Deep Services Trade Agreements and their Effect on Trade and Value Added

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Abstract

The majority of services trade is currently transacted under the terms of preferential trade agreements (PTAs) with increasingly ambitious provisions on crossborder trade and investment in services. This paper exploits novel and detailed information on the architecture and depth of services PTAs (the World Bank Deep Trade Agreements 2.0 database) to study which provisions, or policy configurations, characterise an effective agreement. The richness of policy information is crucial for being able to identify those aspects that matter most, namely an agreement's structure, its rules of origin for firms and natural persons, and provisions that ensure accountability. Ambitious provisions in these areas are associated with 15–65 percent higher bilateral trade, driven by regulation-intensive services. Services PTAs also lead to an increase in services value added sourced from PTA partners, through provisions that facilitate the exchange of capital and people. This finding sheds light on how services PTAs can affect the configuration of value chain trade.

Deep Services Trade Agreements

and their Effect on Trade and Value Added[*]

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1 Introduction

Provisions affecting trade in services are nowadays an integral part of ambitious preferential trade agreements (PTAs). The surge of PTAs that started in the 1960s and 1970s as shallow agreements aimed at reducing tariffs now covers a plethora of aspects, ranging from the international exchange of goods, services, knowledge and people to governance of data flows and even non-trade issues. Not only has the scope of PTAs broadened over time but also their depth. This is a particularly important development for services trade, where the impediments to trade relate almost exclusively to behind-the-border regulatory measures that are difficult to negotiate and to liberalise.

The proliferation over the last decades of PTAs that cover services trade has coincided with the emergence of value chain trade and advances in digital technology, which has transformed the way in which services can be produced, consumed, and traded across borders. It is likely that these developments have evolved in a mutually reinforcing manner. On the one hand, waves of unbundling (stages of production, and tasks within stages) have increased the need for services to be traded (Baldwin and Lopez-Gonzalez, 2015), and ever deeper services PTAs were part of the trade policy response to this requirement. On the other hand, the very existence of services PTAs has underpinned the growth of services trade.

The surge of bilateral and plurilateral trade liberalisation also reflected the crisis of the multilateral system; for instance, negotiations under the auspices of the WTO for a Trade in Services Agreement (TISA) have thus far not produced a result and are currently stalled. By now, liberalisation of services trade via PTAs has firmly taken hold in the global economy (Figure 1). In 2016, over 120 economies were signatories to at least one services PTA. At the top are Chile and Singapore, which are each party to 20 services

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PTAs, followed by South Korea, which has concluded 15 such agreements. The EU is party to 14 agreements, as is Japan; the US, China and Peru each have 13, and Australia and New Zealand have signed 10 services PTAs.

Figure 1: Number of Agreements per Economy in 2016
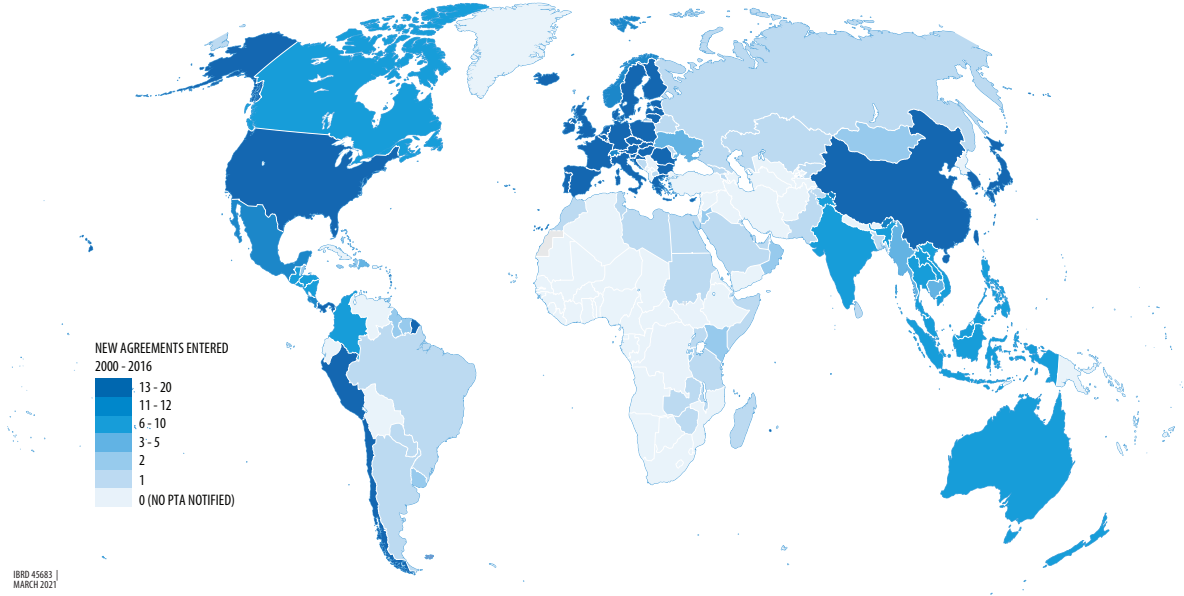
Source: Authors' elaboration using the World Bank DTA 2.0 Database.
Note: Zero ('0') means that an economy has no agreements notified to the WTO. This could be because there is in fact no services PTA (the vast majority of cases), or because an economy is not a member of the WTO, or even if it is, an agreement may not been notified to the WTO until well after it has taken effect.

As a result of this spread of services PTAs over the past 20 years, the majority of services trade now happens under preferential terms for most countries (Figure 2). The graph depicts the log average value of services exports with partner for which it has a services PTA (red circle), if there is one, and the log average value of services exports with non-PTA partners (black diamond). For most countries PTA trade exceeds services under most favoured nation (MFN) terms. Two notable exceptions are the US and Japan, which trade services extensively with EU member states but as of 2016 neither had a services PTA in place with the EU.

The proliferation of services PTAs has been accelerating since 2000. That said, partic-ipation of economies has been highly unequal; for instance, whereas China and Australia

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Figure 2: Average Value of Services Trade Outside and Within Services PTAs
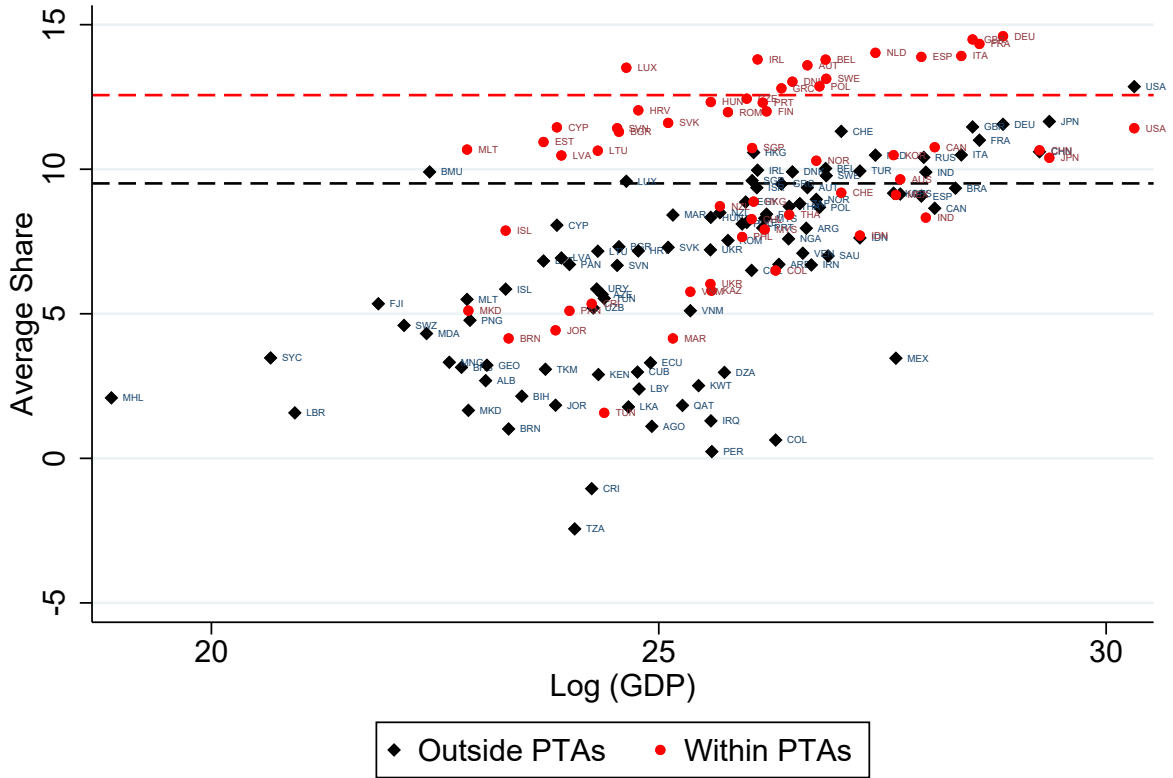
Source: Authors' elaboration using the World Bank DTA 2.0 Database and ITPD-E data.
Note: dashed lines denote the log value of average trade within (red) and outside of (black) services PTAs.

have greatly increased the number of partners with which they have signed a services PTA, there was no change at all over the 2000-16 period for Brazil and South Africa (Figure 3), whose connectivity remains at very low levels.[1] When countries sign or join plurilateral agreements, their connectivity displays a discrete jump, as is apparent from Figure 3 when China signed a PTA with ASEAN in 2007, as did Australia—jointly with New Zealand—shortly afterwards in 2010. Overall, Since 2000, economies in Europe, Asia-Pacific and in North America have been most active in concluding services PTAs (Appendix Figure 9). Singapore concluded 19 services PTAs in that period, followed by Chile which signed 18 agreements.

