

BILATERAL SERVICIFICATION IN GVCs AND DEEP TRADE AGREEMENTS

Preliminary version

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Abstract:

International trade has been transformed by participation in Global Value Chains (GVCs), where services linkages play a critical role. Recent studies examine the impact of deep trade agreements on GVC-related trade, but none of them focuses on GVC-related services. Using the gravity framework, this paper investigates the impact of trade agreements with substantial provisions on services on bilateral foreign services value added embodied in manufacturing exports. We also consider the depth of these agreements and explore the asymmetric effects depending on the partners' income level, the EU membership and on the direction of the trade flows. The analysis reveals that deep trade agreements with services provisions boosts embodied services value added from partner countries, with larger impacts for deeper agreements. Moreover, there are heterogeneous effects, which are particularly significant for North-North flows and for embodied services value added from EU countries. Therefore, those deep trade agreements seem to allow the EU to exploit its comparative advantage in services and, consequently, strengthen intra-EU GVCs and GVCs with non-EU countries.

JEL codes:

Key words: Servicification, Global Value Chains, Deep Trade Agreements, Gravity model.

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1. INTRODUCTION

Two of the most relevant features in the context of international trade in recent decades are the increase in exchanges of intermediate goods and services linked to Global Value Chains (GVCs) and the increase in the depth of preferential trade agreements. The concept of "deep" versus "shallow" trade agreements was introduced by Lawrence (1996) and, according to the World Bank, it refers to trade agreements which extend beyond traditional areas by including new aspects such as services, investment, competition policy, labour and the protection of intellectual property rights and the environment¹.

In the case of multistage production processes, where goods and services move in a sequential manner from upstream to downstream with value added at each stage, related trade becomes more sensitive to the establishment (or elimination) of trade barriers. Since foreign direct investment and GVCs are inextricably linked, and services link are crucial for GVCs, regulatory policies that affect FDI or services play a leading role in shaping global production sharing. In this context, the gains from a coordinated reduction of barriers to goods and services trade and regulatory harmonisation would be particularly large for GVCs². Therefore, the positive relationship between deep trade agreements (DTAs henceforth) and trade is expected to be stronger for GVC-related trade.

The connection between DTAs and GVC-related trade is a topic that has not been empirically explored until very recently because of difficulties in defining and measuring the depth of trade agreements. The development of new databases (Ruta, 2017; Mattoo et al., 2020) has stimulated research on this topic. There are several papers corroborating that the deeper a trade agreement is, the higher the GVC-related trade (The World Bank, 2020)³. Further knowledge about this topic is

¹ The World Bank Project "Deep Trade Agreements: Data, Tools and Analysis": <https://datatopics.worldbank.org/dta/about-the-project.html>.

² A few papers have recently modelled this relationship. Antras and Staiger (2012) show that, with incomplete contracts, the institutions that affect parties' bargaining power can influence decisions and the amount of offshoring, so policy harmonisation can play an important role in such decisions. Ornelas et al. (2018) extend the model to consider deep integration by incorporating bilateral recognition of intellectual property rights, and they find that it boosts trade flows. Antras and de Gortari (2020) develop a general equilibrium model to analyse how changes in trade costs affect the degree to which countries participate in GVCs. In the model calibration, they find that the gains from trade are considerably higher with the sequential production of GVCs than with the vertical integration model. A reversion to autarky when value chains are highly fragmented is costly, as countries cannot exploit the comparative advantage of foreign countries at various stages of the value chain.

³ Orefice and Rocha's (2014) was the first work that find a positive effect of the depth of trade agreements on GVC-related trade (proxied by imports of parts and components). Laget et al. (2020) add value-added trade as proxy of GVC-related trade and distinguish between forward and backward linkages within GVCs. Rubino (2017) additionally investigates whether the effects of DTAs are asymmetric according to the level of economic development of trading countries, the type of participation in GVCs and the type of provision added in DTAs.

particularly important considering that a new scenario is anticipated for GVCs, with changes in their configuration due to Covid-19 and growing trade protectionism.

Our paper contributes to this stream of research by going one step further and empirically investigating the relationship between a particular type of DTA, those with services provisions, and a specific aspect of GVC-related trade, such as foreign services embodied in manufacturing exports. These GVC-related services are intrinsically linked to the expansion of GVCs. It requires services-related activities such as transport, communications, coordination, logistics or quality control, which are essential for proper functioning of cross-border fragmented manufacturing processes. As Van der Marel and Saéz (2016) point out, services have a dual role in GVCs, one as an enhancer of value-added and one as a creator of value-added. As the business environment becomes more competitive, more manufacturing companies are relying on specialised companies for the provision of services. This trend is rooted in the desire to increase operational flexibility, save on costs, differentiate products and achieve greater efficiency. Advances in information and communication technologies have promoted services to be more marketable, which has favoured their use as foreign inputs in manufacturing production. These services are provided by specialised companies that offer them globally, making them a crucial factor in the performance and upgrading within GVCs. This strong connection between services and manufacturing within GVCs can be referred to as GVC-related servicification.

Thus, eliminating impediments to trade and investment in services is a priority for promoting GVC participation. Hand in hand with this increasing role of services in GVCs, DTAs that include rules for the liberalisation of trade and investment in services between two or more economies have proliferated since the 2000s. Gootiiz et al. (2020) survey and code them and show that 144 agreements that contain such rules have been signed by 105 WTO members (considering the EU as one member) and notified to the WTO as of the end of December 2016. Most of these services DTAs have been signed between developed and developing countries, with OECD countries, Asia and Latin America leading the number of agreements. However, taking into account their importance for GVCs, there is still ample room for reducing obstacles to trade in services, as the World Bank (2020) points out. This is the case of third-party logistics providers, express delivery services and telecommunications services, including Internet access, which matter for timely delivery to global markets and for effective communication between participants in GVCs. Here, the difficulty in reaching agreements between countries is even higher.

As far as we know, there are no empirical studies that examine the greater liberalisation of trade in services through DTAs with the phenomenon of servicification within GVCs. Although two previous works analyse trade agreements with services provisions, neither of them focuses specifically on GVC-related services. Rubinova (2017) identifies five behind-the-border policy provisions (trade services, capital movement, investment, intellectual property rights and competition policy) with the largest

potential to influence international production networks and explores their impact on manufacturing GVC trade. She finds that services trade provisions positively affect intermediate inputs exports from North to South and final goods exports from South to North. Her interpretation is that such liberalisation of trade in services is fundamental for the insertion of less developed economies in GVCs, which tend to specialise in low-value-added downstream activities. Lee (2019) explores the heterogeneous effects of services trade agreements on backward and forward GVC linkages and the heterogeneous effects of four different provisions on services such as most-favoured nation, national treatment, the right of non-establishment, and movement of natural persons. His findings show a positive and statistically significant effect on GVC exports from South to North. Regarding the heterogeneous impact according to the specific provisions in services trade agreements, the author finds that provisions that allow the export of services without local presence (non-establishment rights) are particularly important in fostering GVC participation.

This paper enriches the prior literature by exploring the effect of the adoption and deepening of services trade agreements on GVC-related services from 1995 to 2011, a period characterised by an increase in new trade agreements with higher coverage rates in services provisions. We estimate a structural gravity model using a Poisson Pseudo Maximum Likelihood (PPML) estimator to deal with the presence of zero trade flows and heteroscedasticity issues. Following recent literature on trade impacts of trade agreements using gravity models (Egger et al., 2020), we also include different leads and lags of the services-DTA variables to investigate the existence of a dynamic adjustment process by capturing anticipation and phasing-in effects and to address endogeneity issues.

