogeneity' of trade agreements (Baier and Bergstrand, 2007). The lead variable allows assessing whether countries tend to sign trade agreements with countries hosting more of their MNEs' investments and foreign affiliate activity. In addition, we include lagged variables of *Inv Prov* to account for the fact that the effect of investment provisions may take time to materialise, as shown by Baier and Bergstrand (2007), Bergstrand et al. (2015) and Mattoo et al. (2017) for the impact of trade agreements on international trade.

Figure 1 illustrates the dynamic effect of investment provisions on MP of goods and services.[21] These results are based on the specifications in Columns 3 and 8 of Table 3, including leads and lags of the variable *Inv Prov*. The results suggest that the entire economic effect of deep agreements on MP cannot be fully captured in a single year. It takes, on average, at least 2 years for the effect to materialise. In addition, the coefficients of the lead variables are not significant and close to zero, downplaying the role of reverse causality in our findings.

5.1.2. Falsification test

An alternative approach to provide further support to the estimates in Table 3 is as follows. For each country pair with a trade agreement, we randomly assign a value (either 1 or 0) to Inv Prov_{ijt} and then re-run the regression. Figure 2 shows the distribution of these regression coefficients obtained from 2000 random draws. The randomised coefficients are centred around zero and are distant from the estimated effect of investment provisions (shown by the dashed lines) corresponding to Columns 3 and 8 of Table 3. These results confirm that our main findings are not driven by some random allocation of investment provisions across country pairs.

5.1.3. Instrumenting for investment provisions

To verify conclusively that the presence of investment provisions is the factor driving our results, we use an instrumental variable (IV). In the spirit of Osnago et al. (2019), we propose an instrument that is constructed as the average between the number of PTAs with investment provisions that each partner and host country have with other countries,

21 The regression outputs used for these figures are available upon request.

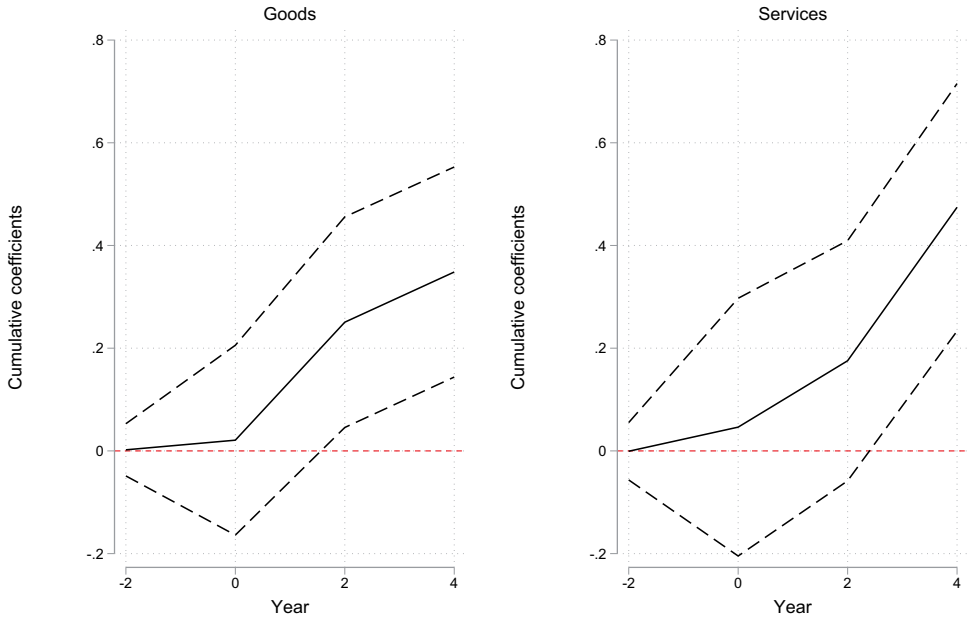

Figure 1. Dynamic effects of investment provisions on MP of goods and services.
Note: Results are based on the regression specification in Column 3 for goods and Column 8 for services in Table 3, which is augmented to include leads and lags of the variable of interest. The solid lines depict the cumulative effect and the broken lines at the 95% confidence intervals.