Latin America and the Caribbean is a region with economies at very different stages of

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[1]A similar figure showing the increasing connectedness of Chile, the US, Japan and India is included in the Appendix as Figure 10.

Figure 3: Increasing number of bilateral pairs covered by Services PTAs
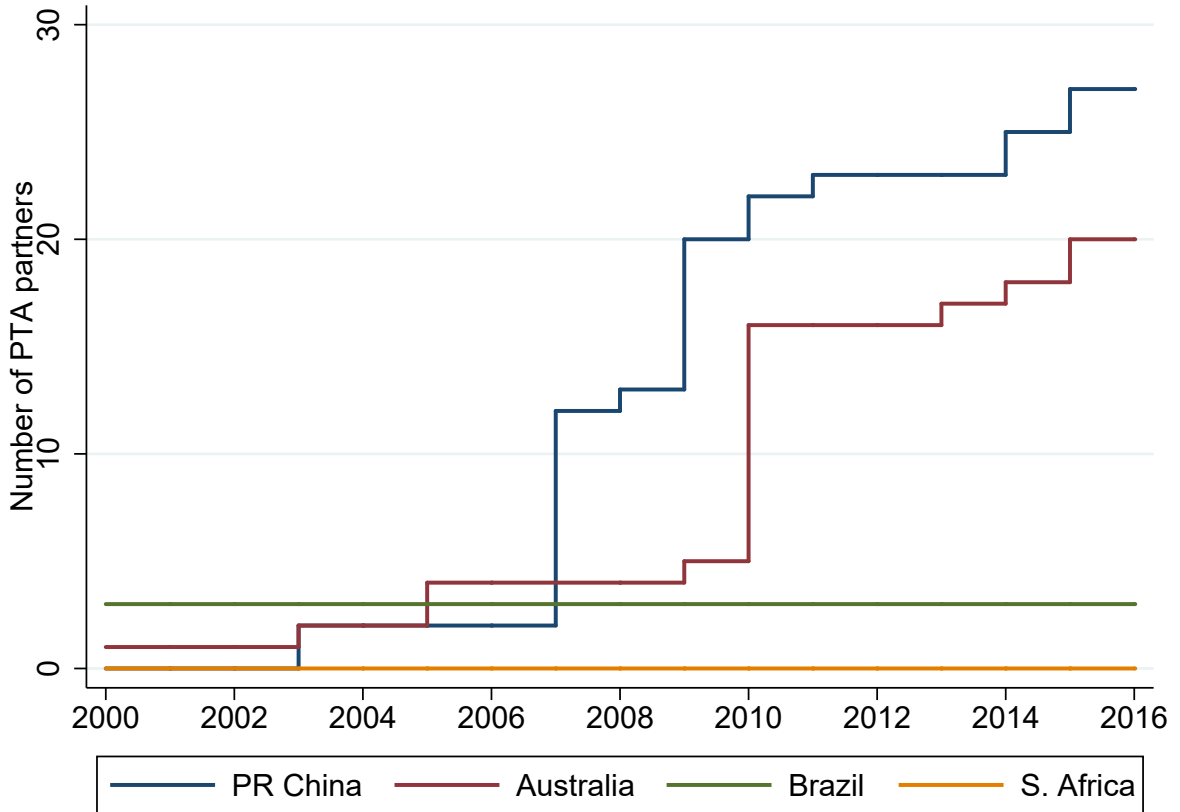
services trade integration. A few economies are party to many services PTAs (e.g. Chile: 20; Panama: 14; Peru: 13; Costa Rica: 12; or Mexico: 11). That is, these countries are well connected, both externally as well as within the region.[2] At the same time, the largest economies such as Argentina or Brazil do not actively pursue services integration and are party to only few agreements (MERCOSUR in this case) with shallow provisions.

In this paper we study the effect of services PTAs on cross-border services trade and countries' engagement in international services value chains. We do so by exploiting, for outcome variables of interest, the newly released ITPD-E data on bilateral services trade (Borchert et al., 2021), and the 2018 edition of the Trade in Value added (TiVA)

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[2]For instance, Chile and Panama have bilateral agreements covering services with each other as well as with Costa Rica, Guatemala, Honduras, Nicaragua and El Salvador. Mexico has also signed a number of intra-regional services PTAs.

indicators. We use data on all services PTAs notified to the WTO, which are available from the novel World Bank Deep Trade Agreements 2.0 database (Mattoo et al., 2020). Crucially, these data contain detailed information on the structure and depth of services PTAs collected by Gootiiz et al. (2020). To the best of our knowledge, this is the first work exploiting such a rich data structure: this allows us to go beyond aggregate country-level effects of PTAs, and to study how different services sectors are affected by the PTA structure or certain configurations of services-liberalizing provisions.

Thus we make two principal contributions. First, we find that services PTAs are associated with significant and large increases in bilateral services trade, especially in regulation-intensive services such as financial and insurance services, business and professional services, and charges for intellectual property rights, respectively. But there are distinct differences across PTAs. We document that substantial trade-enhancing effects only emanate from deep trade agreements, and we trace the effects back to the existence of an ambitious agreement structure, meaningful disciplines and provisions that ensure accountability.

It is evident that PTA participation is not randomly distributed across country pairs; in particular, economies with certain features may self-select into signing services PTA. We address the potential endogeneity concerns by obtaining our results subject to a very demanding fixed effects structure and three-way clustering of standard errors.

Second, we also find that the presence of services PTAs affects the sourcing pattern of value added from partners that are embodied in a country's exports. Economies tend to import relatively more foreign services value added from within services PTAs as compared to value added imported from non-PTA partners. Hence, in addition to direct trade effects, services PTAs are also conducive to increasing the contribution of foreign services

value added, part of which is embodied in manufacturing exports. We find that individual PTA provisions that relate to investment flows and the movement of people are associated with higher foreign services value added from PTA partners, which is consistent with these effects to manifest in, and contribute to, value chain trade. Together, these results shed light on how services PTAs affect the supply side and configuration of value chain trade, which has thus far not been studied with recent data.

Our finding of large and significant trade effects from services PTAs stand against the long-held view that agreements in the realm of services often do not entail much if any actual liberalisation when compared to actually applied services trade policies (Miroudot and Pertel, 2015; Borchert et al., 2011). The results show that depth matters. The granular information contained in the World Bank's Deep Trade Agreements 2.0 database enables us to uncover these effects, provided that information at the level of specific policy areas and individual provisions is combined with the best bilateral data on services trade and value added that is currently available.

The remainder of this paper is organized as follows: section 2 provides a brief overview of the literature, section 3 describes the data we exploit in analysis, section 4 sets out our methodological approach, sections 5 and 6 present the results for services trade and the sourcing of value-added, section 7 concludes.

2 Related literature

Services are an increasingly important part of a country's production and trade, as reflected by the growing attention to services in domestic regulation, as well as multilateral and bilateral policy instruments.

From a general equilibrium perspective, entering a services PTA is likely to generate welfare gains akin to those arising from entering PTAs liberalizing trade in goods, as the PTA is expected to lower services input prices, final goods prices, and allow more consumption than would otherwise be possible. Further, as barriers to services trade typically consists of regulatory measures which act behind a country's border, their removal does not come at the expense of a loss in tariff revenues, making services PTAs even more desirable (Egger and Shingal, 2020).

The economic literature on how PTAs affect services trade is a great deal less abundant than work on goods trade. Partly the reason is data availability: it is only with the publication of the OECD database on bilateral services trade in the early 2000s that a literature attempting to estimate determinants of bilateral services trade rapidly emerged, finding generally a positive and significant impact of PTAs (Ceglowski, 2006; Kimura and Lee, 2006; Walsh, 2008; Marchetti, 2011; Shingal, 2010; Egger et al., 2012).[3]

Another reason why analyses on PTAs and services are scant, is that most of the PTAs explicitly featuring services chapters have been negotiated in the last two decades. For this reason, early work investigated the impact of goods PTAs, rather than services PTAs.[4] More recently, work focusing explicitly on the impact of services PTAs confirms

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[3]Authors also investigated whether the standard gravity equation can explain bilateral services trade patterns, some confirming that proximity (geographical and linguistical) is a key determinant of services trade (Ceglowski, 2006; Kimura and Lee, 2006), other concluding that the impact of distance is negligible (Walsh, 2008; Kandilov and Grennes, 2012).

