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Services liberalization and GVC participation: New evidence for heterogeneous effects by income level and provisions*

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Abstract

Participation in global value chains (GVCs) is a key element in the industrialization strategies of many developing nations. Many studies look at the determinants of GVC participation but most focus on domestic regulatory environments, the cost of doing business, and trade policy. This paper investigates the possibility that services also matter by empirically testing for a link between higher GVC participation and services liberalization. Using the gravity framework, I examine the impact of services trade agreements on gross trade and GVC-trade (backward and forward participation). I find that services trade agreements promote both, but especially GVC-trade, although the effects are heterogeneous: the impact is bigger for developing nation exporters. Moreover, I find that services agreements that allow the export of services without local presence (non-establishment rights) are particularly important in fostering GVC participation.

Keywords: Services liberalization, Global value chains, Regional trade agreements, Gravity equation, Non-establishment rights
JEF classification: F13, F14, F15, F63

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1 Introduction

Global value chains (GVCs) have transformed trade and development since the late 1980s by fragmenting the production process across borders (Baldwin, 2013, 2016). Coming under multiple labels such as trade in tasks, international fragmentation, offshoring, and the second unbundling, GVCs have attracted enormous attention both from academics and policy makers in the developing and developed world.

Although studies on GVCs and trade have been focused on the manufacturing sector, services also play a critical role in GVCs. However, the role of services in value chains is often underappreciated and poorly understood despite the dominance of services in many national economies in terms of GDP and employment (Low, 2013). One of the most startling new facts concerning services have emerged from the breakthrough that came with the development of "value added trade" concepts (Koopman et al., 2014; Timmer et al., 2014; Johnson and Noguera, 2012). A joint OECD-WTO project found that services contribute over 50% of total value added embodied in the exports of the US, UK, France, Germany and Italy. Even for China, traditionally viewed as a goods exporter, about one third of their value added exports come from the service sector.

The importance of services in GVCs, however, goes beyond their large share in value-added. It has been argued that a well-functioning services sector enables and facilitates fragmentation, leading to an international reallocation of production stages (Jones and Kierzkowski, 1990; Francois, 1990c; Deardorff, 2001). The recent popularization of the GVC concept has also highlighted the connection, with many authors emphasizing how services is like the glue that holds supply chains together and ensures that they function in a fluid manner (Low, 2013; Egger et al., 2015; Francois et al., 2015).

Besides the rise of GVCs, another phenomenon, not unrelated, that characterizes trade in the past three decades is the rapid surge of bilateral and plurilateral trade agreements.[1] This proliferation has not only been in terms of quantity but also the quality or "depth". Recent trade agreements often include provisions on services, investment, environmental and labor standards, as well as tariff reductions. These deep agreements have also been partly motivated by the international expansion of production networks since a harmonization in certain national policies facilitates cross-border business activities and allows GVCs to work smoothly (Lawrence, 1996). Furthermore, the actors involved in regional trade agreements (RTAs) have also become

[1]Hereafter, I use the term regional trade agreements (RTA) for all bilateral and plurilateral trade agreements, also referred to as preferential trade agreements (PTA).

more diverse. In 2010, South-South trade agreements represented two-thirds of all RTAs in force, compared to barely 20 per cent three decades earlier (Organization, 2011). This increased coverage and heterogeneity of RTAs provide the variation needed to identify the heterogeneous impact of services liberalization on GVC participation.

Using extensive datasets on RTAs and international input-output linkages, I examine whether a country pair that has freer trade in services via RTAs tend to engage more in GVC-trade. By focusing on manufacturing GVCs as the outcome variable, the paper seeks to identify the role of services trade liberalization beyond boosting trade in services, but as the "enabler" for a broader unbundling of production. This is one of the first attempts to empirically test the impact of services liberalization on manufacturing GVC participation. Furthermore, it examines the varying effect of services trade agreements depending on countries' income level as well as the specific provisions in the agreement. This is a novel contribution to the literature that has not yet explored the asymmetric effect of services liberalization in helping developing countries join GVCs, as well as the heterogeneous effects of different provisions in services RTAs.

This paper is related to three groups of literature. The first one is on quantifying GVCs and trade in value added.[2] One of the earliest attempts to measure international fragmentation was by Feenstra and Hanson (1996), focusing on the foreign content of domestic production, using information from input-output (I-O) tables. Hummels et al. (2001) further narrowed the measure to capture the import content of exports, to focus on cases where the good or service cross borders at least twice. Recent efforts to build international I-O matrices has led to more advanced measures of GVC such as those developed in Johnson and Noguera (2012), Timmer et al. (2014), Koopman et al. (2014), Wang et al. (2013). The empirical analysis in this paper relies on the decomposition method developed in Wang et al. (2013) to construct bilateral measures of GVC participation.

Then, there is a relatively smaller but quickly growing literature on the role of services in GVCs. Early theoretical research on the role of services in international trade and fragmentation includes Jones and Kierzkowski (1990) and Deardorff (2001) who argue that trade liberalization in services can stimulate fragmentation of production of both goods and services, thus increasing international trade and gains from trade. Empirical research on services and GVCs has been rather limited, due to the relative scarcity of data on services

[2]The GVC literature builds on a much larger literature on fragmentation, sometimes referred to as "vertical specialization" (Hummels et al., 2001), the "second unbundling" (Baldwin, 2006) or "trade in tasks" (Grossman and Rossi-Hansberg, 2008). For an excellent survey of this literature, see Amador and Cabral (2016).

trade or services liberalization. Some recent attempts include Francois et al. (2015) who examine the value added linkages between services and goods and stress the importance of services for the total cost structure of traded goods and services. Debaere et al. (2013) show that, for Ireland, greater availability of services across regions, industries, and time increases firms' foreign sourcing of materials relative to sales. Nordås and Rouzet (2015) show that services trade restrictions are negatively associated with both imports and exports of services as well as manufactured goods, using a new dataset on services trade restrictiveness. Beverelli et al. (2015) examine the link between services trade restrictiveness and manufacturing productivity, emphasizing the role of institutions, while Miroudot and Shepherd (2016) analyzes trade in services with new measures of trade costs, distinguishing between services used as inputs and for final consumption. The main message from these earlier studies that services linkages are important for the trade and performance of the goods sector as well is in line with the findings of this paper. Nonetheless, the literature has not yet empirically established how preferential services liberalization affects GVC participation in manufacturing.

Finally, a large strand of literature studies the impact of regional trade agreements on trade flows, but fewer studies focus on services trade agreements.[3] However, as many of the major trade agreements now include service provisions, some effort has been made to better understand the implications of trade agreements in services.[4] Mattoo and Fink (2004) argue that a country is likely to gain from trade liberalization in services due to the low costs of trade diversion (compared to goods liberalization), as well as potential knowledge spillovers. Yet, the effect of having RTAs covering services, or whether they actually are preferential, is debated due to the often non-discriminatory nature of services restrictions (Roy et al., 2007; Miroudot et al., 2010; Miroudot and Shepherd, 2014). To deal with this issue, Marchetti and Roy (2008) delve deeper into investigating the actual commitments made in services RTAs and compares them with countries' multilateral commitments. Finally, Shingal (2016) is one of the first to take into account heterogeneous provisions found in services RTAs, but only considers the aggregate number of provisions "depth") and how it affects services trade flows, as opposed to this paper that examines the effect of specific provisions on manufacturing GVC-trade.

The empirical findings of this paper show that services trade agreements

[3]See Head and Mayer (2013) and Cipollina and Salvatici (2010) for a survey on the use of gravity equations to identify the effect of RTAs. The review here focuses only on services trade agreements.

[4]See Francois and Hoekman (2010) for a survey.

(or substantive provisions on services) increase gross trade, and to a larger extent, GVC-trade between developing countries, and from developing (South) to developed countries (North). The trade-enhancing effect of RTAs that cover services is almost double the effect of RTAs that only cover goods for Southern exporters. Regarding specific provisions, services agreements that have a provision to allow the export of services without local presence (i.e. right of non-establishment) significantly increase GVC-trade in manufacturing.

The remainder of the paper is organized as follows. Section 2 provides a theoretical background to think through how trade liberalization in services affects cross-border production sharing. Section 3 discusses the heterogeneous effects of services trade agreements on GVC participation depending on countries' income levels and the provisions in the agreement. The empirical specification is described in Section 4, and the data in Section 5. Section 6 presents the results and Section 7 concludes.