Moreover, asymmetric effects could arise from the mode of GVC participation. As Rubinova (2017) and Lee (2019) note, when trade is driven by international production fragmentation, we would expect that the effect of trade agreements would vary according to the income level of the partners and the direction of the trade flows. This suggests that services DTAs may have differential effects depending on whether they are signed between Northern countries, between Southern countries or between a Northern and a Southern country, as countries differ in their GVC participation depending on their specialisation pattern. This would happen particularly in the case of GVC-related services. Developed countries tend to show a more sophisticated way of GVC participation by specialising in more technological and skill-intensive stages where their competitive strength lies, such as high-quality and highly specialised services. Developing countries are less engaged in GVCs or are engaged in less complex GVC activities such as non-advanced manufacturing and assembly (Baldwin et al., 2014; World Bank, 2020). Recent related literature points out that, for developing countries' GVC participation, access to high-quality, highly specialised services to be embodied in their manufacturing exports, often provided by foreign suppliers from the North, becomes a key factor for enhancing their

competitiveness (Díaz-Mora et al., 2018; Blázquez et al., 2020) and their upgrading within GVCs (OECD, 2013; Kowalski et al., 2015). In this vein, if international production fragmentation was driven by offshoring of manufacturing stages from North to South, we would expect an asymmetric impact on the partners due to the deeper services integration. It would lead to higher services valued added from the North contained in Southern manufacturing exports. We also contribute to the literature by exploring these asymmetric effects.

The rest of the paper is structured as follows. After this introduction, Section 2 describes and discusses the data used and provides suggestive descriptive analysis of the key variables of our model. Section 3 presents the specification of the econometric model. Section 4 offers the results of the empirical analysis, focusing on the impact of the adoption of trade agreements in services and their depth on bilateral GVC-related servicification. Section 5 concludes.

2. THE RISE OF DTAS WITH SERVICES PROVISIONS.

As mentioned in the Introduction, the goal of this paper is to test the effect of DTAs with service provisions on GVC-related services. Data on these GVC-related services comes from the TiVA database which offers information for the period 1995 to 2011 and for 64 countries. For them, we employ two explanatory variables related to services DTAs: 1) whether there is an agreement among country pairs that includes services provisions (or not) and 2) the level of depth of that agreement with services provisions. Following Dür et al. (2014), we use the Design of Trade Agreements (DESTA) dataset⁴ to build both variables. We construct a dummy variable, $DTA_SERV_{ij,t}$, that takes the value 1 if there is a DTA with substantial provisions related to service trade liberalisation and 0 otherwise (when there is no mention of the liberalisation of trade in services or when it is just mentioned as a general objective). Additionally, we build a variable to capture the depth of the services agreement, $Depth_DTA_SERV_{ij,t}$, by using an additive index that includes the different substantial provisions contained in the specific services chapter⁵: specific reference to GATS, most-favoured nation clause, national treatment clause, guarantee of the right of non-establishment, permission to movement of people and provision for review. This depth variable goes up to seven depending on the number of clauses of provision the agreement includes. It captures both the adoption of new services DTAs, taking into account their depth and the deepening of those since 1995. The list of DTAs with service provisions that collect the level of depth that has been reached in each of them is displayed in Table A.1 in the Statistical Appendix. Although some of these services DTAs (around one fifth) had already been signed before

⁴ DESTA project aims to systematically collect data on various types of trade agreements (customs unions, free trade agreements or partial free trade agreements). It includes more than 710 agreements, and it is the most comprehensive in terms of both items coded and number of agreements included (<https://www.designoftradeagreements.org/>).

⁵ Roy et al. (2009) and Roy (2011) offer this information from DESTA.

1995, most of them have been adopted since then and half of them from 2005 to 2011; that is, they are very recent agreements.

Furthermore, four country group dummies (North-North, North-South, South-North, and South-South) are constructed to capture the asymmetric effect that services DTAs could have on bilateral GVC-related servicification according to the income level of country pairs and the direction of the trade flows. *North* is defined as the group of high-income countries according to the World Bank country classification by income level while *South* comprises the three remaining groups (low-, lower-middle and upper-middle income countries) (Table A.2 in the Statistical Appendix).

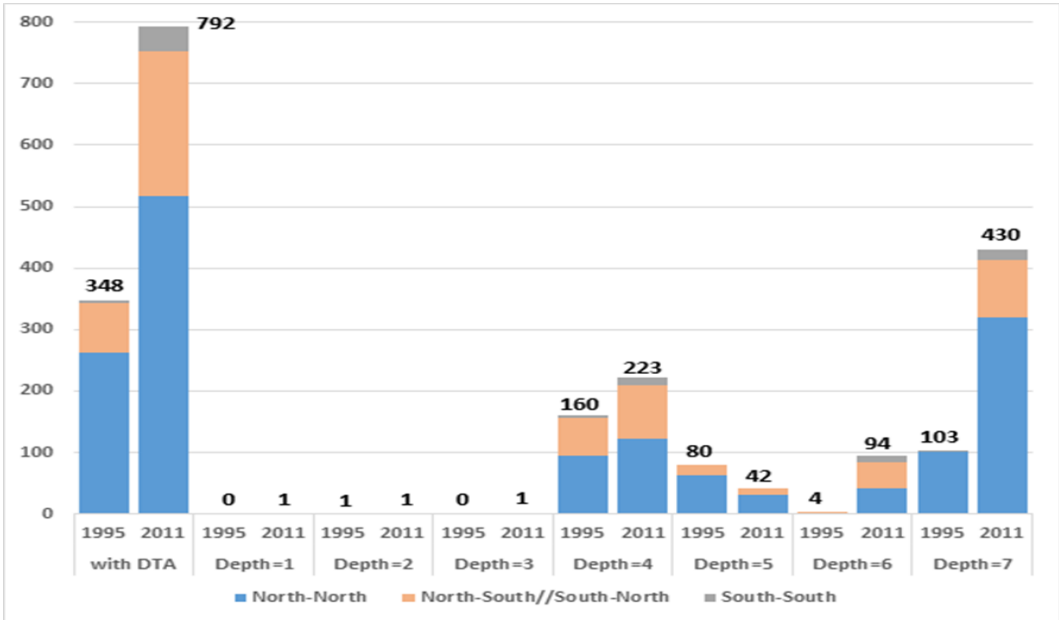
Using the DESTA dataset, we analyse how DTAs with services provisions have evolved over time. It is important to note that these services provisions refer to the four traditional GATS modes of services supply (mode 1: services through cross-border delivery; mode 2: through consumption abroad; mode 3: through establishing a commercial presence; mode 4: through the presence of a natural person). They do not cover specifically services inputs incorporated in manufacturing exports, which some authors have labelled as mode 5 (Cernat and Kutlina-Dimitrova, 2014). Since these services are embodied in manufacturing exports, they face the same tariffs as goods that contain them (Antimiani and Cernat, 2017). This is an important point for our analysis because foreign services are often embodied in foreign intermediate goods inputs which, in turn, are embodied in exports of the exporting country. Anyway, countries that adopt a services trade agreement usually already have a goods trade agreement. Hence, when we analyse the impact of those services trade agreements, we capture the additional effect of specific measures of trade liberalisation in services.