[4]Authors have also detected complementarities between goods and services trade i.e. an increase in goods trade being associated with an increase in services trade (Ceglowski, 2006; Kimura and Lee, 2006), or a larger overlap of goods-trade network leading to a larger volume of services trade (Egger et al., 2017).

a strong positive effect on services trade, with no evidence of trade diversion from non-members (Park and Park, 2011). Guillin (2013) confirms that *only* services PTAs matter for services trade, and goes one step further analysing the heterogeneous impact of the agreements. Guillin introduces a 'depth' measure which clusters services PTA in three groups of low, medium and high liberalization depending on common features, and finds that deeper agreements tend to result in greater services trade.

This paper contributes primarily to the strand of literature on the heterogeneous impact of PTAs characterized by different depth. Studies on PTAs' depth have multiplied in recent years (e.g. Baier et al. (2014); Orefice and Rocha (2014); Kohl and Trojanowska (2015); Kohl et al. (2016); Mattoo et al. (2017); Mulabdic et al. (2017); Dhingra et al. (2018); Baier et al. (2018); Dhingra et al. (2021)), thanks to various PTA classifications and depth measures constructed on the basis of data on the content of PTAs produced by Horn et al. (2010), Hofmann et al. (2017), and the DESTA project (Dür et al., 2014). The common finding of this literature is that deeper agreements generate more trade, due to the growing importance of PTAs that go beyond reducing tariffs on goods, but also concern aspects relating to foreign investment, dispute settlement, competition between domestic and foreign firms, intellectual property rights, and market access for services providers. Despite the wealth of studies examining the depth of trade agreements, works that have explored its impact specifically on trade in services are few, and are those more directly related to our work. Mulabdic et al. (2017) and Dhingra et al. (2021) exploit the World Bank Deep Trade Agreements 1.0 (*horizontal depth*) Database[5] (Hofmann et al., 2017) to measure the depth of PTAs, while Dhingra et al. (2018) exploit data from DESTA. All three works extract data on goods, services and value-added trade from the

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[5]This database is a precursor to that used in this paper, which is the World Bank Deep Trade Agreement 2.0 (*vertical depth*), by Mattoo et al. (2020)

World Input-Output Database,[6] and find that deeper agreement result in both more goods and services trade, with the latter generally being more affected by deep PTAs. A crucial difference among these studies, however, is that Mulabdic et al. (2017) and Dhingra et al. (2021) measure depth with a count of legally enforceable provisions in each PTA, whereas Dhingra et al. (2018) go beyond aggregate effects and identify services, investment and competition provisions to be those most effective at lowering trade barriers[7], especially for sectors such as transport and storage, that facilitate supply chain activity.

This paper's contribution is to identify with a great deal more precision which aspect of the structure and content of services PTAs affects cross-border services trade. Compared to Dhingra et al. (2018), who assess the effect of the presence of a services chapter, in this paper we examine services PTAs only and distinguish between particular configurations of services provisions. This analysis is made possible by the availability of detailed data on the design and content of services PTA from the World Bank Deep Trade Agreement Database 2.0 (*vertical depth*). Another important contribution of this paper is to exploit the most comprehensive data to date on services trade, the ITPD-E data described below, covering a great deal more countries and sectors than the WIOD data.

We also contribute to the literature linking the presence of trade agreements to value-chain activity. Production along global value-chains (GVC) also stands to benefit from services liberalization, as services have various roles in GVCs. Transport, communication and logistics link manufacturing activities across countries, while R&D, design, and

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[6]Despite the similarity of approach, these three papers differ in their focus, with Mulabdic et al. (2017) analysing the differential impact of PTA depth for UK trade, Dhingra et al. (2018) narrowing the focus on the effect of provisions related to services, investment and competition, and Dhingra et al. (2021) taking the reduced form estimates to a general equilibrum framework to quantify welfare effects of deep PTAs.

[7]Dhingra et al. (2018) find that these provisions account for about 60% of the overall effect of trade agreements on exports.

engineering services are key inputs in the production of any good, as well as marketing, distribution, and after-sale services (Miroudot and Cadestin, 2017a). Services are also often sold as a bundle with goods (i.e. 'servitisation'), which allows firms to add more value and create a long-term relation with customers. Due to these strong interconnections between services and manufacturing within GVCs, output of foreign affiliates in both services and manufacturing sectors is harmed by policies restricting trade in services (Andrenelli et al., 2018). Importantly, services are also the output of value-chains, with the fragmentation and internationalization of the production of, for instance, telecom and financial services, becoming increasingly relevant (De Backer and Miroudot, 2014). Finally, the expansion of services-value chains contributes to higher productivity levels and employment growth (Miroudot and Cadestin, 2017b) which makes agreements that facilitate the acquisition of foreign services value-added within GVC a first-order policy objective.

This paper adds to a literature of recent empirical studies that have adopted a gravity framework to assess how the depth of PTAs affects GVC activities, exploiting a variety of GVC indicators (Orefice and Rocha, 2014; Mulabdic et al., 2017; Johnson and Noguera, 2017; Dhingra et al., 2018; Osnago et al., 2020; Laget et al., 2020).[8] These works tends to agree that deeper trade agreements increase GVC activity in both goods and services industries, although results are generally stronger for trade in intermediates than for trade in final goods. This paper contributes to this literature in two ways. On one side, we explore richer information on the content of services PTA, analysing in detail the impact of services provisions directed to the liberalization of investments and movement of personnel (Mode 3 and Mode 4 services trade). On the other side, we explore alternative indicators

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[8]GVC activity has been measured with imports of parts and components (Orefice and Rocha, 2014), value-added to exports ratio (Johnson and Noguera, 2017), domestic and foreign value added in exports of intermediates or final goods (Mulabdic et al., 2017; Dhingra et al., 2018; Laget et al., 2020).

of GVC activity, which allow us to provide novel evidence on the redirection of VA trade from non-PTA to PTA members as a consequence of entering a services PTA.

Finally, it of relevance to acknowledge a strand of literature analysing the determinants of services PTA formation, which we are aware of in specifying our empirical models. From the seminal work of Baier and Bergstrand (2004), the literature on PTA formation has generally found that countries are more likely to enter goods PTA if potential welfare gains are larger. This is the case when trade partners are geographically closer, more remote from the rest of the work, economically more similar, with greater difference in relative factor endowments. Determinant of services PTA have been analysed recently by (Egger and Shingal, 2020). In addition to 'standard' determinants such as countries' size and proximity, they find that countries with more similar unilateral services regulations, as measured in the World Bank Services Trade Restrictiveness Index (Borchert et al., 2014)), are more likely to enter a services PTA.

3   Data

3.1   Services Policy and PTA Data

The findings in this paper are made possible by exploiting novel information from the World Bank Deep Trade Agreements 2.0 (WB-DTA) dataset. These data are publicly available and documented in detail in Mattoo, Rocha and Ruta (2020). The full WB-DTA dataset provides detailed information on the design and depth of 279 PTAs notified to the WTO from 1962 to 2017, across 18 subject areas. In this paper, we focus on the 'Services' subject area of the WB-DTA, which contains information from 143 PTAs, i.e.

agreements that contain provisions that liberalize trade and investment in services.[9] We refer to these henceforth as 'services PTAs.' It is interesting to note that, compared to the average across the 17 other non-services subject areas, the share of "substantive" provisions (flagged as such by the World Bank coding team) relative to the total number of provisions per subject area, is substantially higher in services. In Figure 4 virtually all agreements lie atop the 45-degree line, which would indicate equal shares of substantive provisions (red circles denote bilateral agreements, green crosses denote plurilateral and EU-bilateral agreements). This may be indicative of the importance attached to services when negotiating PTAs. As one might expect, there is a positive correlation between the shares of substantive provisions in the two subject areas of services and investment, respectively (cf. Appendix Figure 11).

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[9]The services subject area of the WB-DTA 2.0 covers 144 PTAs but we exclude the Trans Pacific Partnership (TPP) agreement that, after the withdrawal of the US, did not come into force in 2017 as coded in the data.