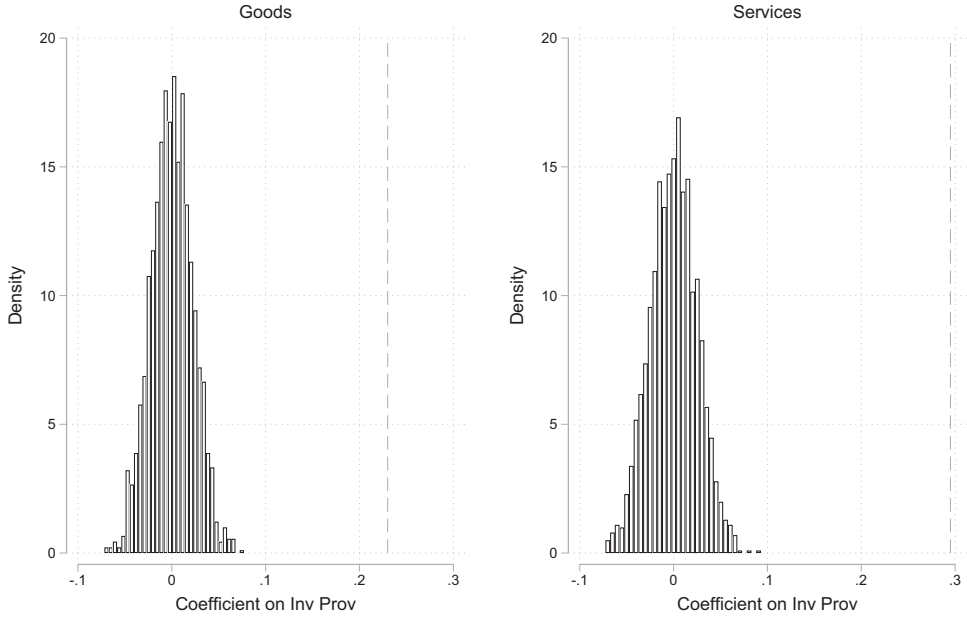

Figure 2. Falsification test with random levels of investment provision (2000 reps).
Note: The regression specification is equal to our baseline specification in (1). The dashed lines show the estimated effect corresponding to Column 3 for goods and Column 8 for services in Table 3.

excluding themselves. We define the instrument as: $\text{Inv Prov}_{ijt}^{IV} = \frac{\sum_{s \in S} \text{Inv Prov}_{ist}}{N_{it}} + \frac{\sum_{s \in S} \text{Inv Prov}_{jst}}{N_{jt}}$, where N_{it} is the number of trade agreements of country i in force in year t, excluding the agreement with country j, while N_{jt} is the number of trade agreements of country j in force in year t, excluding the agreement with country i. S is the set of third countries with whom i and j have signed an agreement (excluding with themselves). The rationale of this instrument comes from the *bandwagon effect* that has characterised the recent surge in PTAs. The key idea is that the signing of trade agreements can induce excluded countries to sign similar agreements.[22] In addition, a recent body of empirical literature shows that countries tend to sign similar PTAs by replicating existing treaties (Allee and Elsig, 2019; Mattoo et al., 2020). Therefore, we expect that the higher the number of investment provisions that country j has in force with third countries, the more likely country i will be to sign an agreement including an investment provision with country j (and vice versa).

Table 4 presents the results using the control function approach.[23] The first-stage results (in Column 1) suggest that our IV is relevant since the coefficient of the investment provision dummy is statistically significant at the 1% level. In addition, the effective F-statistic of the first-stage indicates that the instrument is not weak.[24] The coefficients of the investment provision dummy remain positive and significant in all specifications. The magnitudes are markedly larger than our baseline results, which appear to be affected by a downward bias. This evidence indicates that the estimates in Table 3 are a reliable and conservative assessment of the impact of investment provisions on MP.

5.2. Heterogeneous effect of investment provisions across type of MP

In this section, we investigate whether the effect of PTAs on MP depends on the type of activity performed by foreign affiliates in the host country. We test for these predictions by decomposing MP in *Domestic MP* (FA domestic sales of intermediate inputs), *Horizontal MP* (FA domestic sales of finals products), *Vertical MP* (FA exports of intermediate inputs) and *Export-platform MP* (FA exports of final products).[25] As discussed in Section 2, while *Horizontal MP* and *Export-platform MP* represent foreign affiliates that take the products/services forward towards the customers, *Vertical MP* and *Domestic MP*

22 See Baldwin and Jaimovich (2012) for a review of the mechanisms behind the proliferation of PTAs in past decades.

23 We estimate our IV using the control function approach developed by Wooldridge (2015). This approach is useful for estimating an instrumental variable in a non-linear model as described in Lin and Wooldridge (2019). In particular, this technique is based on a two-stage procedure. In the first stage, the dependent variable is the endogenous variable (a dummy indicating whether the agreement includes an investment provision), and the right-hand-side variables are the instrument, the PTA dummy and the usual fixed effects. The first stage is estimated using OLS. The second stage is, instead, estimated using PPML, including the residuals from the first stage in addition to the endogenous variable, the PTA dummy and the usual fixed effects. The dependent variable in the second stage is MP of either goods or services. The objective of including the residuals from the first stage is to control for the variation in investment provisions not explained by our IV in the first stage. As a result, the coefficient of the investment provision dummy (in the second stage) indicates the effect of investment provisions on MP netted from the endogeneity in investment provisions.

24 As discussed in Andrews et al. (2019), we present the effective first-stage F-statistic of Olea and Pflueger (2013) because it is robust to heteroscedasticity and clustering.

25 While more than 80% of foreign affiliate activity in the services sector is dedicated to serve the domestic market, we also consider FA selling intermediate and final services to foreign markets. For instance, branches or affiliates of banks providing financial services to consumers in neighbouring countries, such as US banks established in London to serve EU customers.