In Figure 1, we observe that the number of country pairs with services provisions in their trade agreements increases by 444 between 1995 and 2011 (from 348 to 792). That is, whereas in 1995, 17 per cent of total country pairs had a DTA with services provisions, that percentage is almost 40 per cent in 2011. This shows how trade relations between countries have developed through new deep agreements which go beyond trade in goods. Although North-South and particularly South-South country pairs have been much more active after having tripled and multiplied by eight, respectively, most agreements are still between North-North country pairs whose number has doubled. The likelihood of DTAs with services provisions between Northern countries (60 per cent of total North-North country pairs) is still higher than between Southern countries (17 per cent of total South-South country pairs).

When the depth of the agreement is taken into account, more than half of services DTAs achieved the maximum level in 2011. These deepest agreements have been the ones that have grown the most. Within them, North-North agreements prevail. A large majority of them take place between the EU15

and Eastern European countries. However, in shallower agreements, there are about as many North-North agreements as there are North-South and South-South agreements combined.

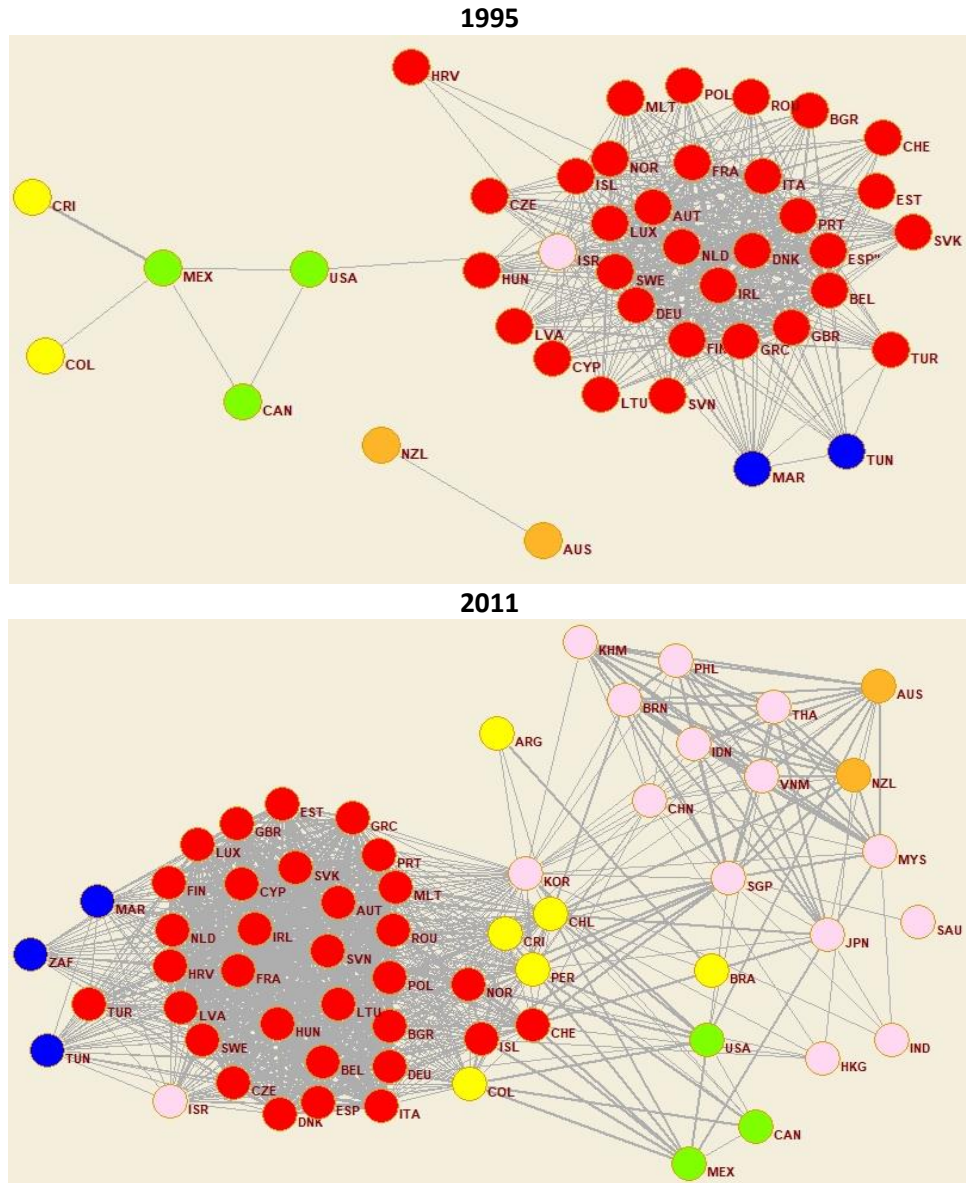
Figure 1. Country pair’s number with services DTAs according to their depth, 1995 and 2011



Source: Authors’ elaboration based on DESTA dataset.

In order to better visualise the regions and countries involved in services trade agreements from 1995 to 2011, we use a social network diagram where nodes are countries and ties represent the existence of such agreements (Figure 2). The links between countries reflect the depth of the services agreement that refers to the number of substantial provisions included in the specific services chapter. The results show that most of the DTAs with services provisions took place between economies from the same continent/region (EU and North America mainly) in the mid-1990s (Figure 2, top chart). It is noteworthy that, even in 1995, there already were some services DTAs between the old EU member states and Eastern Europe economies. In fact, this shows the relevance of European trade integration among countries even before some of them formally joined the EU, as is the case of the former Communist countries. Moreover, the traditional trade links between the European continent and some African countries (Morocco and Tunisia) are reflected in the relevance of some services DTAs in 1995. Fifteen years later, in 2011, the number of services DTAs and their depth of such agreements was much higher (Figure 2, bottom chart). This happened between countries of the same region and between countries that belong to different continents, most notably in agreements within European countries (intra-EU), between European and Asian countries and among Asian countries themselves. Services DTAs were also reinforced between the EU and some North African countries during this period.

Figure 2. DTAs with services provisions by countries and regions in 1995 and 2011



Note: Vertices are in red for the EU countries; green for North America; pink for Asian and Middle East; blue for Africa; yellow for Latin America and orange for Oceania. Links between countries reflect the depth of the services agreement that refers to the number of substantial provisions included in the specific services chapter.

Source: Source: Authors' elaboration based on DESTA dataset using the program package Pajek for analysis and visualisation of large networks (<http://mrvar.fdv.uni-lj.si/pajek/>)

3. EMPIRICAL SPECIFICATION

We propose to estimate a gravity model to study the impact of services DTAs on bilateral GVC-related servicification for the period 1995-2011. The estimating equations are given by the following expressions:

$$Y_{ij,t} = \exp [\pi_{i,t} + \chi_{j,t} + \mu_{ij} + \beta_1 \text{DTA_SERV}_{ij,t} + \beta_2 \text{EIA}_{ij,t}] + \varepsilon_{ij,t} \quad (1)$$

$$Y_{ij,t} = \exp [\pi_{i,t} + \chi_{j,t} + \mu_{ij} + \beta_1 \text{Depth_DTA_SERV}_{ij,t} + \beta_2 \text{EIA}_{ij,t}] + \varepsilon_{ij,t} \quad (2)$$

Here, $Y_{ij,t}$ denotes the value added of services from country i that is embodied in gross manufacturing exports of country j at time t . As explained before, we construct an indicator of bilateral GVC-related services using TiVA database (December 2016 edition) which, in turn, uses information from OECD Inter-Country Input-Output (ICIO) tables⁶. Specifically, it is based on the Leontief inverse matrix to capture those final foreign value-added flows in exports after all stages of production have propagated through the world (Amador and Cabral, 2017). Our indicator of bilateral GVC-related services is the value-added that originates from services industries of a source country embodied in manufacturing exports of the exporting country (EXGR_SERV_FVA using the notation from TiVA indicators).