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Figure 4: Share of substantial provisions across areas in WB-DTA
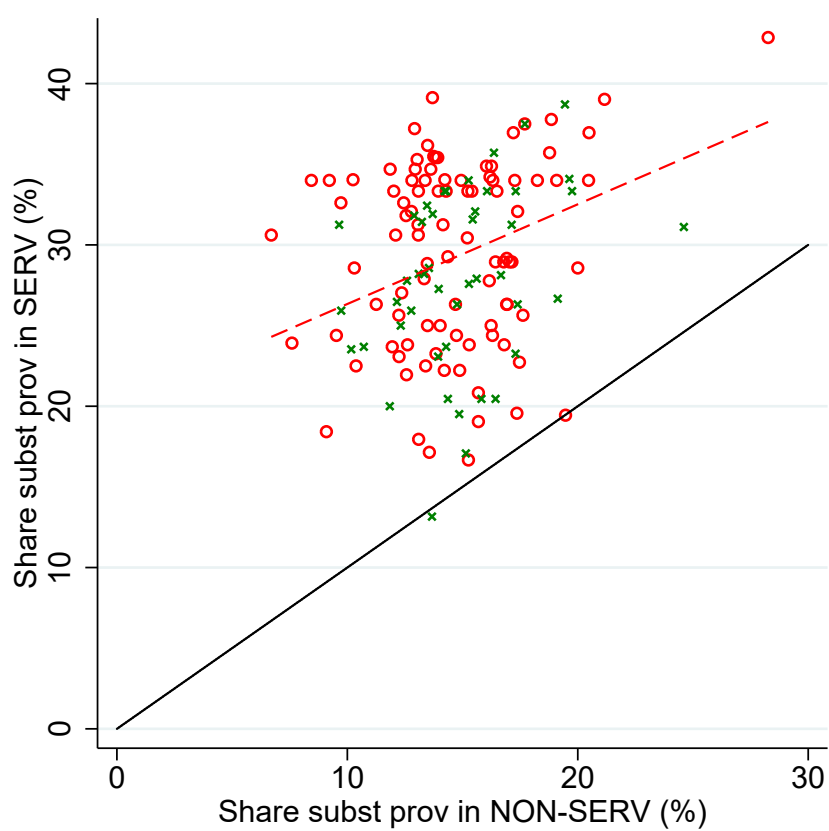
The variables coded for these services PTAs, as well how the WB-DTA relates to, and improves upon, earlier attempts to quantify preferential services trade agreements are described by Gootiiz, Jonetzko, Magdeleine, Marchetti and Mattoo in Chapter 4 of the Handbook by Mattoo, Rocha and Ruta (2020). Of the 143 services PTAs in this dataset, 47 are plurilateral agreements (such as the East African Community) and 96 are bilateral agreements. Bilateral and pluriateral services PTAs exhibit systematic differences in terms of scope and depth. We document these differences below and in the estimation results. Bilateral agreements also contain on average a higher number of services provisions compared to other types of services PTAs (see Appendix Figure 12).

In the empirical analysis, we restrict our attention to the PTAs in force since 2000 in order to be able to match the WB-DTA 2.0 data to bilateral services trade and value-added data, respectively, which are described below. This is inconsequential for the analysis as most agreements prior to 2000 would arguably contain shallow services provisions or would be superseded. Moreover, the majority of observations that we lose from this constraint is accounted for by the European Economic Area (EEA) agreement, and all estimations include an EU dummy variable anyway (see equation 4.1). The services chapter of the WB-DTA database covers various aspects of services PTAs, from the general architecture of the agreements, to the specific commitments and reservations on liberalization negotiated by the parties. This information is coded in 64 variables, which span eight policy areas: agreement structure (coverage of modes, presence of separate chapters and annexes), scope and coverage (liberalization approach - positive list, negative list, other type; sectoral and policy inclusions or exclusions), substantive disciplines (definition of market access, non-discrimination, national treatment, local presence requirements, performance requirements, monopolies, domestic regulation, transparency),

exceptions clauses, safeguard mechanisms, movement of natural persons, rules of origin for judicial and natural persons (ownership and nationality), type of dispute settlement.

3.2   Services Trade Data

The most comprehensive dataset including bilateral and sectoral services trade flows is the newly published International Trade and Production Database for statistical estimation (ITPD-E). This dataset is described in detail in Borchert et al. (2021). The ITPD-E contains consistent data on international and domestic trade for 243 countries, 170 industries, and 17 years. The data are constructed at the industry level and cover 17 services sectors. The time series commences in 2000 and extends to 2016.

The ITPD-E is constructed using reported administrative data and intentionally does not include information estimated by statistical techniques. The primary source of services trade data in the ITPD-E are the 'WTO-UNCTAD-ITC Annual Trade in Services Database' and the UN 'Trade in Services Database' (UN TSD). Whilst the nature of services trade raw data remains qualitatively unchanged, the data in ITPD-E are appreciably enhanced by blending two principal sources of statistics, a conservative use of mirroring techniques, and casting all services trade data in the latest EBOPS 2010 format. These features, as well as the unprecedented coverage of industries and countries with consistent international and domestic trade data, renders the ITPD-E well suited for the estimation of gravity models.

Over the recent past, there have been substantial efforts by multilateral agencies and national statistical offices to improve both the quality and coverage of services trade statistics, and these improvements are fully reflected in the ITPD-E. By contrast, services trade data prior to 2000 is widely understood to be of lesser quality, with only few reporting

countries and, importantly, hardly any sectoral breakdown (often only Transport, Travel and Other Commercial Services). As such, our empirical analyses are based upon trade data spanning the most recent years, i.e. nearly two decades that saw most of the action in the rise of services PTAs.

For the most detailed services sector-level analysis, we retain trade data for three sectors from ITPD-E: (i) Finance and Insurance services, (ii) Other Business services, and (iii) charges for intellectual property rights (IPR), respectively. These services meet two criteria: they are quantitatively important and well covered in balance of payments trade statistics, and they are regulation-intensive and therefore international trade in these services likely to respond to ambitious provisions in deep PTAs (unlike Travel or Transport services).

3.3   Sourcing of Value-Added

The second set of research questions that we address relates services PTAs to the share of services value-added (VA) in a country's exports that originates in PTA partners.

To construct our measures of value-added, we resort to the OECD Trade in Value-Added (TiVA) 2018 dataset. Through use of inter-country input-output tables, TiVA provides a series of indicators on 64 countries and 36 industries, over the 2005-2015 period.[10] We exploit the "Origin of value added in gross exports" (EXGR_BSCI) indicator, which offers a breakdown of country's j gross exports in industry h by the value-added generated by industry p in country i. This allows us to identify two main dimensions of interest:

1. Services value-added from country i in services exports of country j.

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[10]The sample of countries and the time period available in the TiVA data implies a restriction of our sample of agreements in this part of our analysis, from 143 to 106.

2. Services value-added from country i in total exports of country j

From these statistics, we can construct our two main variables of interest by taking the following ratios:

$$sh\_servVA\_serv_{i,j,t} = \frac{servVA\_serv\_exp_{i,j,t}}{\sum_i servVA\_serv\_exp_{i,j,t}} \tag{3.1}$$

$$sh\_servVA\_tot\_exp_{i,j,t} = \frac{servVA\_tot\_exp_{i,j,t}}{\sum_i servVA\_tot\_exp_{i,j,t}} \tag{3.2}$$

Ratio 3.1 denotes the share of services VA from country i in services exports of country j, out of total services VA in services exports of country j. Note that the denominator in 3.1 does not correspond to the total of services exported by country j, as it does not include services that are exported by non-services industries, such as manufacturing. This ratio allows us to inspect changes in services value-chains or, more precisely, whether a PTA between i and j affects the amount of services VA that j sources from i (and that enter j's services exports), at the expense of services from other countries or services produced domestically in country j.

Ratio 3.2 denotes the share of services value-added from country i in total exports of country j, out of the total services VA in total exports of country j. Compared to ratio 3.1, ratio 3.2 captures also services VA exported by other industries, such as manufacturing. Since the export of services value-added as embodied inputs into manufacturing products is known as so-called "Mode 5" services trade, the comparison of the two ratios will allow us to say something about PTA effects on Mode 5 as well.

It is worth noting that both ratios allow us to assess whether entering a PTA has an impact on the *composition* of services VA in exports, from non-PTA and domestic VA, to VA from PTA partners. To do so, we exploit ratios 3.1 and 3.2 in a structural gravity

setting, according to the estimation approach described here below.

4 Methodology

4.1 Estimation strategy

We focus on the direct effect of PTAs on services trade and services VA sourcing within a standard structural gravity estimation framework.[11] Hence, we obtain partial effects of PTA provisions on trade that should be interpreted as reduced form estimates.[12].