2 Theoretical background

Why should services liberalization affect manufacturing GVC participation? A theoretical framework can help us think through the mechanism and provide guidance for the empirics. Early work by Jones and Kierzkowski (1990) provides a theoretical framework where the disparity in productivities and factor prices found between countries (or regions) encourage the use of multiple locations as production blocks for a given production process, i.e. global value chains.[5] Fragmentation, therefore, essentially lowers the marginal costs of production while increasing the total fixed costs from the multiple locations. A key element of the fixed cost of fragmentation is the cost of services linkages — for example, transportation, telecommunications and various producer services such as financial and business services — which are necessary for coordinating different stages of production.[6] If services linkages were more costly to build across borders than domestically, international fragmentation would be the more efficient production choice as long as the additional fixed cost is outweighed by the reduction in marginal costs. This implies that trade liberalization in services could lead to an increased reallocation of production activities.

The possibility that production stages can be dispersed geographically in-

[5]Such production cost differentials are consistent with traditional trade models such as the Ricardian and Heckscher-Ohlin models without factor price equalization.

[6]The role of producer services in specialization and the division of labor is also stressed in Francois (1990a,c).

creases the chance for less developed countries to participate in the industrialization process, whether the source of comparative advantage is differences in technology or factor intensities. This means that some developing countries may be able to attract manufacturing activities located in developed economies by liberalizing trade in services.

A formal North-South model of global sourcing is developed in Antràs and Helpman (2004).[7] A Northern firm's choice of supplier location is governed by the tradeoff between the lower variable costs of southern manufacturing against the lower fixed organizational costs in the North.[8] The location of production is determined by the North-South difference in fixed organizational costs as well as the wage gap. The model predicts that more firms will offshore their manufacturing stages to the South, as the South's organizational cost disadvantage becomes smaller. Interpreting this setup in the light of services, we can say that one of the key elements in the fixed organizational costs is the cost of coordination, which decreases in the presence of good services links. Therefore, a services liberalization that brings good services to the South, hence lowering their fixed organizational cost, would lead to more offshoring to the South.

An important difference in thinking about trade liberalization in services and goods is that services liberalization is fundamentally asymmetric. In a typical trade model, RTAs liberalizing trade in goods are often modeled as a symmetric reduction in trade cost that increases trade. This makes sense when the liberalization takes the form of reciprocal reduction in tariffs, for example. However, services liberalization is profoundly different due to the special nature of services: its global concentration in the North as well as its non-discriminatory character. What matters is to get good services into a country, which in most cases, developed countries already have. Therefore, we should not expect a preferential liberalization in services trade between a developing and developed country to have a symmetric impact on the two partners: it will enhance the quality of services available in the South while affecting the North less. This, in other words, is an asymmetric reduction in the fixed organizational cost for the South in the global sourcing model.

Two hypotheses that follow directly from these frameworks are:

[7] In their model, organizational forms are characterized by ownership structures as well as supplier locations. I focus here only on the choice of supplier locations.

[8] The fixed organizational cost includes joint management costs of final and intermediate goods production such as supervision, quality control, accounting, and marketing which depend on the organizational form and the offshoring location. It is assumed that fixed organizational costs are higher in the South than in the North. The model assumes North to be "home" but the argument goes through for offshoring in a foreign North, as long as the fixed organizational cost is lower than the South.

1. Services liberalization that effectively lowers the fixed cost of providing services across borders would lead to an increased international fragmentation in the manufacturing production process.

2. If services trade agreements lower the fixed cost of fragmentation asymmetrically for developing and developed countries, services agreements will lead to an increased participation in GVCs by developing countries.

This brings us to the next section which further describes how the impact of services liberalization is expected to differ by income levels and specific provisions.

3 Heterogeneous effects of services liberalization

Not all services trade agreements are the same. The role of services liberalization in promoting GVC participation will depend on the effective cost reduction in services linkages that are needed for internationally dispersed production blocks, as well as the nature of GVC participation. Specific provisions and commitments made in the services trade agreements determine whether an agreement would effectively reduce the cost of services linkages in GVCs. Furthermore, the asymmetric nature of services liberalization conjectures that services trade agreements play a stronger role in facilitating GVC participation of developing countries where services sectors tend to be more restrictive.

3.1 With whom you sign the services trade agreement matters

In the theoretical framework described in the previous section, gains from trade liberalization in services manifest themselves in a greater participation of developing countries in manufacturing GVCs. This follows from two main reasons. First, a services trade agreement between a developing and a developed country is likely to affect the services sector of the developing country more, by allowing access to high-quality services from the North. Since many of the restrictions in services trade are in fact behind-the-border measures or non-discriminatory in nature, services agreements do not necessarily provide substantial preferential treatment to partner countries symmetrically. Moreover, an agreement is more likely to be cost-reducing if the existing barriers to services flows are high, which is often the case for developing countries.

This suggests that services agreements have differential effects depending on whether they are signed between developed countries, between developing countries, or between a developed and a developing country, where the effect should be asymmetric in the last case.

Another reason is the nature of comparative advantages of developed and developing countries. The relocation of production stages across borders (or GVCs) happens for several reasons, and the nature of production sharing varies by countries' income levels (Taglioni and Winkler, 2016). If developed and developing countries have different comparative advantages, less costly service links allows more production blocks to be dispersed across North-South borders since certain production stages, for example the labor-intensive ones, could be more cheaply carried out in developing countries. This is essentially because developing countries' comparative advantage is typically in lower costs while developed countries' comparative advantage is often in technology and innovative capacity, and hence, services liberalization strengthens the comparative advantage of developing economies more. Therefore, even if the most efficient providers of service links were located in the developed world, liberalization of services and a subsequent fragmentation of production could result in a finer international division of labor that developing countries could actively share.

3.2 Provisions in services trade agreements

Services trade agreements are very heterogeneous in their commitments and provisions. In this section, I consider four main types of provisions that are frequently found in services RTAs: most-favored nation (MFN), national treatment (NT), the right of non-establishment, and movement of natural persons. The MFN and NT clauses are core disciplines that are also found in GATT (Article 1 for MFN and Article II for NT) as well as GATS (Article II for MFN and Article XVII for NT), while the right of non-establishment and movement of natural persons are specific to services trade agreements.

Most-Favored Nation

The MFN principle guarantees that the best access conditions conceded to one country is automatically extended to all other participants in the system. MFN clauses in RTAs, however, are more complex and diverse than in multilateral agreements. While the MFN discipline in multilateral agreements ensures non-discrimination between members of the multilateral trade body, in RTAs, the promise of non-discriminatory treatment is a reciprocal trade preference between RTA partners. Furthermore, the reach of these

MFN clauses in RTAs is often limited due to specific reservations to the treatment (Fink and Jansen, 2009).

National Treatment

NT implies the absence of all discriminatory measures that may modify the conditions of competition to the detriment of foreign services or service suppliers. By forbidding discrimination against all established firms (even if they are foreign-owned), the scope for preferential treatment of certain foreign providers post-establishment may be limited.

Right of non-establishment

One of the key features in increasingly more RTAs is the comprehensive set of disciplines on investment and the temporary movement of business people. For example, RTAs featuring generic investment disciplines often include a right of non-establishment, which means that no local presence is required as a pre-condition to supply services. The non-establishment provision, for which no GATS equivalent exists, reduces the fixed cost for foreign services providers and is particularly well-suited for promoting e-commerce (Mattoo and Sauvé, 2008).[9] Also, it is particularly relevant to certain services sectors that are not naturally bound by a characteristic specific to some services: proximity requirements. Traditional services are considered to require temporal and spatial proximity between the production and consumption of the service (e.g. haircut). However, ICT development has allowed many modern services to be traded and consumed from distance (e.g. e-learning courses, financial products). Therefore, the right of non-establishment is naturally more important for certain services sectors (e.g. business and financial services) than others (e.g. construction and transport services).

Consider financial services, for example. A financial institution can deliver its services abroad through physical channels such as branches and representative office, or through remote channels like call centers or electronic channels using internet. While supply of insurance services is often allowed on a cross-border basis with certain regulations, in case of banking, pure cross-border supply is often prohibited by requiring that services be provided through a commercial presence (Marchetti, 2009). Such requirements

[9]Mattoo and Fink (2004) categorize services trade restrictions into those that increase the fixed and/or variable cost of services trade and those that impose quantitative restrictions on sales and/or number of providers. The requirement to establish a local presence, the need to re-qualify for foreign professionals, and license fees for entry into the market are examples of measures that increase the fixed cost.

of local presence can increase the fixed cost of providing services across borders by requiring additional capital and liquidity as well as higher regulatory complexity.