Table 4. IV results—control function approach

	(1) First-stage Inv prov	(2) Goods FA output	(3) Services FA output
PTA	0.246***	−0.126	−0.261***
	(0.0454)	(0.0993)	(0.0969)
Inv prov		0.981***	1.000***
		(0.205)	(0.187)
Residuals		−0.837***	−0.755***
		(0.219)	(0.214)
Inv prov (IV)	0.290***		
	(0.0482)		
Observations	13,448	13,440	13,408
F^{eff}-stat		35.6	37.0

Note: The dependent variable in Column 1 is the investment provision dummy, in Column 2, MP of goods and in Column 3, MP of services. All specifications are obtained with data for Years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014; all include partner-time, host-time and partner-host fixed effects and are estimated using PPML. Residuals denotes the residuals from the first-stage regression estimated in Column 1. *Inv prov (IV)* indicates the instrument of the investment provision dummy. F^{eff}-stat refers to the effective *F*-statistic developed by Olea and Pflueger (2013). Standard errors are clustered by country pairs. The p-values read as follows: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

are measures related to the fragmentation of the production processes. Specifically, *Vertical MP* indicates production by foreign affiliates participating in international supply chains, and *Domestic MP* includes foreign affiliates participating in domestic supply chains.

Tables 5 and 6 illustrate the results of the empirical strategy decomposing MP by type (intermediates versus final products) and destination (domestic versus foreign demand). The coefficients indicate that investment provisions increase both the domestic and exporting activities of foreign affiliates, with the effect being stronger for MP of services. The only exception is for foreign affiliates engaging in *Horizontal MP* of goods, where trade seems to act more as a substitute for MP in serving the local demand. As discussed in Section 2, we expect deep agreements to have an ambiguous impact on MP of goods. While investment provisions should reduce barriers to foreign affiliates' entry and operations, conversely, the effect is expected to be negative when deep agreements incentivise trade rather than MP.

Furthermore, the coefficients of *vertical MP* and *export-platform MP* are large and significant, suggesting that investment provisions are helpful in boosting MNEs' participation in GVCs. The complementarity between trade and investment provisions, providing both lower operational costs for foreign affiliates and lower trade costs for their imports and exports, could be the main channel explaining why investment provisions have a stronger impact on *vertical MP* and *export-platform MP*. Interestingly, this is also the case for services when they are part of fragmented production processes. While most services activities are domestic-oriented, it should be noted that some service industries rely on vertical and export-platform MP and have levels of fragmentation of production similar to the manufacturing sector (see Timmer et al., 2021).

Table 5. PTA effects on MP of goods: Decomposition of gross output

	(1) Domestic MP	(2) Horizontal MP	(3) Vertical MP	(4) Export-platform MP
PTA	0.0683	0.213	0.0457	0.0705
	(0.0915)	(0.132)	(0.0938)	(0.0988)
Inv prov	0.239**	0.151	0.328***	0.227**
	(0.108)	(0.129)	(0.0997)	(0.111)
Observations	13,440	13,432	13,440	13,440

Note: The dependent variable is FA domestic sales of intermediate inputs in Column 1; FA domestic sales of final products in Column 2; FA exports of intermediate inputs in Column 3; FA exports of final products in Column 4. All estimates are obtained with data for Years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014; all include partner-time, host-time and partner-host fixed effects and are estimated using PPML. Standard errors are clustered by country pairs. The p-values read as follows: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 6. PTA effects on MP of services: Decomposition of gross output

	(1) Domestic MP	(2) Horizontal MP	(3) Vertical MP	(4) Export-platform MP
PTA	−0.111	−0.0860	−0.169*	−0.0986
	(0.102)	(0.0974)	(0.0879)	(0.0934)
Inv prov	0.389***	0.387***	0.478***	0.491***
	(0.110)	(0.0976)	(0.0834)	(0.0865)
Observations	13,408	13,408	13,408	13,408

Note: The dependent variable is FA domestic sales of intermediate services in Column 1; FA domestic sales of final services in Column 2; FA exports of intermediate services in Column 3; FA exports of final services in Column 4. All estimates are obtained with data for Years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014; all include partner-time, host-time and partner-host fixed effects and are estimated using PPML. Standard errors are clustered by country pairs. The p-values read as follows: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Finally, the (slightly) significant negative sign for the PTA variable in the case of *vertical MP* of services suggests that for the production of services inputs that are further exported, shallow PTAs and PTAs with investment provisions may have opposite effects. One explanation is that the PTA variable might identify country pairs with restrictive trade and investment regimes for services activities that discourage vertical specialisation while also preventing countries from entering into deeper PTAs.

5.3. Mechanisms through which investment provisions can affect MP

We now turn to understanding the mechanisms driving the positive relationship between investment provisions and MP. As shown in the previous section, a first important channel through which investment provisions might increase MP is by facilitating the

fragmentation of production processes. A recent body of literature has shown that deep agreements have a positive effect on boosting GVC trade (Mattoo et al., 2017; Lee, 2019; Dhingra et al., 2021). However, the effect on MP is not well documented. Since investment provisions are expected to liberalise behind-the-border barriers detrimental to multinational activity (Baldwin, 2011; Mattoo et al., 2017), we expect a larger role for investment provisions in facilitating MP in industries that are more fragmented internationally. To test this hypothesis, we explore how the effect of investment provisions on MP varies with the level of fragmentation of production, measured with the supply chain fragmentation (SCF) ratio introduced by Timmer et al. (2021).