$\text{DTA_SERV}_{ij,t}$ is a binary variable that captures whether there is a trade agreement with substantial provisions related to services liberalisation between countries i and j at time t . $\text{Depth_DTA_SERV}_{ij,t}$ is a variable that also measures the depth of the adopted services agreement between countries i and j at time t . As mentioned above, using the information on the content of services DTAs, we can distinguish cases where country pairs opt for deeper integration by concluding an agreement with a larger number of services provisions.

$\text{EIA}_{ij,t}$ is also a binary variable which, in this case, takes the value one when the country pair ij has an economic integration agreement (Preferential Trade Agreement or stronger economic integration agreement) at time t from the NSF-Kellogg Institute Database on Economic Integration Agreements⁷. Since countries that adopt a services trade agreement usually already have a goods trade agreement, when this EIA variable is included, the variables DTA_SERV and Depth_DTA_SERV capture the additional effect of specific measures of trade liberalisation in services.

We add pair fixed effects (μ_{ij}) in our gravity estimations with panel trade data to account for the potential endogeneity of the trade policy variable (Baier and Bergstrand, 2007) and for all time-invariant bilateral trade costs (Egger and Nigai, 2015; Agnosteva et al., 2014). Moreover, as noted by Anderson and van Wincoop (2003), taking into account the multilateral resistance terms is essential to avoid biased estimation results in gravity estimations. To control for these unobservable multilateral resistances and, potentially, for any other observable or unobservable characteristics that vary over time for each source and destination country, we include time-varying country-specific fixed effects in

⁶ The December 2018 edition of the TiVA database offers data for the period 2005-2015. Because of the methodological differences between the 2016 and 2018 editions, the latter cannot be used to extrapolate the data from the former.

⁷ Available at <https://kellogg.nd.edu/nsf-kellogg-institute-data-base-economic-integration-agreements>.

our gravity estimation framework with panel data (Olivero and Yotov, 2012). In particular, $\pi_{i,t}$ is a vector of source-country time-varying fixed effects, and $\chi_{j,t}$ is a vector of destination-country time-varying fixed-effects.

We estimate our gravity equation in its multiplicative form instead of logarithmic form using the Poisson Pseudo Maximum Likelihood (PPML) estimator. This approach effectively handles both the presence of zero trade flows and heteroscedasticity, which are common for trade data⁸.

Recently, researchers have suggested the inclusion of both international and intra-national trade flows in structural gravity estimations (Dai et al., 2014; Bergstrand et al., 2015; Anderson and Yotov, 2016; Heid et al., 2021). Among other reasons, the use of intra-national trade data is consistent with gravity theory given that there are domestic as well as foreign varieties that consumers choose from. The main difficulty at this point is the construction and sources of intra-national trade data, which are commonly measured by the difference between gross production and exports (that is, apparent consumption), although this has several limitations (Yotov et al., 2016). In our model, the difficulty is even bigger because the variable of intra-national flows needs to be consistent with our dependent variable. In fact, the previous studies that analyse the impact of trade liberalisation on GVC-related trade do not include intra-national flows (Laget et al., 2020; Lee, 2019; Rubinova, 2017). In this paper, we use the domestic services value added embodied in a country's manufacturing exports as the equivalent of intra-national trade flows. The idea is that manufacturing exporters choose among domestic and foreign intermediate services to be embodied in their production.

Following the recommendations by Yotov et al. (2016) and Egger et al. (2020), we take into account additional considerations. First, we test the possible existence of "reverse causality" between the services DTA variable and the dependent variable, which would cause endogeneity problems. This would happen when, all else equal, the probability that a given country liberalises its trade with another country is greater when that country is already a significant trade partner. In this sense, as the above-mentioned authors suggest, we include future leads of the DTA variables ($DTA_SERV_{ij,t+n}$ and $Deep_DTA_SERV_{ij,t+n}$). Their inclusion allows us to measure an anticipation effect of the future agreement on embodied services value added. In the panel context here, a positive and significant coefficient of the lead variable could hint at an endogeneity problem or could capture anticipation effects if trade increases in anticipation of a trade agreement. Alternatively, a negative and significant coefficient of the lead variable would indicate that trade decreases in anticipation of the benefits of

⁸ We use the Stata command *ppml_panel_sg* (Larch et al., 2019), which allows for fast PPML regression for panel gravity models with time-varying origin and destination fixed effects and time-invariant pair fixed effects. Moreover, it supports multi-way clustering of standard errors. Specifically, we use the automatic three-way clustering option (by exporter, importer, and time, which are all possible dimensions of the panel), even though it leads to more conservative inferences.

the new trade agreement. Secondly, since firms need time to adjust to new trade-facilitation agreements, there can be a delayed (instead of an instantaneous) response of trade flows to those trade policy changes. Such a delayed response is also expected when trade agreements involve phase-in periods to full implementation, which can be significantly different across agreements⁹. For those reasons, Trefer (2004) and Cheng and Wall (2005) suggested using panel data with intervals (3-, 4- or 5-year intervals) instead of data pooled over consecutive years. In this way, the possibility that the effects of trade agreements change over time is captured by including 3-, 4- or 5-year lags of the trade agreement dummy variable. However, the recent study by Egger et al. (2020) points out that the direct trade response to trade agreements is highly non-linear. Also, the use of time-interval data does not allow the capture of the pattern of response times to detect the important phases of the process and may lead to biases of the estimated short-run and long-run effects. Consequently, they recommend using annual data rather than time-interval data in order to distinguish those different phases in the impact of trade agreements on trade flows during the dynamic adjustment process for the average country pair. According to their results, the authors distinguish seven different phases, where the larger positive effects take place between three and six years after the trade agreement is signed and full potential seems to be reached after about seven years from that. Given that they also find some positive anticipation effects, the dynamic-adjustment process is estimated to take about ten years.

Hence, to control for the dynamic effect of trade agreements in services on bilateral GVC-related servicification, specifications (1) and (2) are modified to include a set of leads and lags of both services DTA variables ($DTA_SERV_{ij,t-n}$ and $Deep_DTA_SERV_{ij,t-n}$). In particular, we generate lagged values (up to a maximum of eight years) and lead values (one and two years). Longer lagged effects can only be estimated for older existing agreements which are a small part of the existing ones in our sample. Considering that the impact of trade agreements on bilateral trade may be significantly different across agreements (Baier et al. 2019), the interpretation of the results would be rather specific for those particular agreements. Alternatively, we propose to estimate the model using shorter lags (up to two years). The reason is that many services DTAs are very recent and their effects cannot be observed at longer lagged levels, so those effects cannot be fully captured in our model. The augmented equations with the different sets of lead and lagged variables are as follows:

$$Y_{ij,t} = \exp [\pi_{i,t} + \chi_{j,t} + \mu_{ij} + \beta_1 DTA_SERV_{ij,t+n} + \beta_2 DTA_SERV_{ij,t} + \beta_3 DTA_SERV_{ij,t-n} + \beta_4 EIA_{ij,t}] + \varepsilon_{ij,t} \quad (3)$$

⁹ In a study about how such an implementation period determines the dynamic effects of a trade agreement on trade, Nguyen (2019) shows that the implantation period length differs according to the member countries' level of development. He finds that trade agreements formed between countries with dissimilar development level seem to undertake a longer implementation or transition period. Consequently, he suggests that the impact of North-South agreements on members' trade should be smaller and more delayed than North-North and South-South agreements.

$$Y_{ij,t} = \exp [\pi_{i,t} + \chi_{j,t} + \mu_{ij} + \beta_1 \text{Depth_DTA_SERV}_{ij,t+n} + \beta_2 \text{Depth_DTA_SERV}_{ij,t} + \beta_3 \text{Depth_DTA_SERV}_{ij,t-n} + \beta_4 \text{EIA}_{ij,t}] + \varepsilon_{ij,t} \quad (4)$$

For $\text{DTA_SERV}_{ij,t+n}$ and $\text{Depth_DTA_SERV}_{ij,t+n}$, n takes the values 1 and 2 to include one- and two-year lead variables, and it takes values from 1 to 8 to include up to eight-year lags.