The dyadic country-pair-year structure of our trade and value-added datasets, alongside a large number of countries, makes it possible to adopt a state-of-the-art approach based on the following estimable equation:

$$Y_{ij,t} = \exp\left(\beta \mathbf{SPol_{ij,t}} + \gamma EU_{ij,t} + \mu_{\mathbf{it}} + \delta_{\mathbf{jt}} + \lambda_{\mathbf{ij}}\right) + \varepsilon_{ij,t} \tag{4.1}$$

where $Y_{ij,t}$ is either the value of directional bilateral services exports[13] between countries i and j in year t, or the VA ratios $sh\_servVA\_serv_{ij,t}$ and $sh\_servVA\_tot\_exp_{ij,t}$ described above. $\mathbf{SPol_{ij,t}}$ is our key variable of interest and represents time-varying services trade policy at varying levels of aggregation. At the most aggregated level, and thereby connecting back to most of the empirical literature thus far, this variable is simply a indicator for the presence of a services PTA, additionally broken out by type of PTA (bilateral, plurilateral, or EU-bilateral).[14] In other specifications, $\mathbf{SPol_{ij,t}}$ represents a vector

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[11]We therefore build on the long tradition of research on trade agreements using gravity models; see Limão (2016) for a survey of this literature.

[12]General equilibrium effects will be accounted for, and embodied in, the fixed effects structure but we do not currently exploit this information.

[13]Note that country-pairs may belong to more than one PTA (e.g. pairs belonging to the EU, which has several agreements with third parties), and therefore may appear as many times in our data as they have signed PTAs in any given year, although the content of these PTAs will of course be different.

[14]We prefer to keep these agreements separate from the other two categories, because unlike in goods trade, there is no uniform external services trade policy for the EU. Technically most of these agreements

of mutually exclusive binary variables that proxy for the depth of services PTAs. Depth can be captured either by a count measure tallying the number of substantial provisions included in services chapters[15], or by indicator variables for the presence of specific policy configurations of key provisions in a certain policy area. The construction of these latter variables will be explained in detail in section 4.2 below. At the most disaggregated level, $\mathbf{SPol_{ij,t}}$ could stand for individual PTA provisions.[16] Because of its particular significance in internal services market liberalization, we control for (time-varying) EU membership in all models.

We include a demanding set of fixed effects in all models, namely at the exporter-year, importer-year and country-pair level. This represents current best practice in the estimation of structural gravity models (Baier et al., 2019), and addresses several endogeneity concerns.

The country-pair fixed effects λ_{ij} account for all bilateral time-invariant factors that could affect bilateral trade (or VA sourcing) or the existence and content of a services PTA: conventional gravity variables such as distance, similarity of legal systems etc. Importantly, the use of country-pair fixed effects also addresses self-selection into signing a PTA. If there were any (economic or political) characteristics of country pairs that provided an incentive of conclude a services PTA, then the dyadic fixed effects λ_{ij} will absorb these factors as long as such features are time-invariant (Baier and Bergstrand,

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are plurilateral ones since "mixed agreements" require ratification by individual EU member states. At the same time, the Commission negotiates on behalf of member states, which *de facto* renders these agreements akin to bilateral ones. To resolve these competing considerations, we keep this set of agreements separate.

[15]Following the approach adopted in other papers that exploit the WB-DTA 2.0 data, we approximate vertical depth with the count of services related provisions, and group PTAs in quartiles of the resultant depth distribution.

[16]Where appropriate we show results based upon individual provisions; generally, however, provisions tend to be correlated, and indeed are sometimes collinear. Hence, including many or all them comprehensively is not feasible whereas arbitrarily including only selected provisions is potentially liable to omitted variable bias.

2007; Yotov et al., 2016).[17] We use two types of country-pair fixed effects (FEs) in this paper: *symmetric* pair FEs when investigating the effect of policies with no distinction on the direction of trade (or VA) flows; *asymmetric* pair FEs when separating the effect depending on the direction of the flow (e.g. high-income to low-income country and *vice-versa*).

In addition, the country-year fixed effects, $\mu_{\mathbf{it}}$ and $\delta_{\mathbf{jt}}$, control for any time-varying country characteristics that could affect its services trade, or sourcing of VA, such as incomes, business cycles, national policies, etc. These fixed effects also account for the multilateral resistance terms of the gravity equation, which capture the fact that changes in bilateral trade costs due to entering a PTA are not independent from changes in trade costs with third countries (Anderson and Van Wincoop, 2003).

Services PTAs are not typically stand-alone agreements; rather, services chapters are negotiated as part of agreements covering a range of trade areas. In this paper, we only use information from the 'Services' chapter of the WB-DTA. It is possible that services provisions are correlated with provisions in other subject areas, which are unobserved here but which may also affect services trade and value added. This could give rise to an omitted variable bias. The WB-DTA 2.0 database encompasses a total of 18 subject areas, and at the level of individual agreements we are able to control for the potential impact of provisions in other subject areas outside of service chapters by including a 'non-services depth variable' that contains the number of provisions in a given PTA outside services. Inclusion of this control variable does not change any of our main results, and its estimated coefficient is typically near zero. We therefore omit it in most tables but

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[17]Alternative methods based control functions and instrumental variables have been proposed to account for endogenous trade policy variables (see e.g. Egger et al. (2011), Egger and Shingal (2020), Osnago et al. (2020)). However, in our context we considered the option of a PPML estimator with country-pair fixed effect to be the preferred approach.

results with non-services depth included are available upon request.

We follow standard practice of estimating equation (4.1) with a non-linear Pseudo Poisson Maximum Likelihood (PPML) estimator as suggested by Silva and Tenreyro (2006). Apart from accounting for the presence of zeroes, which are rife in bilateral services trade data, this approach also handles the heteroscedasticity arising from the presence of several small countries (and flows) in our data. In order to be able to include the three sets of high-dimensional fixed effects described above, we employ the recent PPML estimator developed by Correia, Guimarães and Zylkin (2019).

Finally, we follow the recent innovation by Cameron et al. (2011) and Egger and Tarlea (2015) and base our inferences on three-way clustered standard errors, i.e. at the importer, exporter, and year levels. This strict multi-level clustering takes into account simultaneous correlations across the three main dimension of the panel (over time within countries, and across countries within time periods); these intra-cluster correlations are plausible for trade data.[18] This leads to dramatically more conservative results, compared to robust standard errors, and thus increases our confidence in the significance levels associated with estimated PTA effects.[19]

4.2 Aggregation of services provisions

A principal contribution of this paper is to quantify not only the overall impact of services PTAs but to elucidate specific trade effects that may emanate from the structure of the agreements or certain configurations of individual provisions therein. The design and

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[18]We exploit two-way (importer and exporter) instead of three-way clustered standard errors in the models estimating the PTA effect on services VA. This is because the number of years is limited in the TiVA data, which would imply standard errors to be adjusted to a very small number of clusters. Furthermore, we believe that the correlation across-countries within time period is potentially less concerning than the correlation across-years within countries.

[19]See Egger and Tarlea (2015) and Larch et al. (2019) for a more in-depth explanation of why three-way clustered standard errors should be used in panel-data gravity models.

content of each agreement is coded in 64 variables, across the eight policy areas described earlier in section 1. Yet the role and relevance of the individual variables are likely to be very different; for instance, how to compare the effect of a PTA featuring a positive or a negative list approach with the effect of provisions facilitating the movement of natural persons, or the relevance of a certain type of dispute settlement? To address these issues and to set the WB-DTA data up for meaningful analysis, we propose a way of complexity reduction in this subsection.

Two main approaches have been pursued in the past. Recent works (e.g. Breinlich et al. (2021)) have deployed newly developed statistical techniques to calculate the importance of each variable or provision with respect to, say, international trade flows. These methods are based on 'machine learning' algorithms and do not necessitate an *ex-ante* evaluation of which aspect of a PTA is considered more relevant for the outcome of interest. Prior to machine learning techniques, principal components analysis has sometimes been employed in studies of services trade policies, e.g. Guillin (2013).

A different approach to complexity reduction is to rely to some extent on expert judgement. Rather than letting an algorithm run through all possible combinations of provisions and identifying those with more explanatory power, selection and grouping of PTA provisions is guided by an *a priori* assessment of the significance of provisions, or combination of provisions, in relation to a certain outcome. Although this approach is more subjective, it has a range of advantages: it leverages the experience of researchers with services trade policies, it is more transparent compared to a black box machine learning algorithm, and—in an attempt to mitigate the inherent subjectivity—it can be set up for placebo tests such that no significant results should be obtained where there ought not to be any effect.

The method that we develop for this paper is close to the second approach but, in addition, is guided by the characteristics of the data inasmuch as possible. In a nutshell, our approach follows these steps:

1. From the entirety of the 64 services provisions coded in individual variables, we select key measures that reflect the essence of the agreement's services chapter and whose relevance for international trade in services (and services VA sourcing) can be compared. We group these variables[20] into seven **principal policy areas**.

   (a) The key **policy configurations** that represent the principal policy areas are documented in Table 1 below.