Proximity to customers is another crucial motive driving MP, especially for services activities. Christen and Francois (2017) show that the proximity between supplier and consumer matters in explaining foreign affiliate activity relative to cross-border sales in many service industries. Building on this finding, we conjecture that investment provisions may also facilitate multinationals' activity abroad, especially in industries in which the activity is provided in close proximity to customers. In order to measure this proximity requirement, we use the O*NET measure 'Performing for or Working Directly with the Public' as a proxy for the importance of directly interacting with consumers. Among many, this approach was used in previous works studying the importance of routine tasks Costinot et al. (2011) and communicating with consumers (Oldenski, 2012). Following this literature, we match the relevant task measures from O*NET to the industry-level MP data. We aggregate the raw O*NET scores up to the industry level as the employment weighted average across occupations for each industry and merge them with MP data to obtain an index of the importance of working directly with the public in each industry. We replicate this exercise for all the years in our dataset, obtaining time variation in this industry-specific measure. The use of O*NET (which is specific to the US labour market) is motivated by data availability, as O*NET is the only dataset providing detailed information about tasks performed by workers (across occupations and industries) over time. This loss of measurement precision associated with the use of O*NET for all countries in the estimation sample is also motivated by the fact that the US should be representative of the nature of tasks that workers in each occupation perform due to its large workforce and significant production in all industries.

We thus study the importance of these two mechanisms by using disaggregated data on MP at the industry level. We estimate the following regression specification:

$$\begin{aligned} \mathrm{MP}_{\mathrm{ijkt}} = exp(\alpha + \beta_1 \mathrm{PTA}_{\mathrm{ijt}} + \beta_2 \mathrm{Inv\ Prov}_{\mathrm{ijt}} + \beta_3 \mathrm{BIT}_{\mathrm{ijt}} + \beta_4 \mathrm{Inv\ Prov}_{\mathrm{ijt}} \cdot \mathrm{SCF}_{kt} \\ + \beta_5 \mathrm{Inv\ Prov}_{\mathrm{ijt}} \cdot \mathrm{Proximity}_{kt} + \delta_{\mathrm{ikt}} + \delta_{\mathrm{jkt}} + \delta_{\mathrm{ijk}}) + \varepsilon_{\mathrm{ijkt}} \end{aligned} \quad (2)$$

where MP_{ijkt} is the output of foreign affiliates in industry k in host country i from partner country j. An industry corresponds to one of the two-digit ISIC rev. 4 categories (shown in Appendix Table A3). In this specification, SCF_{kt} is the SCF ratio and reflects all imports of intermediate inputs along the value chain (from all countries) in total output in each industry. $Proximity_{kt}$ is a measure of the importance of working directly with the public in each industry. All specifications include partner country-industry-time, host country-industry-time and host country-partner country-industry fixed effects.

We present the results from estimating regression 2 in Table 7. Column 1 shows our baseline specification from Column 2 of Table 3 for industry-level MP data. The estimated coefficient of investment provisions is 0.293, which is equivalent to an effect of investment provisions on MP of roughly 35%. In Column 2, we interact the dummy accounting for the presence of an investment provision in trade agreements with the SCF ratio in each industry. The coefficient of this interaction is large and highly significant, suggesting that investment provisions matter substantially more for multinational activity in industries with production processes fragmented internationally. For instance, the magnitude of the interaction term implies that the impact of investment provisions on MP is about 46% larger in producing electronic and optical equipment than that of producing textile and leather products.[26] This finding suggests that one of the channels through which investment provisions increase MP is by facilitating multinationals' participation in GVCs.

In Column 3, we interact our measure of the importance of working directly with the public with the investment provision dummy. The effect of investment provisions on MP is larger for industries where working directly with customers is more important. This finding suggests that investment provisions are especially crucial for industries that require proximity between suppliers and customers. In Column 4, we jointly explore the variation in investment provisions for both interactions. The coefficients are similar to prior specifications. Overall, this evidence indicates that investment provisions increase MP through at least two channels. The first involves facilitating multinationals' access to foreign markets, especially for industries where proximity to the final customers is a necessary requirement.

Table 7. Mechanisms at play

	Dependent variable: industry-specific MP			
	(1)	(2)	(3)	(4)
PTA	0.00352	−0.0134	0.0157	0.00617
	(0.0478)	(0.0489)	(0.0527)	(0.0523)
Inv prov	0.293***	−0.0588	−0.282***	−0.526***
	(0.0454)	(0.0715)	(0.104)	(0.124)
Inv prov × GVC	–	1.498***	–	0.955***
	–	(0.245)	–	(0.256)
Inv prov × Proximity	–	–	0.208***	0.214***
	–	–	(0.0361)	(0.0355)
Observations	373,752	373,752	320,754	320,754

Note: The dependent variable in Columns 1–4 is MP of goods and services at the industry level. All specifications are obtained with data for Years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014; all include partner-industry-time, host-industry-time and partner-host-industry fixed effects and are estimated using PPML. *GVC* denotes the SCF ratio. *Proximity* refers to the importance of the proximity between supplier and customer as derived from O*NET. In Columns 3 and 4, the number of observations reduces to 320,754 observations, because we lack industry-level information on the tasks performed across occupations from O*NET for the Year 2000. Standard errors are clustered by country pairs interacted with industry categories. The p-values read as follows: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

26 The electronic and optical industry has one of the highest SCF ratios (equal to 0.44), while textile and leather has a ratio of 0.30. The difference in the effect between the two industries can be calculated as $((0.44–0.30) \times 0.955)/0.293 = 46\%$.

The second channel entails helping multinationals join global supply chains and fragmenting their production processes across countries.