Furthermore, to investigate whether there are heterogeneous responses according to the direction of the embodied services flows, we interact the services DTAs variables with the country group dummies (North-North, North-South, South-North and South-South). Specifically, the North-North dummy will take the value 1 when services value added from a developed country is embodied in manufacturing exports of another developed economy, and 0 otherwise. In the case of the North-South dummy, it will take the value 1 when services value added from a developed country is embodied in manufacturing exports of a developing country. The two remaining country group dummies are constructed in a similar way. These additional specifications are as follows:

$$Y_{ij,t} = \exp [\pi_{i,t} + \chi_{j,t} + \mu_{ij} + \beta_1 \text{DTA_SERV}_{ij,t} * \text{LevDev}_{ij} + \beta_2 \text{DTA_SERV}_{ij,t+n} * \text{LevDev}_{ij} + \beta_3 \text{DTA_SERV}_{ij,t-n} * \text{LevDev}_{ij} + \beta_4 \text{EIA}_{ij,t} * \text{LevDev}_{ij}] + \varepsilon_{ij,t} \quad (5)$$

$$Y_{ij,t} = \exp [\pi_{i,t} + \chi_{j,t} + \mu_{ij} + \beta_1 \text{Depth_DTA_SERV}_{ij,t} * \text{LevDev}_{ij} + \beta_2 \text{Depth_DTA_SERV}_{ij,t+n} * \text{LevDev}_{ij} + \beta_3 \text{Depth_DTA_SERV}_{ij,t-n} * \text{LevDev}_{ij} + \beta_4 \text{EIA}_{ij,t} * \text{LevDev}_{ij}] + \varepsilon_{ij,t} \quad (6)$$

where LevDev_{ij} denotes any of the four country group dummies and n takes the values 1 and 2 to include one- and two-year leads and lags. Here, we limit the number of lagged effects to be estimated to two since the number of less recent agreements is further reduced when subsamples are considered.

4. ESTIMATION RESULTS

4.1. Baseline results

Table 1 displays the estimation results. The first three columns refers to the impact of the adoption of an agreement with services provisions on bilateral GVC-related servicification and the last three columns refer to the depth of the adopted agreement. In all of them, we control for having an economic integration agreement to capture the additional effect of specific agreements with services provisions. This EIA variables shows no statistically significance in any of these regressions.

First, in column 1, we only estimate the contemporaneous effect of trade agreements on services (equation 1). Its coefficient is positive but not statistically significant. A services trade agreement which is signed in a given year does not have a significant effect on embodied services value added from partner countries in that year.

In columns (2) and (3), we incorporate both future leads of services DTAs to account for possible reverse causality between bilateral embodied services and services trade agreements and lags of services DTAs to capture the possibility that these effects change over time (equation 3). These results show a non-significant estimate of the contemporaneous effect of services DTAs, suggesting that these agreements do not promote embodied foreign services between their members immediately. The estimation results when we include one- to two-year lags and leads are presented in column (2). We find a negative and statistically significant coefficient for the first lead, which suggests that embodied services value added from partner countries decrease or are delayed because there is some anticipation effect of services DTAs (Bergstrand et al., 2015; Larch et al., 2019; Laget et al., 2020). This anticipation effect seems to be limited to one year before the agreement is signed, and the decrease is estimated to be around 3.7 per cent ($e^{-0.0372} = 0.9634$). Regarding the lagged effects, the results indicate phasing-in effects of services DTAs. Only the two-year lagged services DTA is positive and statistically significant. This result suggests that the effect of services DTAs takes place the second year after that agreement is formed, and it is a 5.6 per cent ($e^{0.0548} = 1.056$) rise in bilateral GVC-related servicification. The cumulative effect (calculated as the sum of the contemporaneous and the lagged effects) is 0.083 and is statistically significant. This value of the coefficient implies that the cumulative effect of signing a services DTA is a 8.7 per cent increase in embodied services value added from partner countries.

To take into account a broader period of time for phase-in effects of trade agreements (Yotov et al., 2016; Nguyen, 2019; Egger et al., 2020), we estimate the effect of additional lagged effects (up to eight years) of the variable services DTAs. The results are reported in column (3). As explained above, the interpretation of the results would be rather specific for less recent agreements in our sample since these longer lagged effects can only be estimated for them. Here, a positive and significant effect is found exclusively for the five-year lagged variable. Thus, trade agreements with substantial provisions in services seem to have a positive and significant effect on bilateral GVC-related servicification five years after their adoption. This impact is smaller than that of the two-year lagged variable in the previous column (3.3 per cent rise). In contrast, the cumulative effect is higher (14.5 per cent rise).¹⁰

¹⁰ As mentioned above, a common practice in related literature for capturing the possible delay of firms' response to the materialised facilitation of trade flows is to use panel data with time intervals instead of panel data based on consecutive years. When we estimate using two-year and four-year interval data, we obtain a statistically significant positive estimate of the immediate effect of services DTAs. Moreover, both contemporaneous and lagged effects are notably larger, and so is the cumulative effect. Results are available upon request. These results seem to corroborate the argument in Egger et al. (2020) about biased estimates when trade response is highly non-linear and time-interval data are used.

Table 1: Impact of the adoption of services trade agreements

Agreement signature year	(1)	(2)	(3)	(4)	(5)	(6)
	DTA_SERV _{ij}			Depth_DTA_SERV _{ij}		
t+2		0.0064 (0.0218)	0.0203 (0.0179)		0.0025 (0.0032)	0.00443 (0.0027)
t+1		-0.0372*** (0.0076)	-0.0359*** (0.0100)		-0.0056*** (0.0009)	-0.0056*** (0.0017)
t	0.0402 (0.0392)	0.0253 (0.0305)	0.0354 (0.0271)	0.0134* (0.00795)	0.00999* (0.0055)	0.0113** (0.0056)
t-1		0.0034 (0.0128)	0.0036 (0.0098)		0.0009 (0.0019)	0.00088 (0.0018)
t-2		0.0543* (0.0285)	0.0053 (0.0039)		0.00883** (0.0044)	0.0015** (0.0006)
t-3			0.0088 (0.0058)			0.0022*** (0.0008)
t-4			0.0042 (0.0078)			0.0004 (0.0017)
t-5			0.0329*** (0.0077)			0.00410*** (0.0013)
t-6			0.0155 (0.0102)			0.00317** (0.0016)
t-7			-0.0117 (0.0180)			-0.00073 (0.0039)
t-8			0.0376 (0.0324)			0.00363 (0.0054)
EIA	0.0182 (0.0605)	0.0129 (0.0627)	0.0138 (0.0633)	0.0009 (0.0609)	-0.0049 (0.0626)	-0.0033 (0.0627)
Cumulative effect		0.0830* (0.0512)	0.1351 ** (0.0678)		0.0197** (0.0099)	0.0261** (0.1249)
Observations	68,544	68,544	68,544	68,544	68,544	68,544

Notes: Estimates of the effects of services DTAs and their depth on services valued added from a partner country embodied in manufacturing exports (in levels). All estimates are obtained with consecutive-year data for the period 1995-2011, with the PPML estimator and exporter-time, importer-time and country- pair fixed effects. The estimates of all fixed effects are omitted for brevity. The coefficient estimates for the services DTA cumulative average treatment effect are computed using the Delta method. Standard errors are clustered by country pair and are reported in parentheses. p < 0.10, ** p < 0.05, *** p < 0.01.