Movement of natural persons

Many RTAs explicitly allow movement of natural persons in the provision of services either in the form of a chapter or an annex. This clause is specific to mode 4 of services trade where a service is supplied through the temporary presence of a natural person of one member in the territory of another member (e.g. independent professionals). When supply chains are internationally dispersed, or firms offshore certain production tasks abroad, the ease of temporarily moving people around could be essential. For instance, a firm may decide to offshore its assembly process to a developing country only if it knows that it could easily send its own managers or engineers when necessary. It is noteworthy, however, that the issue of movement of persons is also often dealt with outside the scope of RTAs such as migration policies.

4 Empirical specification

The link between services liberalization and the fragmentation of production stages was theoretically explored in Section 2, which led to a testable hypothesis: do certain types of services liberalization increase countries' participation in manufacturing GVCs? To answer this question, I use the gravity equation to identify the heterogeneous effect of services trade agreements on gross trade and GVC-trade. The bilateral framework of the gravity model allows me to tackle the issue of endogeneity often present in country-level indicators of services liberalization.

Before moving on, however, it is worth noting that services restrictions that hinder GVC-trade can be both unilateral and bilateral. Unilateral restrictions include domestic barriers to competition or administrative requirements that make any type of business activity more costly and hence, hinder participation in GVCs. A country with a very restrictive and uncompetitive logistics or transport services, for instance, will not be an attractive destination for production offshoring from any country. On the other hand, there could also be bilateral restrictions. For instance, when a firm sources intermediate inputs from a foreign country, it may want to provide its own legal or banking services to the foreign affiliate or supplier. The cost of building such services linkages can vary bilaterally depending on regional trade agreements that grant preferential treatment. The empirical analysis in this paper

is limited to this bilateral dimension of services restrictions that hinder GVC participation.

Bilateral measure of GVC participation

The outcome variable is a bilateral measure of GVC-trade in manufacturing.[10] Conceptually, this is because the research question of this paper is on the role of services liberalization in the fragmentation of the production process, going beyond facilitating services trade. In addition, this solves potential problems arising from the fact that services trade data in the inter-country IO tables are often imputed using a gravity model, which can hence cast doubt to the validity of using the gravity model to analyze the data.

The most basic measure of GVC-trade would be *gross trade in intermediate goods*, as trade within a GVC entails parts and components crossing borders multiple times. More sophisticated indicators of GVC participation can be calculated based on either backward or forward linkages. At the unilateral country level, backward and forward linkages are defined as the foreign value added in domestic exports, and the domestic value added in foreign exports, respectively. It is worthwhile looking at GVC indicators based on both backward and forward linkages as they bring out different aspects of GVC participation, depending on the country's specialization pattern. For instance, exports of countries that are specialized in high value-added tasks are better captured by forward linkages, while exports of countries specialized in simpler tasks will have stronger backward linkages. This implies that backward linkages may empirically be a better measures for the GVC participation of lower income countres, while forward linkages are more appropriate for wealthier countries or primary commodity exporters (Kummritz, 2016).

To build bilateral measures of backward and forward linkages, I use the decomposition method developed in (Wang et al., 2013). Their decomposition splits gross bilateral exports into 16 components, broadly into domestic value-added absorbed abroad (DVA), domestic value added returning home (RDV), foreign value added (FVA), and pure double counting terms (PDC) at the sector level. This accounting framework allows me to construct the fol-

[10]Developing novel indicators of GVC participation is still an ongoing process, but what has been used mostly in the empirical literature on GVC include the Vertical Specialization (VS) that captures foreign value added in exports (Hummels et al., 2001) or its variations such as VS1 and VS1*, and the VAX ratio which is the share of value-added to gross exports as an inverse measure of GVC (Johnson and Noguera, 2012). Koopman et al. (2014) summarize the relationship among these different measures by deriving a comprehensive decomposition of gross exports, and Wang et al. (2013) extend the decomposition to a bilateral and sector level.

lowing bilateral measures of GVC participation.[11] First, the bilateral sourcing measure, or the *backward* linkage indicator, between countries i and j for industry k is defined as the sum of value added from all industries of all foreign countries in the exports of country i's industry k to country j. Second, the bilateral selling measure, or the *forward* linkage indicator, is defined as the sum of value added from country i's industry k in country j's export to all foreign countries in all industries. This measure includes back-and-forth trade, that is the value added from country i's export to country j in industry k that comes back to country i. To clarify what these bilateral indicators capture, consider an example GVC of car speakers as in Figure 1. Say a Japanese car manufacturer offshores the production of speakers for a new car model. Korea exports the speaker drivers such as tweeters and roofers to Thailand where they produce a frame around it. This, then, is shipped to a Chinese plant for final assembly before being exported to Japan where it will be used in their car production.

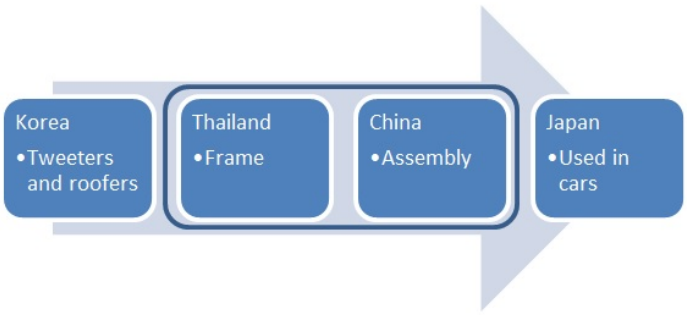

Figure 1: An example GVC of car speakers

In this example, Thailand and China are engaged in GVC-trade that also involves Korea (backward) and Japan (forward). The bilateral backward and forward GVC measures for Thailand (T) and China (C) would be:

- $Backward_{TC}$: Korean value-added in Thailand's export to China (i.e. the value of the tweeters and roofers)
- $Forward_{TC}$: Thai value added in Chinese exports to Japan (i.e. the value of the frame)

The backward-GVC measure for Thailand and China captures the foreign value added in Thailand's export to China, while the forward measure cap-

[11]The decomposition was technically implemented using the R package *decompr* developed by (Quast and Kummritz, 2015), which automates the calculation of GVC indicators.

tures the Thai value added exports to China that is re-exported. Both measures are elements of gross trade between Thailand and China but captures different asepcts of GVC participation. Note that the notion of "forward" and "backward" is relative for these bilateral indicators. The "forward" measure captures what is a forward participation from Thailand's point of view but a backward participation from China's point of view. Also, the value of Korean roofers exported to Thailand is captured by the forward-GVC measure between Korea and Thailand ($Forward_{KT}$) as well as backward GVC measure for Thailand and China ($Backward_{TC}$).

The gravity equation

The gravity equation is a very strong and robust empirical tool in international trade, widely used and developing over time in terms of econometric techniques to accurately estimate the effects of RTAs on trade flows (Carrère, 2006; Santos Silva and Tenreyro, 2006; Baier and Bergstrand, 2007; Head and Mayer, 2013; Bergstrand et al., 2015). I use the gravity equation to cleanly identify the effect of services trade liberalization on GVC-trade.

To control for observed and unobserved heterogeneity across countries and pairs, and to minimize the risk of endogeneity, I include a rich set of importer-year, exporter-year, and country pair fixed effects. One of the biggest and oldest concerns in identifying the effect of trade policy on trade flows is endogeneity, since countries that trade more with each other are arguably more likely to conclude an RTA. Addressing this issue, Baier and Bergstrand (2007) argue that the most plausible estimates of the average effect of RTAs on bilateral trade flows can be obtained by the use of panel data with country pair fixed effects. This eliminates an important source of endogeneity that is due to time-invariant unobserved heterogeneity between country pairs.[12] Furthermore, in estimating the gravity equation, I use the Poisson Pseudo Maximum Likelihood (PPML) estimation, as advocated by Santos Silva and Tenreyro (2006), to account for potential heteroskedasticity in the trade data which can lead to inconsistent estimation of log-linearized OLS.[13]

[12]The fixed effects, however, cannot account for country-pair-specific changes over time, other than trade agreements, that may affect trade flows (Bergstrand et al., 2015). The concern for potentially remaining endogeneity is partially addressed in the robustness checks by interacting distance with year dummies. This would control for the changing effects of distance, possibly an important element of changes in bilateral trade costs over time.

[13]The PPML regressions were technically implemented using the STATA command *ppml_panel_sg*, developed by Zylkin (2017), which speeds up the estimation with many fixed effects.