6. Conclusions

MNEs and their network of foreign affiliates are important players in today's global economy, coordinating trade and organising GVCs. Therefore, understanding the effect of trade agreements on the activities of multinational firms is a fundamental question that has not been extensively studied in the literature. Using a novel database, this article makes one of the first attempts to empirically assess the link between PTAs and MP for a large set of developed and emerging economies while looking separately at the manufacturing and services sectors. Thanks to the granularity of our data, we have also introduced a novel categorisation of the motives driving MNE activities abroad based on a decomposition of foreign affiliates' production.

Using a structural gravity model, we provide several novel empirical contributions to the literature. We find that country pairs with trade agreements including a substantive investment provision tend to have higher MP of goods and services. The magnitude of our estimate is quite sizeable: on average, having an investment provision is associated with increased MP up to 26% in the manufacturing sector and 34% in the service sector. This effect is stronger for MP of services than goods, consistent with our finding that the effect of investment provisions on MP is stronger for industries requiring proximity between producers and final consumers. We also find that it takes on average at least 2 years for investment provisions to increase MP of goods and services, suggesting that deep liberalisation takes time to materialise. Our results are robust to the inclusion of other deep provisions in trade agreements and BITs, to a falsification test and to the instrumentation of investment provisions. Our combined evidence suggests that trade agreements including investment provisions have been a critical determinant in boosting MNEs' production activities abroad.

Moreover, we provide evidence consistent with the prominent narrative that deep agreements facilitate access to GVCs by reducing domestic barriers impeding the fragmentation of production processes. First, we find that the effect of investment provisions is stronger for foreign affiliates engaged in exporting activities, hinting at a complementary relationship between trade and MP. Secondly, we find that investment provisions tend to increase MP particularly for industries where production is more fragmented internationally. These findings suggest that, by allowing access and fair treatment to MNEs, investment provisions help countries participating in GVCs.

As our data cannot distinguish the extensive margin from the intensive margin of MP and remain at the industry level, we believe that further research, possibly at the firm-level, could provide additional evidence on the impact of PTAs on MP and the economic mechanisms at stake. Moreover, since PTAs cover a large set of investment provisions involving both market access and national treatment (in the pre-establishment and post-establishment phases), understanding the types of provisions that drive our positive results also offers avenues for future research.

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Supplementary material

A complete replication package, including our novel database on multinational production and all codes to generate the figures and tables in the paper, is available at this link: https://github.com/DavideRigo/MiroudotRigo.

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Appendix

A. Additional tables

Table A1. List of treaties identifying the coefficients of interest

Year	Name	Type	Region
2001	European Free Trade Association (EFTA)—Mexico	3	Intercontinental
2001	Estonia—Hungary-Free Trade Agreement	1	Europe
2002	Asia-Pacific Trade Agreement—China accession	5	Asia
2002	Bulgaria—Estonia Free Trade Agreement	1	Europe
2002	Bulgaria—Lithuania Free Trade Agreement	1	Europe
2002	Croatia—EFTA	3	Europe
2003	Bulgaria—Latvia Free Trade Agreement	1	Europe
2003	Central European Free Trade Agreement (CEFTA)—Croatia accession	5	Europe
2003	Croatia—Lithuania Free Trade Agreement	5	Europe
2003	Croatia—Turkey Free Trade Agreement	5	Europe
2004	EU Enlargement (25)—Czech Republic accession	6	Europe
2004	EU Enlargement (25)—Estonia accession	6	Europe
2004	EU Enlargement (25)—Hungary accession	6	Europe
2004	EU Enlargement (25)—Lithuania accession	6	Europe
2004	EU Enlargement (25)—Latvia accession	6	Europe
2004	EU Enlargement (25)—Poland accession	6	Europe
2004	EU Enlargement (25)—Slovakia accession	6	Europe
2004	EU Enlargement (25)—Slovenia accession	6	Europe
2005	Croatia—EU Stabilisation and Association Agreement	3	Europe
2005	Japan—Mexico Economic Partnership Agreement	1	Intercontinental
2005	Association of Southeast Asian Nations (ASEAN)—China Free Trade Agreement	3	Asia
2005	Australia—US Free Trade Agreement	1	Intercontinental
2006	EFTA—Korea Free Trade Agreement	3	Intercontinental
2007	EU Enlargement (27)—Bulgaria accession	6	Intercontinental
2007	EU Enlargement (27)—Romania accession	6	Intercontinental
2008	Preferential Tariff Arrangement-Group of Eight Developing Countries	2	Intercontinental
2008	Indonesia—Japan Economic Partnership Agreement	1	Asia
2008	ASEAN—Japan-Free Trade Agreement	3	Asia
2009	Canada—EFTA-Free Trade Agreement	3	Intercontinental
2009	Japan—Switzerland Economic Partnership Agreement	1	Intercontinental
2010	ASEAN—Australia-Free Trade Agreement	4	Intercontinental
2010	India—Korea Comprehensive Economic Partnership Agreement	1	Asia
2011	EU—Korea Free Trade Agreement	3	Intercontinental
2011	India—Japan Economic Partnership Agreement	1	Asia
2012	Korea—US-Free Trade Agreement	1	Intercontinental
2013	EU Enlargement (27)—Croatia accession	6	Europe
2014	China—Switzerland Free Trade Agreement	1	Intercontinental
2014	Australia—Korea-Free Trade Agreement	1	Intercontinental

Note: The variable *Type* denotes the type of agreement and takes the following values: 1, bilateral; 2, plurilateral; 3, plurilateral and third country; 4, region-region (e.g. CARIFORUM EC EPA); 5, accession (e.g. UK EU accession agreement signed in 1972); 6, accession to an agreement as a result of membership in a regional agreement (e.g. when Romania entered the EU, it also signed up to the FTA between the EU and Mexico signed in 2000); 7, withdrawal. *Year* indicates the year in which the agreement entered into force. *Region* denotes the geographic location of signatory states.