Next, we estimate the depth of services DTAs on bilateral GVC-related servicification using the variable Depth_DTA_SERV. The results of estimating equations (2) and (4) are displayed in columns (4) to (6). According to them, the depth and not the mere presence of additional services trade agreements matters for foreign value added from services in manufacturing exports. In column (4), when only the contemporaneous effect of that variable is estimated, a positive and statistically significant coefficient is found. The results show that one more point in depth in a services trade agreement (by adding a substantial provision in services) increases the services value added from the partner country embodied in a country's manufacturing exports by 1.4 per cent. When leads and lags are added, the model again estimates a negative one-year anticipation effect (columns 5 and 6). When only one- to two-year lags are included, the contemporaneous effect remains positive and statistically

significant, and so does the two-year lagged effect (column 5). Moreover, the results show a significant cumulative effect of a 2.0 per cent increase in embodied services value added from partner countries. In column (6), when we expand the gravity equation to incorporate up to eight-year lagged effects, we find significant effects for the depth of services DTAs at further lagged levels, which suggests those effects extend for a longer period. Hence, the changes seem to take longer than expected because of phasing-in effects of a deeper services DTA. In particular, in addition to immediate and two-year lagged effects, there are significant effects at the third, fifth and sixth lagged terms. The effect is the strongest five years after the adoption or deepening of the services DTA, with a 0.4 per cent rise in bilateral embodied services. The coefficients of further lagged effects are statistically insignificant, implying that deeper services DTAs have reached their full potential six years after their implementation. The total effect implies that, all else equal, one more point in depth in a services trade agreement led to an average increase of 2.6% in bilateral GVC-related servicification between the agreement members relative to the non-members¹¹.

4.2. Heterogeneous effect of services DTAs by country group

Additionally, we investigate whether the impact of services DTAs and their depth on embodied services value added from a partner country is affected by income differences between partners and direction of the flows. The results of estimating equations (5) and (6) are displayed in columns (1) and (2) of Table 2. We highlight two results. First, the contemporaneous effect is statistically significant in none of the income group of countries involved. Second, we do find differences in lagged effects and in the cumulated effect.

Regarding North-South agreements, neither contemporaneous nor lagged effects of services DTAs are significant. Hence, we do not find empirical evidence supporting that, taking into account the type of GVC participation, services DTAs may matter more for North-South and South-North flows of embodied services. It is important to note that this lack of the effect of services trade agreements could be explained by longer implementation or transition periods for North-South agreements with smaller and more delayed effects than North-North agreements (Nguyen, 2019).

For North-North agreements, the coefficient for the two-year lagged variable is positive and statistically significant. That is, according to our estimates, there are services DTA effects on embodied foreign services between Northern countries two years after the agreement is formed, specifically, an increase of 8.5 per cent (column 1). We also find a significant and negative anticipation effect one year

¹¹ The results of estimating the model using 2-year and 4-year interval data show similar immediate and cumulative effects although there is not an anticipated effect or shorter lagged effects (available upon request). Again, using time-interval data seems to be a worse option for capturing the dynamic adjustment process.

before the adoption of the North-North agreement. The cumulated effect is positive and statistically significant (12.4 per cent rise).

The results for South-South services DTAs are more difficult to explain because the phasing effects show the opposite direction. The impact is negative one year after and positive two years after the signing of the agreement. One possible explanation could be the lack of confidence in the commitment to eliminate trade obstacles among Southern countries, at least in the first year after the adoption of the DTA. This lack of confidence is overcome in the second year. In the case of these South-South exchanges, we find a positive and statistically significant coefficient for the two-year lead of the services DTA. This may suggest an endogeneity problem if the agreement is signed for enhancing flows of embodied services between countries where such linkages are already established or capture a possible anticipation effect if trade increases in anticipation of the agreement. In any case, the very low number of South-South country pairs that have adopted a new trade agreement with services provisions during the period of study implies that the interpretation of its impact on embodied services from the partner country is rather case-specific (Rubinova, 2017). The estimated impacts are driven by particular South-South agreements such as the ASEAN-China agreement on Trade in Services, China-Costa Rica, China-Peru, Peru-Costa Rica and India-Malaysia agreements. Moreover, these results must be interpreted with caution because those are very recent agreements and their effects cannot be fully captured in our model.

Column (2) reports the results on the impact of the formation of services DTAs when their depth is taken into account. The findings are very similar. For North-North agreements, a deeper services integration facilitates embodied services value added from a partner country two years after the agreement, but that positive effect disappears for South-South agreements.

Table 2: Impact of the adoption and depth of services trade agreements by country group

Agreement signature year	-1	-2	Agreement signature year	-3	-4
	DTA_SERV _{ij}	Depth_DTA_SERV _{ij}		DTA_SERV _{ij}	Depth_DTA_SERV _{ij}
N=> N			Intra-EU		
t+2	-0.00500 (0.0266)	0.000861 (0.00426)	t+2	-0.0609*** (0.0121)	-0.00821*** (0.00143)
t+1	-0.0482*** (0.0169)	-0.00724*** (0.00273)	t+1	-0.0131 (0.0261)	0.000726 (0.00313)
t	0.0283 (0.0350)	0.0143 (0.01000)	t	0.122* (0.0761)	0.0606*** (0.0168)
t-1	0.00707	0.00156	t-1	0.00355	0.00111