   (b) One criterion for selecting provisions into policy configurations is their assumed significance for services trade and services VA. Another criterion is a provision's empirical frequency distribution across services PTAs. For instance, continuing the above example, the variable that codes "does the agreement contain provisions on mutual recognition (MR)?" exhibits a 'yes' response in 93% of observations, which does not provide the necessary variation to identify an effect. It is therefore better to combine it with information on the strength of MR; for instance, such provisions can represent (i) general obligation of mandatory nature (47%), (ii) obligation subject to limitations (5%), (iii) general obligation but best endeavour nature (36%), and (iv) voluntary obligation (5%). Thus together these two variables exhibit useful variation that can be exploited in estimation.

   (c) The frequency tabulations of variables referred to above take the actual sample size into account, i.e. are weighted by the number of country pairs to which they apply. This means that plurilateral agreements, which involve a large number of bilateral pairs, play a role when gauging the frequency of policies, which we consider as the right approach.

2. Within each policy area, we combine the selected variables. The resultant pattern has itself an empirical frequency distribution across the estimation sample. Some of these policy configurations are fairly highly concentrated, meaning that in practice a few patterns cover nearly all observable cases, whereas other policy configurations also have frequent patterns but in addition have a longer tail across a great many other combinations that occur. For instance, the four most frequent patterns in

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[20]Some of these variables are constructed from a combination of variables as they are published in the WB-DTA 2.0 dataset. For instance, a binary variable indicating the presence of a mandatory provision with respect to mutual recognition, which represents a meaningful covariate for estimation, is constructed from two raw variables, one that indicates the existence of a mutual recognition provision and a second one that indicates its strength (mandatory, as opposed to best endeavour).

the first policy area (Structure of agreement), embodying information from four variables, cover 80% of all observations.

3. Within each policy area, we construct sets of ten mutually exclusive binary variables that correspond to the nine most frequently observed policy configurations, plus one residual variable that equals unity for all other combinations, no matter how many of them may occur. It is these indicator variables for distinct policy configurations that we use jointly in estimation.

4. It is important to notice that the joint inclusion of these 10 variables cover all observable policy configurations contained in the PTAs per policy area. As such, there is no scope for omitted variable in the same way that would be a concern if only selected individual variables would be included in estimation.

5. It is interesting and reassuring to note that in many instances, those policy configurations that emerge amongst the most frequent ones per policy area have a natural interpretation and can be evaluated as being 'ambitious' or 'shallow' in a straightforward manner. For instance, the most frequent pattern in the first policy area (Structure of agreement) can be described, using the underlying variable information, as an agreement that follows a negative list approach, has two main chapters (one for cross-border trade in services and one for investment), and includes a ratchet clause as well as a standstill clause. Against the backdrop of the four underlying variables, this constitutes the second most ambitious pattern that is possible. The most ambitious configuration, which is similar to the above but the agreement exhibits three separate chapters (per mode of supply), is the eighth most frequent pattern and would therefore also be picked up by a discernible indicator variable in estimation.

6. Because policy configurations can be interpreted as ambitious or shallow from their contents, it should be the case that indicator variables for ambitious patterns return positive and significant coefficient whereas there should be no effects for unambitious provisions. This is indeed what we find.

We define seven policy configurations which reflect the contents of 29 different provisions:

Table 1: Construction of Policy Configurations within Policy Areas

No	Policy Area	Policy Configuration: variables	Share Top-4 (%)
1	Structure	Liberalization approach + Agreement structure + Standstill clause + Ratchet clause.	80.4
2	Scope (I)	Existence of sector-specific chapters + Existence of sector-specific provisions + Subsidies not excluded + Govt procurement not excluded.	74.8
3	Scope (II)	Market access disc + Prov on licensing, prof qual, tech std + Prud carveout fin services + National treatment obligation + MFN provision.	54.5
4	Domestic Regulation	Limited dom reg discipline + Mandat information requirement + Mandat provision on MR + Mandat reasonable admin of provisions.	72.7
5	Other Disciplines	Disc monopolies + Prov covering new issues + Disc national/resid managers or BOD + Disc local presence requirement + Disc tech transfer requirement.	51.7
6	Modes of Supply	ROO Mode3 + ROO Mode4 + Prov presence nat persons + Prov perm employ beyond Mode4.	58.7
7	Accountability	Mandat publication laws + Mandat appeals authority + ISDS and state-to-state.	89.5

Source: Authors' elaboration using the WB-DTA 2.0 dataset.
Notes: 'Share Top-4' denotes the share of observations, in percent, covered by the four most frequent policy configuration.

5   Results for Cross-Border Services Trade

We structure the empirical analysis of services PTAs on trade in three steps, starting with establishing an aggregate impact effect to establish a baseline. The main results exploit the rich detailed WB-DTA data to unpick this overall average effect. Hence, using equation (4.1), we first estimate services PTA effects on aggregate services exports from ITPD-E. We then zoom in on specific policy configurations to shed light on those design features of PTAs that effectively matter for trade. Thirdly, we show that these effects in aggregate trade flows are driven by sizable trade effects on specific, regulation-intensive services sectors.

A general insight from our results is that aggregate average trade effects are small and often insignificant, but that highly significant impacts of policy can be found by employing more granular data, i.e. specific policy configurations or sectoral services trade flows, or both. We conclude, therefore, that the rich and novel policy information offered by the WB-DTA 2.0 is instrumental in an analysis of services trade flows, and that small or insignificant aggregate effects should not prematurely be interpreted as services PTAs being ineffective. Our results demonstrate that quite the contrary is true, and as such our paper sheds light on the design of effective service trade agreements at the provisions level.

5.1   Benchmark Overall PTA Effect

We start our analysis with a simple specification that has usually been employed in the literature, namely a binary indicator variable for the existence of a services PTA subject to a number of appropriate controls, which here consists of full sets of fixed effects and an EU membership dummy. The existence of an agreement *per se* is associated with a very small

and insignificant contemporaneous trade effect (Table 2, column 1). Against the backdrop of earlier studies that have found positive overall services PTA effects, we attribute the insignificance of these dummy variables to the demanding fixed effects structure employed in all models, which consumes most cross-sectional variation and leaves essentially only within-agreement variation over time to identify PTA or policy coefficients. Moreover, the three-way clustering tends to increase confidence intervals and leads to (very) conservative inference as to whether or not a coefficient is significant.

However, once broken out by type of agreement, it becomes evident that trade between country pairs linked by a bilateral agreement is on average 9.4% higher than non-PTA trade. This result likely reflects the feature of bilateral PTAs to exhibit more services provisions than other types of agreements (Figure 12).

Estimations with lagged PTA variables show that the effects take time to materialise (columns 3 and 4 of Table 2). Two years after inception, services trade under the auspices of bilateral PTAs are on average 19.7% higher than non-PTA trade flows.

Table 2: Trade Effect of Services PTAs, 2000-16

	(1)	(2)	(3)	(4)	(5)	(6)
Services PTA	0.0042					
Bilateral PTA		0.0895**				
EU-bilat PTA		0.0034				
Plurilat PTA		0.0042*				
Depth subst Serv Q1			0.0003			
Depth subst Serv Q2			0.0156			
Depth subst Serv Q3			0.0426			
Depth subst Serv Q4			0.1651*			
Services PTA (t-2)				0.0041*		
Bilateral PTA (t-2)					0.1802**	
EU-bilat PTA (t-2)					0.0024	
Plurilat PTA (t-2)					0.0041**	
Depth subst Serv Q1 (t-2)						0.0002
Depth subst Serv Q2 (t-2)						0.0721
Depth subst Serv Q3 (t-2)						0.0726*
Depth subst Serv Q4 (t-2)						0.3019***
EU Pair	0.2485*	0.2478*	0.2475*	0.2320*	0.2308*	0.2305*
Depth subst Non-Serv			0.0001			
Depth subst Non-Serv (t-2)						0.0001
Observations	235,876	235,876	235,876	208,076	208,076	208,076
Exporter-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' estimations using WB-DTA 2.0 and ITPD-E data. Dependent variable: bilateral services trade X_{ijt}. PPML estimation with three-way clustered standard errors. 'Depth subst' measures the number of substantial provisions in a PTA's services and non-services chapters, respectively. Q1-Q4 denotes quartiles.