Table A2. List of countries

Country	Income group (in 2000)	OECD countries (in 2000)
Australia	High income	OECD
Austria	High income	OECD
Belgium	High income	OECD
Brazil	Upper middle income	Non-OECD
Bulgaria	Lower middle income	Non-OECD
Canada	High income	OECD
China	Lower middle income	Non-OECD
Croatia	Upper middle income	Non-OECD
Czech Republic	Upper middle income	OECD
Denmark	High income	OECD
Estonia	Upper middle income	Non-OECD
Finland	High income	OECD
France	High income	OECD
Germany	High income	OECD
Greece	High income	OECD
Hungaria	Upper middle income	OECD
India	Low income	Non-OECD
Indonesia	Low income	Non-OECD
Ireland	High income	OECD
Italy	High income	OECD
Japan	High income	OECD
Korea	Upper middle income	OECD
Latvia	Lower middle income	Non-OECD
Lithuania	Lower middle income	Non-OECD
Luxembourg	High income	OECD
Mexico	Upper middle income	OECD
Netherlands	High income	OECD
Norway	High income	OECD
Poland	Upper middle income	OECD
Portugal	High income	OECD
Romania	Lower middle income	Non-OECD
Russia	Lower middle income	Non-OECD
Slovak Republic	Upper middle income	OECD
Slovenia	High income	Non-OECD
Spain	High income	OECD
Sweden	High income	OECD
Switzerland	High income	OECD
Taiwan	High income	Non-OECD
Turkey	Upper middle income	OECD
UK	High income	OECD
USA	High income	OECD

Table A3. List of industries

ISIC Rev. 4	Goods/services	Label
A	–	Agriculture
B	–	Mining
10-12	Goods	Food and tobacco
13-15	Goods	Textile and leather
16	Goods	Wood
17-18	Goods	Paper and printing
19	Goods	Coke and Petroleum
20-21	Goods	Chemicals
22	Goods	Rubber and plastics
23	Goods	Mineral products
24	Goods	Basic metals
25	Goods	Metal products
26	Goods	Electronic and optical
27	Goods	Electrical
28	Goods	Machinery
29	Goods	Transport
30	Goods	Other transport
31-32	Goods	Furniture
33	Goods	Repair and installation
35-36	–	Utilities
37-39	–	Sewerage and waste management
F	–	Construction
G	Services	Wholesale and retail trade
49	Services	Land transport
50	Services	Water transport
51	Services	Air transport
52	Services	Warehousing and transport support
53	Services	Postal and courier
I	Services	Accommodation and food
58	Services	Publishing activities
59-60	Services	Motion picture and broadcasting
61	Services	Telecommunications
62-63	Services	Computer and information services
K	Services	Finance and insurance
L	Services	Real estate
M	Services	Professional and scientific services
N	Services	Administrative services
O	–	Public Administration
P	–	Education
Q	–	Health
R-S	–	Arts, recreation and other services
T	–	Household
U	–	Extraterritorial organisations

Table A4. Estonia EU membership timeline

Year	Date	Event	Note
1991	20 August	Restoration of independence from USSR	–
1994	18 July	Free trade agreement concluded	–
1995	1 January	Free trade agreement in force	Shallow PTA
	12 June	Europe Agreement concluded	–
	24 November	Applied for Membership	–
1998	1 January	Europe Agreement comes into force	Deep PTA including provisions on services and competition
	March	Membership negotiations open	–
1999	–	17 chapters opened	–
2000	–	6 chapters opened	–
2002	December	All chapters closed and negotiations concluded	–
2003	8 April	Draft accession treaty approved by Estonian government	–
	16 April	Treaty of Accession signed	–
	14 September	Referendum on membership approved	–
2004	1 May	Acceded to EU	Investment provision + Deep PTA with third countries (e.g. EFTA)
	28 June	Joined ERM	
2007	21 December	Entered the Schengen area	–
2011	1 January	Adoption of the euro	–
	1 May	Right to limit migration from 2004 countries expired	–

Table A5. Cross-correlation table

	PTA	Serv prov	Inv prov	Comp prov	Proc prov	SPS prov	TBT prov	IPR prov	Depth	BIT
PTA	1.000	–	–	–	–	–	–	–	–	–
Serv prov	0.777	1.000	–	–	–	–	–	–	–	–
Inv prov	0.634	0.808	1.000	–	–	–	–	–	–	–
Comp prov	0.717	0.918	0.876	1.000	–	–	–	–	–	–
Proc prov	0.756	0.860	0.723	0.776	1.000	–	–	–	–	–
SPS prov	0.934	0.830	0.677	0.765	0.810	1.000	–	–	–	–
TBT prov	0.935	0.831	0.678	0.767	0.809	0.980	1.000	–	–	–
IPR prov	0.681	0.755	0.830	0.722	0.756	0.727	0.728	1.000	–	–
Depth	0.876	0.947	0.836	0.902	0.914	0.933	0.934	0.854	1.000	–
BIT	0.132	0.047	−0.035	0.037	0.061	0.140	0.127	0.020	0.079	1.000

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* stands for bilateral investment treaties.