	(0.0202)	(0.00180)		(0.0160)	(0.00219)
t-2	0.0816**	0.0128**	t-2	0.123***	0.0154***
	(0.0354)	(0.00564)		(0.0305)	(0.00434)
N=> S			EU=> non-EU		
t+2	0.00634	0.00391	t+2	-0.0532	-0.0107
	(0.0472)	(0.00815)		(0.0453)	(0.0102)
t+1	-0.0226	-0.00208	t+1	0.0435	0.0129
	(0.0276)	(0.00487)		(0.0502)	(0.0108)
t	-0.0456	-0.00219	t	0.109***	0.0214**
	(0.107)	(0.0182)		(0.0395)	(0.00928)
t-1	0.0516	0.00967	t-1	-0.000665	-0.00281
	(0.0926)	(0.0138)		(0.0275)	(0.00699)
t-2	0.114	0.0172	t-2	0.161*	0.0416*
	(0.0950)	(0.0155)		(0.0926)	(0.0217)
S=> N			non-EU=> EU		
t+2	0.0257	0.00673	t+2	-0.0486	-0.0118
	(0.0578)	(0.00864)		(0.0500)	(0.0110)
t+1	-0.0203	-0.00341	t+1	0.0591	0.0185
	(0.0148)	(0.00229)		(0.0607)	(0.0136)
t	0.0375	0.00888	t	0.0950	0.0251
	(0.0580)	(0.00900)		(0.0731)	(0.0154)
t-1	0.0354	0.00523	t-1	-0.0132	-0.00602
	(0.0366)	(0.00685)		(0.0546)	(0.0128)
t-2	-0.0568	-0.00832	t-2	0.0979	0.0236
	(0.0480)	(0.0118)		(0.0833)	(0.0200)
S=> S			Extra-EU (non-EU=>non-EU)		
t+2	0.129**	0.0207*	t+2	-0.0134	-0.00182
	(0.0617)	(0.0114)		(0.0227)	(0.00375)
t+1	-0.0107	-0.00121	t+1	0.00542	0.00189
	(0.0563)	(0.00942)		(0.0284)	(0.00469)
t	0.0355	0.00490	t	0.00413	0.00267
	(0.0458)	(0.00759)		(0.0313)	(0.00513)
t-1	-0.0643**	-0.00889*	t-1	-0.0114	-0.00138
	(0.0320)	(0.00514)		(0.0210)	(0.00350)
t-2	0.0916*	0.0147	t-2	-0.0438*	-0.00652
	(0.0516)	(0.00985)		(0.0245)	(0.00519)
EIA _{ijt}			EIA _{ijt}		
N=> N	-0.156***	-0.188***	Intra-EU	0.0164	-0.106*
	(0.0369)	(0.0474)		(0.0547)	(0.0638)
N=> S	0.0266	0.0165	EU=> non-EU	-0.218**	-0.210**
	(0.130)	(0.119)		(0.0909)	(0.0932)
S=> N	0.105	0.0961	non-EU=> EU	-0.162*	-0.174*
	(0.0680)	(0.0596)		(0.0972)	(0.0903)
S=>S	0.108	0.108	Extra-EU	0.130**	0.119**

	(0.0860)	(0.0834)	(0.0575)	(0.0525)
Cumulated effect			Cumulated effect	
N=> N	0.1169*	0.0286*	Intra-EU	0.2475**
	(0.0671)	(0.0149)		(0.0966)
N=> S	0.1202	0.0246	EU=> non-EU	0.2688**
	(0.1163)	(0.0184)		(0.1146)
S=> N	0.0160	0.0057	non-EU=> EU	0,1796
	(0.0796)	(0.0084)		(0.1264)
S=>S	0.0628	0.0107	Extra-EU	-0.0510
	(0.0796)	(0.0146)		(0.0433)
Observations	68,544	68,544		68,544

Notes: This table reports estimates of the effects of services DTAs and their depth on services valued added from a partner country embodied in manufacturing exports (in levels). All estimates are obtained with consecutive-year data for the period 1995-2011 and with the PPML estimator and exporter-time, importer-time and country- pair fixed effects. The estimates of all fixed effects are omitted for brevity. The coefficient estimates for the services DTA cumulative average treatment effect are computed using the Delta method. Standard errors are clustered by country pair and are reported in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

As the European Union has been one of the most active areas in signing services DTAs during the period of study, we re-estimate the model to explore heterogeneous effects for EU and non-EU services agreements on flows of embodied services value added between partners. We construct four country group dummies (EU-EU or intra-EU, EU-non EU, non EU-EU and non EU-non EU). The EU-EU or intra-EU dummy will take the value 1 when services value added from an EU country is embodied in manufacturing exports of another EU economy, and 0 otherwise. The EU refers to the 28 EU member states in the last year of our analysis (2011). Consequently, this EU-EU dummy would capture flows between the former and the new member states that joined the EU in 2004 and 2007. The EU-non EU dummy is 1 when services value added from an EU country is embodied in manufacturing exports of a non-EU country, and 0 otherwise. The construction is similar for the other two country group dummies.

The addition of interaction terms between the services DTA dummy and these country group dummies varies the effect of services DTAs on services value added from a source country embodied in a country's manufacturing exports depending on the EU membership of country pairs and on the direction of the flows. Columns (3) and (4) of Table 2 reports the results. When both countries are EU member states (intra-EU), adopting a services DTA has a positive and significant effect on bilateral embodied services value added. In the case of EU-non EU services DTAs, the effect depends on the direction of the flow. It is significant only for services value added from EU countries to be embodied in non-EU manufacturing exports. In both cases (intra-EU and EU-non EU flows), there are an instantaneous effect and a two-year lagged effect which are similar in magnitude. These increases are

estimated to be between 10 and 16 per cent (column 3). The positive and significant cumulative effect suggests that these services trade agreements lead to an increase of around 28 per cent of services value added from the EU in manufacturing exports of both EU and non-EU countries.

When the depth is taken into account, we also find significantly positive effects of deeper agreements in services for intra-EU flows and for EU-non EU flows (column 4), particularly, a contemporaneous effect and a two-year lagged effect. Notice that the former is larger than the latter for intra-EU flows (an increase of 6.1 per cent vs. an increase of 1.5 per cent), whereas the opposite happens for EU-non EU flows (2.5 per cent of instantaneous increase vs. 4.1 per cent of lagged effect). The cumulative effect is larger than the one obtained for the full sample. One more point in the services DTA depth increases the embodied services value added from an EU member state by 8.0 per cent for EU countries and by 6.2 per cent for non-EU countries.

These findings would support the idea that services DTAs facilitate flows of intermediate services from the EU to be incorporated into manufacturing exports of both new EU member states and non-EU partner countries. These results would be in line with an international production structure where “old” EU member states are specialised in more complex tasks such as GVC-related services, whereas new EU member states and non-EU partner countries are specialised in manufacturing and assembly tasks. Within the EU, the new member states have been playing the role of lower-cost economies (Rubinova, 2017). In the case of EU-non EU flows, the results are largely driven by a few specific agreements such as the EU-Morocco and the EU-Tunisia agreements, both based on the Euro-Mediterranean partnership (EuroMed), the EU-Chile, the EU-South Africa and the EU Switzerland Bilaterals I agreements.

This positive result contrasts with the lack of significant effects on services value added from non-EU countries contained in EU and non-EU manufacturing exports and suggests a different type of bilateral GVC linkage between these country pairs where non-EU trade partners engage in manufacturing-related stages.

To conclude this section, we want to remark the difficulties in capturing the dynamic effects of services DTAs when they have different phase-in periods to full implementation, the period of study is not very long and the number of agreements is short for specific country groups. Additionally, there are several reasons that might explain why the services DTA variable is not statistically significant in all cases. The first is that, for country pairs involved in services trade agreements, trade cost reduction is quite modest and not very different between members and non-members because restrictions in services trade are generally not of a discriminatory nature and do not lead to substantial preferential treatment of partner countries (Miroudot and Shepherd, 2014). The second is that services are often

embodied in intermediate goods, which in turn are embodied in manufacturing exports; that is, there are joint flows of goods and services. In this case, embodied services trade would also have to deal with trade barriers to goods¹². Countries that sign a trade agreement with services provisions usually already have a trade agreement in goods, so they add services to the existing agreement in goods. Consequently, the enhancing effect of this deeper trade agreement on embodied services trade would be diminished. The third is that services inputs that are traded internationally as part of exported manufactured goods are not explicitly covered by GATS modes of services supply. For that reason, a “mode 5: services” to refer to that indirect mode of supply should be created to enhance the foreign services value added component of manufacturing exports given its positive impact on manufacturing competitiveness.