The estimating equation is given by

$$Y_{ijt} = \exp(\beta_0 + \beta_1 RTA_{ijt} + \beta_2 SERV_{ijt} + \alpha_{ij} + \alpha_{it} + \alpha_{jt}) + \epsilon_{ijt} \qquad (1)$$

where Y_{ijt} is gross or GVC-exports in manufacturing from country i to country j in year t. Three alternative measures of GVC-exports (described in detail above) will be used: gross exports in intermediate goods, backward GVC-exports, and forward GVC-exports. α_{ij} captures all time-invariant country pair-specific effects such as distance, cultural and linguistic similarities, as well as any unobserved bilateral characteristics that may affect the trade flow between the two countries. α_{it} and α_{jt} are country-year fixed effects that capture all exporter or importer characteristics that vary over time such as output, price levels and multilateral resistance. RTA is a dummy variable which takes value one when the country pair has an RTA (FTA or stronger), and $SERV$ is a dummy variable for having a services trade agreement or a substantive services provision.[14] Note that variable $SERV$ is equivalent to an interaction variable with RTA (i.e. $RTA_{ijt} \times SERV_{ijt}$) since there are no observations where a country pair has a services agreement without having an RTA in goods. Hence, β_2 captures the extra effect of having a services agreement additional to a goods RTA. Also note that the identification is within country pairs since dyad fixed effects are included. This means that β_2 is identified not by comparing GVC-trade of a country pair with an RTA only covering goods to another pair with an RTA that also covers services, but by comparing GVC-trade of a country pair when it only had an RTA in goods to when it also had a services trade agreement. This would be the case when a country pair that already has a bilateral or regional trade agreement in goods later becomes part of another RTA (perhaps with different members involved) that includes services, or when a country pair signs a bilateral or regional trade agreement for goods and services but the date of entry into force is different for the two.[15]

A caveat for the bilateral framework is that it has some limitations in addressing the particular research question of this paper for two main reasons. First, GVCs are not bilateral. As the name suggests, GVCs involve a chain or network of countries at the global or regional level, often more than two. Although it is possible to measure GVC-trade at the bilateral level, as discussed in detail above, it is admittedly not an ideal measure to capture the

[14] See next section on data for more details.

[15] An example of the first case would be New Zealand and Thailand. They first signed a bilateral trade agreement for goods (entry into force: 2005), and then became part of the ASEAN-Australia-New Zealand agreement which also covered services (entry into force: 2010). An example of the latter case would be, ASEAN-China trade agreement which entered into force in 2005 for goods and in 2007 for services.

degree of "global" value chains. Second, estimating the impact of services trade liberalization through a bilateral framework (i.e. RTAs) is much less straight-forward than for goods trade liberalization. As Miroudot and Shepherd (2014) point out, RTAs play a different role for goods trade and services trade in reducing trade costs. While trade costs are significantly lower within RTAs for goods, for services, the reduction of trade costs for country pairs that are part of an RTA is much smaller and diminishing over time. This is because many of the restrictions in services trade are behind-the-border measures or non-discriminatory in nature. Despite these limitations, the gravity model allows us to capture to the extent that is possible the impact of services trade liberalization on manufacturing GVC participation with the least concerns for endogeneity. One should however be cautious in interpreting the results of bilateral (or preferential) services liberalization.

Heterogeneous effect of services agreements

As described in Section 3, the asymmetric and often non-discriminatory nature of services liberalization suggests that the effects of services trade agreements are likely heterogeneous. To allow for such heterogeneity, I include interactions variables with the SERV dummy: first with income pair dummies (SS, NS, SN) and then with provision dummies (MFN, NT, $NonEst$, $Move$).

$$\begin{aligned} Y_{ijt} = \exp\big[&\beta_0 + \beta_1 RTA_{ijt} + \beta_2 SERV_{ijt} + \beta_3 (SERV_{ijt} \times SS_{ij}) \\ &+ \beta_4 (SERV_{ijt} \times NS_{ij}) + \beta_5 (SERV_{ijt} \times SN_{ij}) + \alpha_{ij} + \alpha_{it} \\ &+ \alpha_{jt}\big] + \epsilon_{ijt} \end{aligned} \tag{2}$$

SS is a dummy variable equal to one if the exporter and importer are both developing countries (South-South), NS equals one if the exporter is high-income and importer is a developing country (North-South), and SN equals one if the exporter is a developing and importer is a high-income country (South-North).[16] The benchmark (SERV) captures the effect of services trade agreements between developed countries (North-North).

Similarly for provisions, I estimate

$$\begin{aligned} Y_{ijt} = \exp\big[&\beta_0 + \beta_1 RTA_{ijt} + \beta_2 SERV_{ijt} + \beta_3 (SERV_{ijt} \times MFN_{ijt}) \\ &+ \beta_4 (SERV_{ijt} \times NT_{ijt}) + \beta_5 (SERV_{ijt} \times NonEst_{ijt}) \\ &+ \beta_6 (SERV_{ijt} \times Move_{ijt}) + \alpha_{ij} + \alpha_{it} + \alpha_{jt}\big] + \epsilon_{ijt} \end{aligned} \tag{3}$$

[16]Income groups are defined according to World Bank's classification. North includes countries that were classified as high-income in 1995, and South include countries that were classified as low- and middle-income in 1995.

where MFN equals one if the services agreement between the country pair (ij) at time (t) includes a MFN provision. Likewise, NT, $NonEst$, and $Move$ are dummy variables for having a provision on national treatment, non-establishment, and movement of natural persons.

5 Data

The bilateral indicators of GVC participation are calculated from OECD Inter-Country Input-Output tables (ICIO). This international input-output data allows one to decompose gross trade, using the method developed in Wang, Wei, and Zhu (2013) with a large coverage — 61 countries, 34 industries, and 7 years. For the empirical analysis in this paper, I exclude countries that do not have a manufacturing export base (i.e. less than 20 percent of total exports in manufacturing).[17] Also, I exclude years 2008, 2009, and 2010 in which trade flows were heavily affected by the global financial crisis. This is also to be consistent with the literature in using 5-year intervals. The resulting dataset has 56 countries and 4 years (1995, 2000, 2005, and 2011).[18]

For data on trade agreements, I use the Economic Integration Agreement (EIA) database by Baier and Bergstrand (2007) and the Design of Trade Agreements (DESTA) database by Dür et al. (2014). The latest version of the EIA database covers the period 1950–2012. They code the trade agreements as following: (1) non-reciprocal preferential trade arrangements, (2) preferential trade arrangements, (3) free trade areas, (4) customs union, (5) common market, and (6) economic union. The dummy variable for the existence of an RTA equals one if a country pair has a FTA or stronger, as often used in the literature.

DESTA also provides an extensive database of PTAs signed between 1945 and 2015. Building on the list held by the World Trade Organization (WTO) and World Trade Institute (WTI), it combines agreements from a large number of other sources such as webpages of foreign ministries or governmental institutions, making it one of the most ambitious attempts at measuring the design of preferential trade agreements in terms of the number of agreements and sectors covered. Besides its large coverage, the dataset also measures the depth of each agreement as an additive index that combines seven key

[17] These are Brunei Darussalam, Cyprus, Hong Kong, Luxembourg, and Saudi Arabia. See Appendix A.1 for the full list of countries.

[18] The baseline regressions include years 1995, 2000, 2005, and 2011 instead of 2010 for two reasons: (i) In 2010, many countries' trade flows were still heavily affected by the crisis, and (ii) by using 2011 instead of 2010, the number of services agreements included in the sample increases significantly.

provisions. For the purpose of this paper, I use the dummy variable (SERV) indicating whether the trade agreement includes a substantive provision on services. Furthermore, to examine the heterogeneous effect of services agreements by contents, I use the more detailed data on different types of provisions found in services trade agreements, also provided by DESTA. In particular, the database codes whether the services agreement contains an MFN clause, national treatment clause, the right of non-establishment, and movement of natural persons, and so on.[19]

Using these data sources, I construct the main variables of which the summary statistics are provided in Table 1 over time, and in Table 2 across income groups. The three indicators of GVC participation — gross exports in intermediate goods, backward-, and forward-linkage measures — are expressed as a share of total gross bilateral exports, and the two trade agreement variables are dummy variables taking value one if the country pair has an FTA or stronger (RTA), or if the country pair has a services agreement ($SERV$). Provisions in the services trade agreement are also expressed as dummy variables equal to one if the services agreement includes a specific provision: MFN, NT, $NonEst$ (right of non-establishment), and $Move$ (movement of natural persons). Table 1 shows that the average GVC participation rate has been steadily increasing since 1995 with a small dip during the global financial crisis for all three measures. At the same time, regional trade agreements in goods and in services also saw a rapid increase. In 2011, 46 percent of the country pairs in the dataset have an RTA covering goods, and 42 percent have an RTA for services as well. The provisions data show that a smaller share of services agreements includes an MFN clause, while provision on NT, non-establishment, and movement of persons are more frequently found.