Figure 5: Key provisions by type of agreement, across 131 Services PTAs
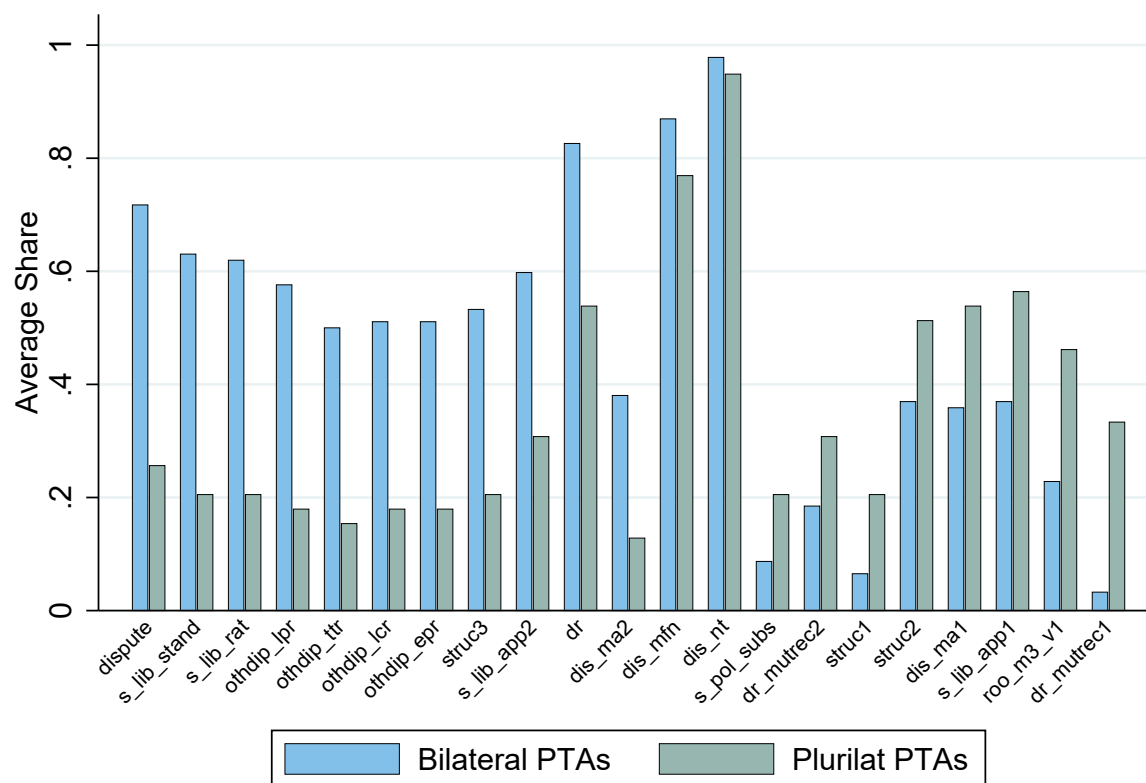
The reason for the greater effectiveness of bilateral PTAs, as opposed to plurilateral ones, may lie in the systematic differences in terms of structure and scope of these two agreement types. Figure 5 depicts the relative incidence of key provisions across the two types. Whilst almost all agreements exhibit an MFN and NT clause, indicated by bars of similar height in the middle of the graph, there are distinct sets of provisions that predominantly occur in bilateral agreements (on the left) and in plurilaterals (on the right). Plurilateral agreements more often exhibit some mandatory provision on mutual recognition ('dr_mutrec1'), but are also more likely to follow the GATS concept of market access ('dis_ma1') and a positive list approach to scheduling commitments ('s_lib_app1'). By contrast, bilateral agreements are much more likely to feature a range of other disciplines ('othdip_xxx'), include a standstill clause ('s_lib_stand') and more chapters related to services ('struc3'), and to follow a negative list approach to scheduling commitments ('s_lib_app2'). These features are arguably characteristic of more ambitious liberalisation, which may explain the difference in estimated effects.

The results in Table 2 also confirm that the effect of services PTAs is robust to the inclusion of a proxy for depth across the rest of the agreement. The coefficient on the number of substantive provisions in *non-services* areas is essentially nil (columns 3 and 6); at the same time, estimated coefficients for the depth of *services* chapters (quartiles for the number of substantive provisions in services) show that only the really ambitious, deep agreements are associated with higher services trade. This result foregrounds a general insight, elaborated by more detailed findings below, that all results are robust to a proxy for ambition in other parts of the agreement, but depth in services chapters is crucial.

Some of the individual provisions or design features of an agreement are associated with significant trade effects (Table 3). For instance, trade is about 10-16% higher under

agreements that feature a standstill or ratched clause, that provide for comprehensive dispute settlement (ISDS and state-to-state dispute resolution), or agreements that employ a definition of market access as in US FTAs. These effects are driven by agreements between countries from the same income per capita bracket, i.e. similar economies in terms of development stage. These findings on the impact of individual aspects are robust to controlling for non-services agreement depth.

Table 3: Trade Effect of Services PTAs, 2000-16

	(1)	(2)	(3)	(4)	(5)
Services PTA	0.0036	0.0036	0.0038	0.0038	
Comprehen dispute	0.1166**				
Comprehen dispute Equal		0.1340**			
Comprehen dispute H2L		0.1054			
Comprehen dispute L2H		0.0106			
Ratchet/Stand			0.0932		
Ratchet/Stand Equal				0.1010*	
Ratchet/Stand H2L				-0.0069	
Ratchet/Stand L2H				0.0400	
MA US-FTA					0.1514*
MA GATS					0.0035
MA Other					0.0041
EU Pair	0.2476*	0.2476*	0.2479*	0.2479*	0.2478*
Observations	235,876	235,876	235,876	235,876	235,876
Exporter-year FE	Yes	Yes	Yes	Yes	Yes
Importer-year FE	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes

Source: Authors' estimations using WB-DTA 2.0 and ITPD-E data. Dependent variable: bilateral services trade X_{ijt}. PPML estimation with three-way clustered standard errors.

5.2 Impact of Policy Configurations

In order to obtain more detailed results that would help us understand which exact features of services PTAs are effective in facilitating trade, we employ the policy configurations as defined in section 4.2 in estimation. Table 4 displays the empirical results for three policy areas: Structure of an agreement, Rules of Origin, and Accountability. 'Structure', for instance, refers to the liberalisation approach taken by an agreement (positive or negative list approach), 'rules of origin' define ownership or nationality criteria for firms and natural persons to be considered as belonging to a PTA partner, and 'accountability' refers to transparency of regulation and dispute settlement mechanisms. In every estimation, the full set of ten indicator variables is always included; as such, the entirety of all policy combinations that occur empirically in the data is always captured. Whilst all dummy variables are included, the Table only shows the coefficients associated with two *ambitious* policy configurations (highlighted in green) as well as two shallow policy configurations, respectively.

The main result from Table 4 is that ambitious policy configurations increase services trade by 15-65%, depending on the policy area, whereas shallow combinations have no discernible effect. These trade impacts are sizable, although we should emphasise again that they represent reduced form, partial equilibrium effects. What is evident in any case is that the richness of policy data at the level of individual provisions, and in combination, matters crucially for the significance and magnitude of estimated trade impacts.[21] These findings are testimony to the fact that only agreements with ambitious structure, disciplines and accountability affect services exports significantly. Other combinations, especially shallow ones, are not associated in any way with more trade. This placebo test

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[21]Both size and significance are fully robust to controlling for non-services agreement depth.

lends further credibility to the results and shows that estimated effects are not randomly distributed across observable policy patterns.

Table 4: Trade Effect of PTA Policy Clusters, 2000-16

	(1)	(2)	(3)	(4)	(5)	(6)
Struct(most ambitious)	0.4681**	0.5531***				
Struct(very ambitious)	0.1910*	0.0327				
Struct(not ambitious)	0.0037	-0.0002				
Struct(least ambitious)	0.0021	0.0000				
RoO(liberal M3 M4)			0.5031***	0.3545**		
RoO(move profs)			0.4347*	0.5627***		
RoO(most frequent)			-0.0057	0.0321		
RoO(2nd most freq)			0.0023	0.0001		
Account(most ambitious)					0.1469***	0.1022**
Account(very ambitious)					0.0079	-0.0006
Account(pub requirement)					0.0622**	0.0580**
Account(least ambitious)					0.0034	-0.0001
EU Pair	0.2475*	0.3119	0.2479*	0.3123	0.2474*	0.3121
Observations	235,876	203,732	235,876	203,732	235,876	203,732
Exporter-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' estimations using WB-DTA 2.0 and ITPD-E data. Dependent variable: bilateral services trade X_{ijt}. PPML estimation with three-way clustered standard errors. Other policy patterns controlled for but coefficients not reported. Columns 1, 3, 5 include all observations whereas columns 2, 4, 6 restrict the sample to PTA pairs.

Finally, we estimate effects for bilateral trade in individual services products. The approach deploys the same technique as above, i.e. using indicator variables for specific policy configurations, but does so on disaggregated trade flows for individual services sectors (Table 5). With some variation across the individual services sectors, the results confirm our main finding that the trade-enhancing effect of PTAs materialises only through ambitious policy configurations in key areas that pertain to the agreement's structure, its scope, and meaningful disciplines e.g. on the prohibition of local presence requirements, technology transfers, or nationality requirements for managers. Only in these instances do agreements increase bilateral trade substantially. Moreover, Table 5 shows that aggregate effects are driven by increases in trade in regulation-intensive services such as financial and business services and intellectual property rights. All of these findings are robust to controlling for non-services agreement depth.