5. CONCLUDING REMARKS

In this paper, we have explored the effect of trade agreements with substantial provisions in services on boosting a specific type of GVC-related trade, which is bilateral foreign services value added embodied in manufacturing exports. The increase of these embodied services value added is one of the channels of the phenomenon of servicification within GVCs. We focus on the period 1995-2011, when many new deep trade agreements that contain rules for the liberalisation of trade and investment in services were signed. Most of them were adopted between developed countries, and are the deepest agreements with regard to the number of services provisions included. Moreover, the EU has been one of the most active areas in signing and deepening these DTAs in services.

Using the gravity framework and a Poisson Pseudo Maximum Likelihood (PPML) estimator to deal with the presence of zero trade flows and heteroscedasticity issues, we have estimated the impact of signing new DTAs with services provisions and the impact of the level of depth of new and deepening agreements on bilateral GVC-related servicification. Also, we have included different leads and lags of the trade agreement to investigate the existence of a dynamic adjustment process by capturing anticipation and phasing-in effects and to address endogeneity issues.

Our results show that both new and deeper services DTAs are associated with significant and positive effects on services value added from partner countries to be embodied in manufacturing exports. When we estimate the impact of signing a new agreement regardless of its depth, only lagged effects are positive and statistically significant, which suggests phase-in periods to full implementation.

¹² Cadestin and Miroudot (2020) highlight that servitised firms (those in which the sale of a good is replaced by a contract covering the provision of the good and related services) have to face both barriers to goods and to services when they export it is seen as a joint export of a good and a service.

When the level of depth of new and deeper services DTAs is measured, both contemporaneous and lagged positive effects are found. Moreover, lagged effects of deeper agreements seem to extend for a longer period (up to six years after the signing of the agreement).

We have further explored the asymmetric effects that could arise from the mode of GVC participation when countries differ in such participation depending on their pattern of specialisation. Looking at contemporaneous effects, we do not find different effects according to the income level of the partners or the direction of the trade flows, because those effects are statistically significant for none of them (North-North, North-South, South-North, South-South). However, our results show heterogeneous two-year lagged effects and cumulated effects for DTAs with services provisions, being positive only for North-North agreements. Differences in the impact of DTAs are particularly apparent for agreements signed by EU countries which seems to play a significant role in boosting services value added from EU countries embodied in both EU and non-EU manufacturing exports. That is, we find a servicification-enhancing effect of services DTAs that takes place only for embodied services value added from EU countries. Therefore, services DTAs seem to allow the EU to exploit its comparative advantage in services and thereby strengthen intra-EU GVCs and GVCs with non-EU countries.

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STATISTICAL APPENDIX

Table A.1. DTAs with services provisions, 1995-2011

Year	DTAs with services provisions	Depth	Year	DTAs with services provisions	Depth
1985	Israel United States	2	2004	Australia United States	7
1988	Australia New Zealand (ANZCERTA)	6	2004	Japan Mexico	7
1988	Canada United States	4	2004	Morocco United States	7
1991	Czech Republic EU	4	2005	EFTA Korea	6
1991	EU Hungary	4	2005	India Singapore	6
1991	EU Poland	5	2005	Japan Malaysia	7
1992	Czech Republic Slovakia	5	2005	Korea Singapore	6
1992	EFTA Israel	5	2006	Chile Colombia	7
1992	Estonia Switzerland	4	2006	Chile Peru	5
1992	European Economic Area	4	2006	Colombia United States	6
1992	Latvia Switzerland	4	2006	Japan Philippines	7
1992	Lithuania Switzerland	4	2006	Peru United States	7
1992	North American Free Trade Agreement (NAFTA)	6	2007	ASEAN China	6
1993	Bulgaria EU*	4	2007	ASEAN Korea	6
1993	EU Romania	5	2007	Brunei Japan	7
1993	EU Slovakia	5	2007	Chile Japan	7
1994	Costa Rica Mexico	7	2007	Indonesia Japan	7
1995	EU Estonia Europe Agreement	5	2007	Japan Thailand	7
1995	EU Israel Euro-Med Association Agreement	4	2007	Korea United States	7
1995	EU Latvia Europe Agreement	4	2008	Australia Chile	6
1995	EU Lithuania Europe Agreement	5	2008	Canada Colombia	7
1995	EU Tunisia Euro-Med Association Agreement	4	2008	Canada Peru	7
1996	Canada Chile	7	2008	China New Zealand	6
1996	EU Morocco Euro-Med Association Agreement	4	2008	China Singapore	5
1996	EU Slovenia Europe Agreement	4	2008	Colombia EFTA	6

1996	Israel Turkey	4	2008	Japan Vietnam	7
1998	Chile Mexico	7	2008	Peru Singapore	7
1999	EU South Africa	6	2009	ASEAN Australia New Zealand	7
1999	EU Switzerland Bilaterals I	4	2009	Chile MERCOSUR	5
2000	EFTA Mexico	7	2009	China Peru	5
2000	New Zealand Singapore	6	2009	India Korea	6
2000	United States Vietnam	6	2009	Japan Switzerland	7
2001	Croatia EU	4	2009	Malaysia New Zealand	7
2001	EFTA services	6	2010	China Costa Rica	4
2002	Chile EU	5	2010	Costa Rica Singapore	5
2002	EFTA Singapore	7	2010	EU Korea	6
2002	Japan Singapore	5	2010	EFTA Ukraine	5
2003	Australia Singapore	6	2010	Hong Kong New Zealand	6
2003	Chile EFTA	6	2011	Costa Rica Peru	6
2003	Chile Korea	6	2011	EFTA Hong Kong	5
2003	Chile United States	7	2011	India Japan	5
2003	China Hong Kong	1	2011	India Malaysia	4
2003	Singapore United States	6	2011	Japan Peru	5
2004	Australia Thailand	6	2011	Korea Peru	6

Source: Authors' elaboration based on DESTA dataset.

Table A.2. Income classification of countries based on World Bank.

High-income countries	Australia (AUS), Austria (AUT), Belgium (BEL), Brunei Darussalam (BRN), Canada (CAN), Switzerland (CHE), Chile (CHL), Cyprus (CYP), Czech Republic (CZE), Germany (DEU), Denmark (DNK), Spain (ESP), Estonia (EST), Finland (FIN), France (FRA), United Kingdom (GBR), Greece (GRC), Hong Kong, China (HKG), Croatia (HRV), Hungary (HUN), Ireland (IRL), Iceland (ISL), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Lithuania (LTU), Luxembourg (LUX), Latvia (LVA), Malta (MLT), Netherlands (NLD), Norway (NOR), New Zealand (NZL), Poland (POL), Portugal (PRT), Saudi Arabia (SAU), Singapore (SGP), Slovak Republic (SVK), Slovenia (SVN), Sweden (SWE), Chinese Taipei (TWN), United States (USA).
Low and medium-income countries	Argentina (ARG), Bulgaria (BGR), Brazil (BRA), China (CHN), Colombia (COL), Costa Rica (CRI), Hungary (HUN), Indonesia (IDN), India (IND), Cambodia (KHM), Morocco (MAR), Mexico (MEX), Malaysia (MYS), Peru (PER), Philippines (PHL), Romania (ROM), Rest of the World (ROW), Russian Federation (RUS), Thailand (THA), Tunisia (TUN), Turkey (TUR), Viet Nam (VNM), South Africa (ZAF).