	1995	2000	2005	2011
Intermediate goods	0.536	0.546	0.562	0.573
Backward-GVC	0.215	0.239	0.252	0.252
Forward-GVC	0.139	0.156	0.159	0.167
RTA	0.199	0.301	0.388	0.460
SERV	0.150	0.204	0.330	0.423
— MFN	0.007	0.044	0.073	0.102
— NT	0.139	0.157	0.280	0.369
— NonEst	0.123	0.161	0.260	0.349
— Move	0.144	0.172	0.278	0.367

The three GVC-variables are shares in total gross bilateral trade in manufacturing. *RTA*, *SERV*, *MFN*, *NT*, *NonEst*, and *Move* are dummy variables.

Table 1: Summary statistics (mean) over time

[19]See Appendix A.2 for more details.

	South-South	North-North	North-South	South-North
Intermediate goods	0.550	0.578	0.545	0.550
Backward-GVC	0.250	0.225	0.232	0.245
Forward-GVC	0.145	0.172	0.154	0.155
RTA	0.218	0.495	0.345	0.345
SERV	0.145	0.456	0.284	0.284
— MFN	0.033	0.076	0.062	0.062
— NT	0.114	0.420	0.237	0.237
— NonEst	0.106	0.419	0.216	0.216
— Move	0.115	0.407	0.249	0.249

The three GVC-variables are shares in total gross bilateral trade in manufacturing. *RTA*, *SERV*, *MFN*, *NT*, *NonEst*, and *Move* are dummy variables. Averaged across sample years.

Table 2: Summary statistics (mean) across income groups

The comparison between different income pairs also shows interesting trends. The share of intermediate goods in total gross manufacturing trade is highest between developed countries. For the backward and forward GVC-measures, developing countries have higher backward linkages on average in their exports to the developed and developing countries, while forward linkages show opposite trends. This is intuitive since higher income countries tend to export high value-added inputs to each other (as part of the production process of sophisticated goods) or to developing countries for assembly. On the other hand, developing countries have a high share of foreign-value added in their exports either to other developing countries or to developed countries since their participation in GVCs are often characterized by lower value-added activities such as assembly. In terms of trade agreements, high-income country pairs are most likely to have an RTA and most of them include a services agreement. A smaller share of developing country pair has RTAs, and having an RTA for services is even less likely.

6 Results

Heterogeneous effect of services RTAs by income group

The discussion in Sections 2 and 3 conjecture an asymmetric impact of services trade liberalization for developed and developing economies. By adding interaction terms between the services agreement dummy and income groups, I let the effect of services agreements on GVC participation and trade vary depending on whether the country pair's income groups.[20] Consistent

[20]The results of treating services trade agreements as homogeneous are however provided

with the theoretical intuition, the empirical results in Table 3 show that the effect of services agreements are heterogeneous across income groups, with a significantly positive impact on trade and especially GVC participation for developing countries. Compared to the baseline (NN), services agreements increase GVC-exports from developing to developed countries (SN), as well as between developing countries (SS), and the increase is proportionately larger than for total gross exports. In contrast, services agreements generally do not increase GVC-exports from developed countries either to their developed counterparts (NN, baseline) or to developing countries (NS).

	(1)	(2)	(3)	(4)
		GVC-exports		
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.134***	0.135**	0.128**	0.144**
	(0.0386)	(0.0448)	(0.0441)	(0.0499)
SERV	-0.119	-0.122	-0.159*	-0.0711
	(0.0620)	(0.0708)	(0.0762)	(0.0728)
SERV*SS	0.233**	0.237*	0.363**	0.145
	(0.0888)	(0.0991)	(0.114)	(0.0983)
SERV*NS	0.0169	0.0224	0.0589	-0.0398
	(0.0751)	(0.0826)	(0.0901)	(0.0866)
SERV*SN	0.238**	0.265**	0.296***	0.298**
	(0.0749)	(0.0842)	(0.0870)	(0.0931)
N	12320	12320	12320	12320

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. The baseline (SERV) is between developed countries (NN). $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table 3: Heterogeneous impact of services agreements by income group

The asymmetric effect of services trade agreements is evident: a services agreement between a developing (South) and developed country (North) increases gross and GVC-exports from South to North, but not the other way around. Furthermore, the increase is proportionately larger for GVC-trade than gross trade.

The average effect of signing an RTA is a 14.3 percent increase in gross bilateral trade.[21] When a North-South country pair further concludes a

in Appendix A.3 for reference.

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

services agreement (or the services agreement enters into force at a later stage), this increases total gross exports from South to North by an additional 12.6 percent, making the total effect of their RTA (in goods and services) 27 percent increase in total gross trade.[22] When looking only at intermediate goods, the effect of a goods RTA is almost the same but the additional effect of the services agreement is larger at 15.4 percent, suggesting that services liberalization is particularly more important for GVC-trade (trade in intermediate goods) than the more traditional final-goods trade. The stronger positive impact of services agreements on GVC-exports is found consistently with backward and forward indicators as well. Services trade agreements additionally increases backward-GVC exports by 14.7 percent, and forward-GVC exports by 25.5 percent which are 2 and 13 percentage points larger, respectively, than the effect on total gross trade.

The positive impact of services liberalization on GVC-trade between the South and North is consistent with the theoretical predictions. The higher forward-GVC measure captures the increased value-added in South's export to the North that will be re-exported to the rest of the world. This can be explained by manufacturing firms in the North offshoring parts of their upstream production processes to the South. As discussed in Section 2, less costly service links between the South and North makes it more economically reasonable for Northern countries to offshore upstream activities to the South.

The increase in backward-GVC trade from South to North implies an increase in foreign value added in the trade flow from South to North. If the input provided by South is not the first stage of production, i.e. if the South imports intermediate inputs from other countries to produce its own intermediate exports to the North, this increase is natural. More exports of a composite intermediate good by South would imply an increase in both domestic and foreign value added in the export. Another intuition for an increase in backward-GVC linkages is that better services linkages (or more liberalized services trade) allow the South to export more downstream or complex inputs that require more imported intermediate inputs itself to the North. Then, even if the volume of South's exports in the composite intermediate good (extensive margin) does not change, the foreign (and domestic)

[22]Note that baseline $SERV$ is the effect of services trade agreements on developed country pairs (NN). Hence, the interpretation of the coefficients on interaction variables are always relative to North-North services agreements. To compute the effect of services agreements on South-North trade, for example, one needs to add the coefficients of $SERV$ and $SERV^*SN$. Table A.2 reports coefficients where $SERV^*NN$ is introduced instead of $SERV$.

value being exported may (intensive margin).[23]

Another interesting finding is that services trade agreements also have a positive and significant effect on gross and GVC-trade between developing countries. Having a trade agreement in services additionally increases South-South total gross exports by 12.1 percent, export in intermediate goods by 12.2 percent and backward-GVC trade by 22.6 percent without a significant increase in forward-GVC trade. Since trade barriers tend to be highest among developing countries, the flow of services is often highly restrictive, and a bilateral trade agreement aimed at liberalizing services trade could substantially increase GVC trade between the two countries. An example could provide more intuition to the results. Let's say that the last two stages a production process are assembly and packaging. One can imagine some manufacturing product being assembled in Vietnam, then shipped to China for final packaging before it is sold as final goods around the world. If more valuable (or more complex) products require better service links between production stages, a services agreement between Vietnam and China (ASEAN-China) could encourage firms to assemble and package more valuable or sophisticated goods in these two countries. So instead of assembling 100 units of fans, after ASEAN-China agreement, Vietnam assembles 100 units of air purifiers and exports to China for packaging. This would lead to an increase of foreign value-added in Vietnamese exports to China, without necessarily increasing the domestic value added.[24]

Services trade agreements do not seem to increase GVC- nor gross-exports from developed economies either to other developed countries or developing countries. The lack of North-North effect could be because developed countries already have relatively low levels of services restrictions and the flow of services across each other is not costly regardless of the services RTAs. Regarding North-South services agreements, the asymmetric effect for developing countries has been stressed in Section 3. Furthermore, developed economies often participate in GVCs not as cost-saving measures but because of their technology or innovative capacity. Then, services liberalization that lowers the cost of fragmentation strengthens the comparative advantage of developing countries (e.g. lower labor costs) but not necessarily that of developed countries.

[23]Note that the intermediate inputs that South imports to produce intermediate exports to North can be in any sector (including agriculture and services) as long as the input South exports to North is a manufacturing product.

[24]This is assuming that the value of assembly are the same for fans and air purifiers, while the value of intermediate inputs that Vietnam imports are higher for air purifiers than fans.