B. Robustness checks

In this section, we present several additional robustness checks to provide further confidence in our main conclusions. First, our results are robust to controlling for the age and different waves of trade agreements. Since deep trade agreements are typically signed later than shallow PTAs, one potential concern of our estimation strategy is that investment provisions may capture the growing impact over time of shallow PTAs, which would bias the effect of investment provisions upwards. The results in Appendix Table B1 control for the age of PTAs, while Appendix Table B2 controls for different waves of PTAs by including interaction terms between the variable PTA and year dummies.

Secondly, even with the rich set of fixed effects included in (1), the issue of endogeneity is not fully tackled if there are other time-varying unobserved changes in bilateral costs that are country-pair specific (such as bilateral costs of information and communications technology). To address this concern, we follow Bergstrand et al. (2015) by including the interaction between year dummies and a dummy variable ($Border_{ij}$), which equals 1 if the partner and destination country are different and 0 otherwise. These interaction terms capture all bilateral factors influencing (on average) international relative to intra-national production over time (relative to a base period). The key findings are also robust to this specification (see Appendix Table B3).

Finally, we include a dummy variable for countries belonging to the European Union (EU) in our baseline specification. We believe that EU enlargement agreements may be different from all other PTAs. 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. Secondly, 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, which might already reduce tariffs and non-tariffs barriers, affecting MNEs' trade and investment strategies (Lakatos and Nilsson, 2016).[27] Appendix Table B4 shows that the inclusion of the EU dummy does not contradict our main conclusions. Moreover, becoming part of the EU is generally associated with lower MP of goods and services. As a final robustness check, we replicate our baseline analysis (based on (Equation 1)) on the sample of country pairs where the host and partner countries are either a member of the EU or the USA. As shown in Appendix Table B5, the results remain consistent with our main findings.

Table B1. Effects on MP of goods and services: shallow PTA age

Variables	(1) Goods FA output	(2) Goods FA output	(3) Services FA output	(4) Services FA output
PTA	0.208**	0.0517	0.122**	−0.117
	(0.0963)	(0.0882)	(0.0593)	(0.0964)
Inv prov	–	0.216**	–	0.293***
	–	(0.0978)	–	(0.103)
PTA age	0.0442***	0.0421***	0.0605***	0.0586***
	(0.00778)	(0.00773)	(0.00655)	(0.00663)
Observations	13,440	13,440	13,408	13,408

Note: The dependent variable is MP of goods in Columns 1 and 2 and MP of services in Columns 3 and 4. All specifications are obtained with data for Years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014; all include partner-time, host-time and partner-host fixed effects and are estimated using PPML. PTA Age equals 1 if t is the first year for the country pair to have a PTA in force. *PTA Age* varies between 1 and 8, since there are 8 years included in the analysis. Standard errors are clustered by country pairs. The p-values read as follows: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

27 See, as an example, Table A4 in the Appendix, showing Estonia's accession timeline to the EU.

Table B2. Effects on MP of goods and services: year dummies

Variables	(1) Goods FA output	(2) Goods FA output	(3) Services FA output	(4) Services FA output
PTA	0.293***	0.143	0.253***	0.0698
	(0.0921)	(0.0874)	(0.0535)	(0.0941)
Inv prov	–	0.203**	–	0.220**
	–	(0.0950)	–	(0.101)
PTA*y2000	−0.481***	−0.468***	−0.598***	−0.585***
	(0.0634)	(0.0631)	(0.0670)	(0.0674)
PTA*y2002	−0.166***	−0.153***	−0.363***	−0.349***
	(0.0493)	(0.0493)	(0.0520)	(0.0532)
PTA*y2004	−0.123***	−0.120***	−0.160***	−0.156***
	(0.0447)	(0.0445)	(0.0427)	(0.0430)
PTA*y2006	−0.106**	−0.103**	−0.126***	−0.122***
	(0.0431)	(0.0430)	(0.0341)	(0.0343)
PTA*y2008	−0.0145	−0.0141	0.0279	0.0296
	(0.0363)	(0.0363)	(0.0357)	(0.0358)
PTA*y2010	−0.0413	−0.0408	−0.0320	−0.0297
	(0.0299)	(0.0300)	(0.0250)	(0.0250)
PTA*y2012	0.00125	−0.000526	0.00976	0.0102
	(0.0266)	(0.0262)	(0.0242)	(0.0242)
Observations	13,440	13,440	13,408	13,408

Note: The dependent variable is MP of goods in Columns 1 and 2 and MP of services in Columns 3 and 4. All specifications are obtained with data for Years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014; all include partner-time, host-time and partner-host fixed effects and are estimated using PPML. Standard errors are clustered by country pairs. The p-values read as follows: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table B3. Effects on MP of goods & services: border-year dummies