Heterogeneous effect of services RTAs by specific provisions

What types of provisions in services trade agreements are important for facilitating GVC participation? The question boils down to what type of service linkages are needed to maintain internationally dispersed production blocks. As discussed in Section 2, one of the key factors that enabled the rise in GVC or offshoring is the capacity to coordinate different stages of production across borders. The cost of coordination and communication along GVCs has fallen significantly with ICT development but still exists, and depends on how restrictive the services sector is, both unilaterally and bilaterally. However, due to the bilateral nature of the gravity model, the analysis can only identify the effects of bilateral (or plurilateral) services liberalization. Therefore, the MFN clause in services trade agreements which does not grant preferential treatment to the partner country is not expected to affect a country pair's engagement in GVC-trade. The same holds for the NT provision which is also often a multilateral commitment rather than preferential. The right of non-establishment and movement of natural persons, on the other hand, have a more preferential flavor, and are intuitively important for bilateral GVC-trade.

Table 4 shows the estimation results with interaction terms between the services agreement dummy ($SERV$) and provision dummies (MFN, NT, $NonEst$, and $Move$). As expected, having a MFN or NT clause in the services agreements does not have a significant impact on a country pair's gross- or GVC-trade. However, services trade agreements that grant the right of non-establishment significantly increase both gross- and GVC-trade. Country pairs tend to trade 12.4 percent more when they have a services agreement that allows services exports without local establishment, compared to when they only have an RTA covering goods. The effect of a services agreement without a non-establishment clause is absent. Furthermore, the positive impact of the non-establishment right is larger at 18.4 percent for trade in intermediate goods, 14.5 percent for backward-GVC, and 12.1 percent for forward-GVC trade, hinting at the particular importance of non-establishment rights as GVCs become more prevalent. Provisions on the movement of natural persons do not show significant effects on GVC trade but one could speculate that this issue is often dealt with outside of the scope of RTAs, such as separate visa arrangements or migration policies.

The intuition for why the non-establishment clause should matter for GVC-trade is straight forward. The requirement of local presence is one of the large fixed costs of building the services links that are needed for multiple production blocks. The relaxation of proximity requirements, therefore, could result in a reallocation of production activities by facilitating trade in

	(1)	(2)	(3)	(4)
		GVC-exports		
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.126**	0.119*	0.145**	0.0891
	(0.0422)	(0.0476)	(0.0507)	(0.0482)
SERV	-0.0662	-0.0334	-0.0573	-0.0840
	(0.0767)	(0.0954)	(0.0644)	(0.118)
SERV*MFN	-0.115*	-0.0838	-0.192*	0.0256
	(0.0573)	(0.0634)	(0.0750)	(0.0615)
SERV*NT	0.135	0.139	0.155	0.105
	(0.0811)	(0.0802)	(0.0821)	(0.0820)
SERV*NonEst	0.183***	0.202***	0.193**	0.198***
	(0.0536)	(0.0559)	(0.0638)	(0.0567)
SERV*Move	-0.160	-0.224	-0.165	-0.147
	(0.109)	(0.119)	(0.104)	(0.138)
N	12221	12221	12221	12221

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. *MFN*=1 if the services agreement contains an MFN clause. *NT*=1 if the services agreement contains a national treatment clause. *NonEst=1* if the services agreement explicitly grants the right of non-establishment (i.e. if it allows the provision of services without local presence). *Move*=1 if the services agreement allows the movement of natural persons in the provision of services. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table 4: Heterogeneous impact of services agreements by provisions

producer services (Francois, 1990b). Furthermore, sectors that are particularly affected by this provision are those without an inherent requirement of proximity in the provision of the services, such as business and financial services, which arguably are particularly important in the context of offshoring.

Robustness

The findings discussed above are robust to alternative specifications.[25] First, including an additional dummy variable for the European Union (EU) does not alter the main findings. Controlling for EU may be important since the nature and implications of the EU agreement are clearly different from all other RTAs. Table A.3 shows that being part of the EU is associated with larger trade flows and higher GVC participation, and the magnitude of

[25]See Appendix A.4 for results.

the effect is larger than an average RTA. However, the main findings that services agreements increases GVC participation of developing countries and that the non-establishment provision plays a key role in promoting GVCs are not driven by the EU agreement.

Second, the results are robust to controlling for the age and different waves of RTAs. Considering that services agreements are always signed either together with or later than RTAs in goods, some may worry that the services agreement dummy is capturing an "aging effect" of RTAs. If the trade-promoting effect of RTAs tends to grow over time, this could bias the effect of services agreements upwards. However, including interaction terms between RTA and age or year dummies does not alter the main findings.

Third, even with the rich set of fixed effects included in the econometric analysis, the issue of endogeneity is not fully tackled if there are other time-varying changes in bilateral trade costs that are specific to country pairs. To partially address this concern, I include interaction terms between distance and year dummies which would capture the changing effects of distance over time, as in Bergstrand et al. (2015).[26] If distance is an important element in bilateral trade costs that is changing over time, this approach would control for some changes in bilateral trade costs, other than trade agreements, that could affect trade flows. The findings are robust.

Finally, the results are also robust to including all countries available in OECD ICIO database. The average effect of having an RTA is slightly smaller in magnitude than the baseline results, but having a services agreement has a positive and significant effect for developing countries' GVC-exports and for those services agreements that allows services exports without local presence.

7 Conclusion

The link between excellent services and the functioning of GVCs has long been emphasized both by economists and policy makers. This paper is one of the first attempts to empirically assess the importance of this link, in particular, the connection between services trade liberalization and GVC participation in manufacturing. Using inter-country input-output tables and detailed data on services trade agreements, I show that having a services agreement is associated with higher gross trade and GVC-trade between developing countries, and from developing to developed countries, but not symmetrically. The effect is proportionately larger for GVC-trade, suggesting a larger importance of services linkages for fragmented production processes.

[26] I am not able to include the full set of controls suggested by Bergstrand et al. (2015) because there is no clear equivalent of intra-national trade flows for GVC-exports.

The finding that services trade agreements asymmetrically benefits developing countries has important policy implications: when the production of goods involves intermediate inputs crossing borders multiple times, lowering tariffs and liberalizing trade in intermediate goods are not the only options available for developing countries to take part of GVCs. Liberalizing trade in services can provide new pathways for developing countries to utilize their comparative advantage in labor-intensive stages by joining GVCs, even when they lack comparative advantage in the integrated process.

The paper's second finding highlights the importance of non-establishment rights in services liberalization in the GVC context. I find that allowing cross-border supply of services without local presence significantly increases countries' participation in manufacturing GVCs. This novel finding warrants further investigation since it is likely to gain relevance as advanced communication technology enables more modern services to be supplied and consumed from distance.

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A Appendix

A.1 Sample coverage

High-income countries ("North")	Low- and middle-income countries ("South")
Australia	Argentina
Austria	Brazil
Belgium	Bulgaria
Brunei Darussalam	Cambodia
Canada	Chile
Cyprus	China
Denmark	Colombia
Finland	Costa Rica
France	Croatia
Germany	Czech Republic
Hong Kong	Estonia
Iceland	Greece
Ireland	Hungary
Israel	India
Italy	Indonesia
Japan	Latvia
Korea	Lithuania
Luxembourg	Malaysia
Netherlands	Malta
New Zealand	Mexico
Norway	Philippines
Portugal	Poland
Singapore	Romania
Spain	Russia
Sweden	*Saudi Arabia*
Switzerland	Slovak Republic
Taiwan	Slovenia
United Kingdom	South Africa
United States	Thailand
	Tunisia
	Turkey
	Viet Nam

Countries in italics are excluded from the baseline regressions.
Income groups follow World Bank's income classification in 1995.

A.2 DESTA services provisions coding

The dummy variables on services agreements and provisions are from Dür et al. (2014).The questions they used to code the data are as follows.

[servicechap] for SERV

Does this agreement include substantive provisions stipulating the liberalization of trade in services?

0 no mention of services trade liberalization
1 services trade liberalization mentioned as general objective
2 substantive provisions liberalizing trade in services

DESTA codes 1 if the aim of liberalizing services is mentioned in the agreement's preamble. Also 1 are agreements with a services chapter or article that does not contain any substantive liberalization measures.

$SERV$ equals one if DESTA codes serviceschap=2, zero otherwise.

[servicesmfn] for *MFN*

Does the service chapter contain an MFN clause?

0 no service chapter
0 no MFN clause included in the service chapter
1 MFN clause included in the service chapter

[servicesnationaltreat] for *NT*

Does the service chapter contain a national treatment clause?

0 no service chapter
0 no national treatment clause included in the service chapter
1 national treatment clause included in the service chapter that is limited in scope to specific sectors
2 national treatment clause included in the service chapter

Variable NT equals one if servicesnationaltreat ≥ 1, zero otherwise.

[sernonestablishment] for *NonEst*

Does the service chapter grant the right of non-establishment (that is, does it allow the provision of services without local presence)?

0 no service chapter
0 the right of non-establishment is not explicitly allowed (it may be either omitted or explicitly excluded)
1 the right of non-establishment is explicitly granted

[**sermovement**] **for *Move*** Does the service chapter allow the movement of natural persons in the provision of services?

0 no service chapter

0 movement of natural persons is not explicitly allowed (it may be either omitted or explicitly excluded)

1 movement of natural persons in the provision of services is explicitly allowed

A.3 Average effect of services trade agreements

In this specification, I estimate the average effect of having a services agreement in addition to a goods agreement on gross and GVC-trade. Table A.1 shows the results of PPML estimation on three GVC indicators as well as gross exports. Country pairs that have an RTA have significantly higher trade flows and GVC-trade. However, there is no significant effect of having a services agreement on top of a goods agreement.

	(1)	(2)	(3)	(4)
		GVC-exports		
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.130***	0.133**	0.124**	0.138**
	(0.0386)	(0.0439)	(0.0446)	(0.0490)
SERV	-0.0208	-0.0190	-0.00370	-0.00440
	(0.0390)	(0.0437)	(0.0453)	(0.0470)
N	12320	12320	12320	12320

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.1: Services trade agreements and trade flows (average effect)

The lack of the effect of services trade agreements may seem discouraging, but is in fact not surprising. As pointed out in the main text, estimating the impact of services trade liberalization through a bilateral framework (i.e. RTAs) is not as straight-forward as for goods trade liberalization. While trade costs are significantly lower within RTAs for goods, for services, the trade cost reduction for country pairs that are part of an RTA is much smaller and diminishing over time (Miroudot and Shepherd, 2014). Since many of the restrictions in services trade are in fact behind-the-border measures or

non-discriminatory in nature, services trade agreements often do not provide substantial preferential treatment to partner countries as is the case for goods. Taking this into account, it could be expected that having an RTA in services, on average, does not have a significant effect on GVC-trade or bilateral trade flows in general.

However, this does not mean that bilateral or regional agreements in services trade are useless. Despite the lack of average effect, services agreements affect trade flows and GVC participation of country pairs in a heterogeneous matter depending on the countries' income level or the specific provisions included in the services trade agreement.

A.4 Robustness check results

	(1)	(2)	(3)	(4)
			GVC-exports	
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.134***	0.135**	0.128**	0.144**
	(0.0386)	(0.0448)	(0.0441)	(0.0499)
SERV*NN	-0.119	-0.122	-0.159*	-0.0711
	(0.0620)	(0.0708)	(0.0762)	(0.0728)
SERV*SS	0.114	0.115	0.204**	0.0739
	(0.0618)	(0.0675)	(0.0764)	(0.0700)
SERV*NS	-0.102	-0.100	-0.100	-0.111
	(0.0541)	(0.0604)	(0.0605)	(0.0672)
SERV*SN	0.119*	0.142*	0.137*	0.227**
	(0.0561)	(0.0655)	(0.0574)	(0.0777)
N	12320	12320	12320	12320

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. The baseline (SERV) is between developed countries (NN). $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.2: Heterogeneous impact of services agreements by income group

	(1)	(2)	(3)	(4)
		GVC-exports		
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.133***	0.134**	0.126**	0.142**
	(0.0387)	(0.0448)	(0.0441)	(0.0501)
SERV	-0.122*	-0.125	-0.162*	-0.0732
	(0.0619)	(0.0708)	(0.0762)	(0.0728)
SERV*SS	0.252**	0.254*	0.386***	0.165
	(0.0893)	(0.0997)	(0.114)	(0.0997)
SERV*NS	0.0212	0.0255	0.0652	-0.0369
	(0.0752)	(0.0827)	(0.0902)	(0.0868)
SERV*SN	0.241**	0.267**	0.299***	0.302**
	(0.0749)	(0.0842)	(0.0868)	(0.0932)
EU	0.201***	0.201***	0.221***	0.203**
	(0.0556)	(0.0591)	(0.0601)	(0.0654)
N	12320	12320	12320	12320

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. The baseline (SERV) is between developed countries (NN). EU=1 if the country pair is part of the EU. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.3: Heterogeneous impact of services agreements by income group (controlling for EU)

	(1)	(2)	(3)	(4)
		GVC-exports		
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.130**	0.122*	0.148**	0.0916
	(0.0422)	(0.0477)	(0.0509)	(0.0482)
SERV	-0.0586	-0.0274	-0.0484	-0.0787
	(0.0770)	(0.0958)	(0.0649)	(0.119)
SERV*MFN	-0.105	-0.0753	-0.182*	0.0369
	(0.0577)	(0.0638)	(0.0762)	(0.0616)
SERV*NT	0.0634	0.0774	0.0911	0.0382
	(0.0905)	(0.0910)	(0.0943)	(0.0937)
SERV*NonEst	0.151**	0.174**	0.162*	0.165**
	(0.0578)	(0.0604)	(0.0693)	(0.0599)
SERV*Move	-0.0796	-0.154	-0.0931	-0.0679
	(0.117)	(0.125)	(0.117)	(0.141)
EU	0.108	0.0938	0.0951	0.101
	(0.0623)	(0.0662)	(0.0677)	(0.0706)
N	12221	12221	12221	12221

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. *MFN*=1 if the services agreement contains an MFN clause. *NT*=1 if the services agreement contains a national treatment clause. *NonEst=1* if the services agreement explicitly grants the right of non-establishment (i.e. if it allows the provision of services without local presence). *Move*=1 if the services agreement allows the movement of natural persons in the provision of services. *EU*=1 if the country pair is part of the EU. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.4: Heterogeneous impact of services agreements by provisions (controlling for EU)

	(1)	(2)	(3)	(4)
			GVC-exports	
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.116**	0.122**	0.108*	0.133**
	(0.0385)	(0.0442)	(0.0441)	(0.0493)
SERV	-0.119	-0.121	-0.160*	-0.0742
	(0.0609)	(0.0699)	(0.0750)	(0.0720)
SERV*SS	0.224*	0.227*	0.356**	0.142
	(0.0878)	(0.0983)	(0.114)	(0.0969)
SERV*NS	-0.0176	-0.00845	0.0292	-0.0669
	(0.0762)	(0.0832)	(0.0894)	(0.0879)
SERV*SN	0.185*	0.224**	0.252**	0.255**
	(0.0775)	(0.0844)	(0.0880)	(0.0935)
N	14640	14640	14640	14640

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. The baseline (SERV) is between developed countries (NN). $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.5: Heterogeneous impact of services agreements by income group (full sample)

	(1)	(2)	(3)	(4)
			GVC-exports	
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.102*	0.103*	0.121*	0.0768
	(0.0425)	(0.0474)	(0.0512)	(0.0477)
SERV	-0.245*	-0.182	-0.226*	-0.218
	(0.108)	(0.113)	(0.0982)	(0.123)
SERV*MFN	-0.0952	-0.0701	-0.174*	0.0363
	(0.0572)	(0.0632)	(0.0749)	(0.0606)
SERV*NT	0.132	0.139	0.149	0.104
	(0.0827)	(0.0808)	(0.0838)	(0.0829)
SERV*NonEst	0.197***	0.212***	0.202**	0.205***
	(0.0530)	(0.0554)	(0.0636)	(0.0561)
SERV*Move	0.00571	-0.0886	-0.00464	-0.0228
	(0.133)	(0.134)	(0.129)	(0.142)
N	14516	14516	14516	14516

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. *MFN*=1 if the services agreement contains an MFN clause. *NT*=1 if the services agreement contains a national treatment clause. *NonEst=1* if the services agreement explicitly grants the right of non-establishment (i.e. if it allows the provision of services without local presence). *Move*=1 if the services agreement allows the movement of natural persons in the provision of services. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.6: Heterogeneous impact of services agreements by provisions (full sample)

	(1)	(2)	(3)	(4)
			GVC-exports	
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.142***	0.154**	0.117*	0.185***
	(0.0422)	(0.0481)	(0.0460)	(0.0548)
SERV	-0.118	-0.121	-0.159*	-0.0693
	(0.0620)	(0.0707)	(0.0760)	(0.0712)
SERV*SS	0.242**	0.260**	0.349**	0.199*
	(0.0900)	(0.0999)	(0.114)	(0.1000)
SERV*NS	0.0206	0.0332	0.0525	-0.0149
	(0.0750)	(0.0822)	(0.0902)	(0.0872)
SERV*SN	0.242**	0.276**	0.290**	0.325***
	(0.0756)	(0.0849)	(0.0881)	(0.0944)
RTA_age	-0.00489	-0.0123	0.00693	-0.0279*
	(0.0107)	(0.0116)	(0.0115)	(0.0131)
N	12320	12320	12320	12320