Variables	(1) Goods FA output	(2) Goods FA output	(3) Services FA output	(4) Services FA output
PTA	0.147*	0.0264	0.0878	−0.153
	(0.0876)	(0.0884)	(0.0576)	(0.0949)
Inv prov	–	0.165*	–	0.293***
	–	(0.0925)	–	(0.0994)
Border*y2000	−0.538***	−0.532***	−0.340***	−0.333***
	(0.0493)	(0.0491)	(0.0534)	(0.0533)
Border*y2002	−0.399***	−0.392***	−0.373***	−0.365***
	(0.0434)	(0.0432)	(0.0460)	(0.0463)
Border*y2004	−0.312***	−0.308***	−0.253***	−0.250***
	(0.0409)	(0.0407)	(0.0338)	(0.0340)
Border*y2006	−0.267***	−0.263***	−0.164***	−0.161***
	(0.0367)	(0.0363)	(0.0366)	(0.0368)
Border*y2008	−0.103***	−0.100***	−0.00848	−0.00658
	(0.0295)	(0.0292)	(0.0306)	(0.0307)
Border*y2010	−0.105***	−0.101***	−0.0683***	−0.0659***
	(0.0242)	(0.0241)	(0.0224)	(0.0225)
Border*y2012	−0.0464**	−0.0449**	−0.00821	−0.00767
	(0.0199)	(0.0198)	(0.0181)	(0.0181)
Observations	13,440	13,440	13,408	13,408

Note: The dependent variable is MP of goods in Columns 1 and 2 and MP of services in Columns 3 and 4. All specifications are obtained with data for Years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014; all include partner-time, host-time and partner-host fixed effects and are estimated using PPML. Standard errors are clustered by country pairs. The p-values read as follows: *p < 0.1, **p < 0.05, ***p < 0.01.

Table B4. Effects on MP of goods and services: EU dummy

Variables	(1) Goods FA output	(2) Goods FA output	(3) Services FA output	(4) Services FA output
PTA	0.265***	−0.0668	0.231***	−0.360***
	(0.0866)	(0.100)	(0.0494)	(0.127)
Inv prov	–	0.452***	–	0.710***
	–	(0.121)	–	(0.129)
EU	−0.0180	−0.460***	−0.0429	−0.838***
	(0.140)	(0.159)	(0.210)	(0.271)
Observations	13,440	13,440	13,408	13,408

Note: The dependent variable is MP of goods in Columns 1 and 2 and MP of services in Columns 3 and 4. All specifications are obtained with data for Years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014; all include partner-time, host-time and partner-host fixed effects and are estimated using PPML. Standard errors are clustered by country pairs. The p-values read as follows: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table B5. PTA effects on MP of goods and services: EU–US sample

Variables	(1) Goods FA output	(2) Goods FA output	(3) Services FA output	(4) Services FA output
PTA	0.140	−0.229	0.102	−0.200
	(0.142)	(0.171)	(0.140)	(0.187)
Inv prov	–	0.496***	–	0.470***
	–	(0.122)	–	(0.125)
Observations	11,872	11,872	11,840	11,840

Note: The dependent variable in Columns 1 and 2 is MP of goods and in Columns 3 and 4 is MP of services. All specifications are obtained with data for Years 2000, 2002, 2004, 2006, 2008, 2010, 2012 and 2014; all include partner-time, host-time and partner-host fixed effects and are estimated using PPML. The partner and host country are either an EU member country or the USA. Standard errors are clustered by country pairs. The p-values read as follows: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

C. MP data

Our analysis relies on two novel databases on MP. First, we build a novel bilateral matrix of output according to the country of ownership of firms. The database covers 41 countries, which account for more than 85% of world GDP, 43 industries (across the primary, manufacturing and services sector) and the period 2000–2014. This bilateral matrix builds on the OECD AMNEs and the data are made consistent with output as measured in the ICIO tables from the WIOD database.

The OECD AMNE database contains the official data collected and published by National Statistical Offices and Central Banks on activities of MNEs. The coverage of AMNE data has been increasing over time, with a particularly good coverage for the USA and EU countries (as an EU regulation obliges countries to provide AMNE data to Eurostat). The OECD AMNE database contains data for 32 OECD countries plus Costa Rica and Lithuania, over more than 50 industries with the first year of reporting 1985. However, information is not equally available across countries, industries and years with data typically less available for earlier years and more disaggregated levels (e.g. bilateral at industry level). When there is no observation on the activities of foreign-owned firms, these data are estimated using different statistical methods: outward statistics, correlation with FDI data, interpolation methods and a gravity model. See Cadestin et al. (2018a) for further details on the methods used to estimate the missing values. Finally, we also use information coming from FDI statistics to identify zero AMNE sales.

Secondly, we split for the first time ICIO tables from WIOD according to ownership, disentangling the contribution to trade and output of domestic- and foreign-owned firms. Our methodology is divided into two steps. As a starting point, we create three matrices on output, value added and trade (import and export) split according to ownership and consistent with WIOD data. These matrices are first filled with the existing available information and then completed with estimates. The next step consists in splitting the WIOD ICIO tables with all cells divided into the contribution of domestic- and foreign-owned firms. This is done in a single quadratic optimisation that uses as objectives the data from the three matrices previously constructed (output, value-added and trade by country, industry and ownership) and as a constraint the output, value-added and trade reported in the WIOD database. The resulting tables are fully balanced and have the same properties as the original WIOD tables. See Cadestin et al. (2018a) for further details on the methodology used to split the ICIO tables.