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. The baseline (SERV) is between developed countries (NN). *RTA_age*=1 in year t if t is the first year for the country pair to have *RTA*=1. *RTA_age* varies from 1 to 4 since there are four years included in the analysis. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.7: Heterogeneous impact of services agreements by income group (controlling for RTA age)

	(1)	(2)	(3)	(4)
			GVC-exports	
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.131**	0.135**	0.127*	0.130*
	(0.0458)	(0.0511)	(0.0520)	(0.0543)
SERV	-0.0661	-0.0328	-0.0578	-0.0863
	(0.0770)	(0.0965)	(0.0636)	(0.122)
SERV*MFN	-0.117*	-0.0935	-0.182*	-0.00297
	(0.0571)	(0.0633)	(0.0732)	(0.0628)
SERV*NT	0.138	0.149	0.143	0.133
	(0.0815)	(0.0807)	(0.0828)	(0.0828)
SERV*NonEst	0.184***	0.206***	0.189**	0.210***
	(0.0541)	(0.0565)	(0.0634)	(0.0577)
SERV*Move	-0.160	-0.227	-0.162	-0.152
	(0.109)	(0.120)	(0.104)	(0.140)
RTA_age	-0.00266	-0.00873	0.00990	-0.0228
	(0.0108)	(0.0118)	(0.0118)	(0.0130)
N	12221	12221	12221	12221

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. *MFN*=1 if the services agreement contains an MFN clause. *NT*=1 if the services agreement contains a national treatment clause. *NonEst=1* if the services agreement explicitly grants the right of non-establishment (i.e. if it allows the provision of services without local presence). *Move*=1 if the services agreement allows the movement of natural persons in the provision of services. *RTA_age*=1 in year t if t is the first year for the country pair to have *RTA*=1. *RTA_age* varies from 1 to 4 since there are four years included in the analysis. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.8: Heterogeneous impact of services agreements by provisions (controlling for RTA age)

	(1)	(2)	(3)	(4)
			GVC-exports	
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.177***	0.184***	0.166**	0.229***
	(0.0472)	(0.0536)	(0.0524)	(0.0615)
SERV	-0.113	-0.112	-0.159*	-0.0549
	(0.0629)	(0.0721)	(0.0773)	(0.0724)
SERV*SS	0.258**	0.267**	0.379***	0.182
	(0.0892)	(0.0993)	(0.113)	(0.0975)
SERV*NS	0.0275	0.0359	0.0665	-0.0259
	(0.0746)	(0.0819)	(0.0891)	(0.0852)
SERV*SN	0.250***	0.279***	0.304***	0.313***
	(0.0747)	(0.0840)	(0.0860)	(0.0924)
RTA*y2000	-0.0540*	-0.0561*	-0.0549	-0.0988**
	(0.0252)	(0.0270)	(0.0303)	(0.0315)
RTA*y2005	-0.00686	-0.00906	-0.0101	-0.0401
	(0.0377)	(0.0419)	(0.0427)	(0.0457)
RTA*y2011	-0.0743	-0.0894*	-0.0537	-0.141**
	(0.0383)	(0.0418)	(0.0433)	(0.0482)
N	12320	12320	12320	12320

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. The baseline (SERV) is between developed countries (NN). y2000 if a dummy variable equal to one if t=2000. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.9: Heterogeneous impact of services agreements by income group (controlling for RTA wave)

	(1)	(2)	(3)	(4)
		GVC-exports		
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.170***	0.170**	0.189**	0.183**
	(0.0508)	(0.0562)	(0.0596)	(0.0595)
SERV	-0.0679	-0.0291	-0.0632	-0.0867
	(0.0781)	(0.0970)	(0.0657)	(0.117)
SERV*MFN	-0.119*	-0.0913	-0.193*	0.0128
	(0.0574)	(0.0634)	(0.0750)	(0.0607)
SERV*NT	0.146	0.155	0.158	0.130
	(0.0815)	(0.0805)	(0.0828)	(0.0831)
SERV*NonEst	0.191***	0.213***	0.195**	0.213***
	(0.0538)	(0.0562)	(0.0639)	(0.0569)
SERV*Move	-0.156	-0.227	-0.158	-0.143
	(0.110)	(0.120)	(0.104)	(0.137)
RTA*y2000	-0.0560*	-0.0581*	-0.0598*	-0.107***
	(0.0254)	(0.0273)	(0.0302)	(0.0315)
RTA*y2005	-0.0133	-0.0162	-0.0291	-0.0509
	(0.0387)	(0.0429)	(0.0444)	(0.0459)
RTA*y2011	-0.0736	-0.0890*	-0.0553	-0.146**
	(0.0396)	(0.0430)	(0.0446)	(0.0491)
N	12221	12221	12221	12221

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. *MFN*=1 if the services agreement contains an MFN clause. *NT*=1 if the services agreement contains a national treatment clause. *NonEst=1* if the services agreement explicitly grants the right of non-establishment (i.e. if it allows the provision of services without local presence). *Move*=1 if the services agreement allows the movement of natural persons in the provision of services. y2000 if a dummy variable equal to one if t=2000. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.10: Heterogeneous impact of services agreements by provisions (controlling for RTA wave)

	(1)	(2)	(3)	(4)
		GVC-exports		
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.137***	0.131**	0.144**	0.137**
	(0.0389)	(0.0450)	(0.0453)	(0.0500)
SERV	-0.135*	-0.137	-0.172*	-0.0862
	(0.0620)	(0.0708)	(0.0740)	(0.0747)
SERV*SS	0.246**	0.261**	0.345**	0.178
	(0.0898)	(0.100)	(0.116)	(0.0994)
SERV*NS	0.0298	0.0411	0.0504	-0.0169
	(0.0752)	(0.0825)	(0.0895)	(0.0880)
SERV*SN	0.251**	0.284***	0.288***	0.321***
	(0.0762)	(0.0855)	(0.0871)	(0.0952)
ln(dist)*y2000	-0.00501	-0.00365	-0.0195	0.0175
	(0.00932)	(0.00979)	(0.0119)	(0.0113)
ln(dist)*y2005	-0.0525***	-0.0576***	-0.0675***	-0.0300
	(0.0152)	(0.0166)	(0.0164)	(0.0181)
ln(dist)*y2011	-0.0231	-0.0194	-0.0558***	0.00551
	(0.0165)	(0.0180)	(0.0169)	(0.0201)
N	12320	12320	12320	12320

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. The baseline (SERV) is between developed countries (NN). $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.11: Heterogeneous impact of services agreements by income group (controlling for time-varying effects of distance)

	(1)	(2)	(3)	(4)
			GVC-exports	
	Gross exports (total)	Intermediate goods	Backward (sourcing)	Forward (selling)
RTA	0.130**	0.118*	0.157**	0.0891
	(0.0415)	(0.0468)	(0.0503)	(0.0485)
SERV	-0.0601	-0.0255	-0.0555	-0.0845
	(0.0775)	(0.0956)	(0.0657)	(0.120)
SERV*MFN	-0.110	-0.0823	-0.167*	0.0220
	(0.0566)	(0.0630)	(0.0741)	(0.0613)
SERV*NT	0.129	0.133	0.144	0.0974
	(0.0826)	(0.0816)	(0.0833)	(0.0836)
SERV*NonEst	0.192***	0.212***	0.193**	0.204***
	(0.0533)	(0.0557)	(0.0636)	(0.0568)
SERV*Move	-0.178	-0.240*	-0.188	-0.146
	(0.110)	(0.120)	(0.104)	(0.140)
ln(dist)*y2000	-0.00495	-0.00379	-0.0182	0.0175
	(0.00925)	(0.00970)	(0.0117)	(0.0112)
ln(dist)*y2005	-0.0526***	-0.0579***	-0.0648***	-0.0308
	(0.0151)	(0.0165)	(0.0164)	(0.0178)
ln(dist)*y2011	-0.0260	-0.0237	-0.0575***	-0.000154
	(0.0167)	(0.0182)	(0.0169)	(0.0203)
N	12221	12221	12221	12221

Standard errors clustered by country pairs in parentheses. All specifications include exporter-year, importer-year, and country pair fixed effects, and are estimated using PPML. *MFN*=1 if the services agreement contains an MFN clause. *NT*=1 if the services agreement contains a national treatment clause. *NonEst=1* if the services agreement explicitly grants the right of non-establishment (i.e. if it allows the provision of services without local presence). *Move*=1 if the services agreement allows the movement of natural persons in the provision of services. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Table A.12: Heterogeneous impact of services agreements by provisions (controlling for time-varying effects of distance)