Table 5: Impact of Policy Clusters in Individual Services Sectors, 2000-16

	(1) FinIns	(2) OthBusi	(3) IPR	(4) FinIns	(5) OthBusi	(6) IPR
Structure (most ambitious)	0.3944	0.2045	1.0139***			
Structure (shallow)	0.0018	0.0010	0.0065			
Scope I (ambitious)				0.3242***	0.2523	0.4089*
Scope I (shallow)				-0.1286**	0.0196	0.0290
EU Pair	0.9817***	1.4664***	0.0013	0.9861***	1.4678***	0.0013

	(7) FinIns	(8) OthBusi	(9) IPR	(10) FinIns	(11) OthBusi	(12) IPR
Scope II (most ambitious)	0.6328***	0.3221***	0.1161			
Scope II (least ambitious)	0.0023	0.0015	0.0097			
Disciplines (ambitious)				0.7319***	0.2501***	0.1864
Disciplines (shallow)				-0.0953	0.0204	-0.0354*
EU Pair	0.9778***	1.4661***	0.0015	0.9788***	1.4629***	0.0021
Observations	222,856	230,095	204,868	222,856	230,095	204,868
Exporter-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' estimations using WB-DTA 2.0 and ITPD-E data. Dependent variable: bilateral services trade X_{ijt}. PPML estimation with three-way clustered standard errors. Other policy patterns controlled for but coefficients not reported.

6   Results for Sourcing of Value-Added

Signing a services PTA does not only have an impact on the international sales of services as evident in higher bilateral services trade flows; in addition, being part of a PTA may also affect the pattern of value-added sourcing. Easier access to a partner's market can be of relevance to obtain key services inputs through either cross-border trade or, perhaps more crucially, freer movement of professionals and the establishment of foreign subsidiaries, respectively. Changes in the availability of services inputs can induce producers to alter the structure of domestic and international supply chains, in particular towards a larger share of value-added originating from the partner of a trade agreement. The latter might become preferable to value-added from countries with no agreement due to lower sourcing costs. In addition, firms might decide to 'internationalize' their production, switching from domestically produced services inputs to foreign ones.

Motivated by these arguments, we investigate how services PTAs and the specific provisions therein affect the share of value-added in a country's exports that originates from PTA partners. The results shed light on a specific way in which services PTAs impact on supply chain trade, on which little is known thus far.

6.1   Redirection of Services VA Inputs

To illustrate how services PTA can affect the origin of services value-added (VA), Figure 6 provides a stylized example of the main effects that can be at work. Services VA in services exports of, for instance, the US, can be decomposed in services VA sourced on the domestic market and services VA sourced abroad.

In case a PTA covering the supply of services is signed by the US with one of its trade partners, e.g. the UK-Korea FTA (KORUS FTA), US services producers might decide

to shift the sourcing of their services inputs to the new PTA partner, to the detriment of services that were previously sourced from either non-PTA partners, or domestic services producers, or both. The former of these effects can be considered a *redirection* of VA, from non-PTA to PTA partners; the latter can be considered an *internationalization* of VA, from domestic to foreign VA.

Figure 6: Do Services PTAs affect the origin of services value added?
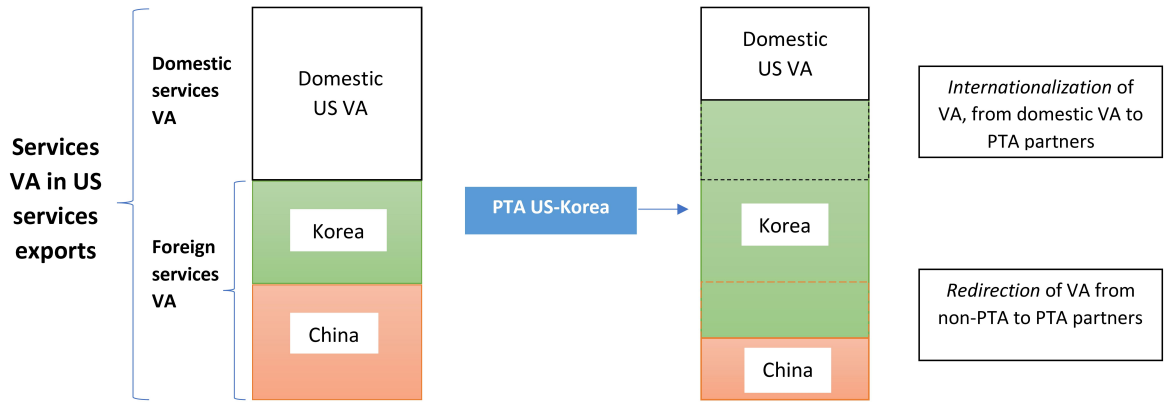
Source: Authors' elaboration.

We investigate the impact of joining a services PTA on the share of foreign services VA in a country's exports sourced from PTA partners by exploiting specification (4.1), with the VA ratios (3.1) and (3.2) as left hand side variables of the model.[22] Similarly to what done for services trade in section (5), we perform the analysis beginning with the aggregate PTA impact on services VA, and subsequently we investigate the effect of specific policy configurations of the agreements.

Table 6 reports the results for the PTA effect. On aggregate, entering a services PTA leads to an increase in the share of service VA sourced from PTA partners. This effect

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[22]Note that our estimation strategy allows us to estimate the (average) change in the share of foreign VA from PTA partners, but not to distinguish whether the effect comes at the expense of non-PTA partners or domestic VA: this is due to our fixed effects structure (the country-year FEs, in particular), which would absorb all the variation in our data if the domestic VA share were used as dependent variable.

is found both for services VA in services exports and services VA in total exports, in columns (1) and (3) of table 6. The magnitude of these effects is rather small, however: the coefficient estimated for services exports suggest that the average PTA effect is to increase the within-PTA services VA share by $e^{0.0125} - 1 = 0.0126\%$.

Table 6: Service PTA effect on value-added shares

| | (1) | (2) | (3) | (4) | (5) | (6) |
	Services VA in services exp.			Services VA in total exp.		
PTA	0.0125**			0.0069**		
Bilateral PTA		0.0309***			0.0474***	
EU bilateral PTA		0.0124**			0.0067**	
Plurilateral PTA		0.0123**			0.0061*	
Depth Q1			0.0013			0.0012
Depth Q2			0.0129**			0.0077
Depth Q3			0.0041			0.0035
Depth Q4			0.0312***			0.0576*
EU Pair	0.113	0.113	0.111	0.133**	0.133**	0.133**
Depth non-serv.			0.0000*			0.0000
Observations	165,066	165,066	165,066	165,066	165,066	165,066
Exporter-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Importer-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: 'Depth' measures the number of provisions in a PTA's services and non-services chapters, respectively. Q1-Q4 denotes quartiles. PPML estimation with two-way standard errors clustered at exporter and importer level. * p <0.1, ** p <0.05, *** p <0.01

In columns (2) and (4) we unpack the PTA effect depending on the bilateral versus plurilateral dimension of the agreements. The coefficients on EU-bilateral and plurilateral PTAs are similar to the aggregate one, as they pick up the effect for the majority of the observations in our data. Bilateral agreements, however, although accounting for a small fraction of our data, appear to lead to a twice as large an increase in the VA share from PTA partners, with this effect being also much more precisely estimated.

In columns (3) and (6), lastly, we exploit the detailed information about the *vertical depth* of services PTAs, i.e. the number of services-related provisions in the agreement.

Similarly to section 5, we construct four mutually exclusive binary variables identifying four quartiles of the services-depth distribution, and flexibly estimate the impact on the share of services VA in services and total exports. We obtain heterogeneous effects, with deeper services-PTAs driving our findings: for both services and total exports, PTAs in the fourth quartile have a substantially larger and more significant effect on the share of services VA from PTA partners. Note that in these models we also control for the effect of the non-services-depth of PTAs, which we take into account with the number of non-services provisions in the agreement: these latter appear to have a positive impact on the within-PTA share of services VA, although the coefficient is a significant for services exports only.

6.2   Linkages to Investment and Mode 4

In this section we investigate the heterogeneous impact of specific policy configurations on the share of services VA from PTA partners.

We focus on two of the seven policy areas described in table 1, namely the provisions relating to the 'other disciplines' included in services PTAs (Policy Area 5), and the provisions relating to liberalization of so-called 'Mode 3' (M3) and 'Mode 4' (M4) services supply (Policy Area 6).

As these are the two policy areas that most relate to GVCs and investment, we explore the existence of asymmetric effects between countries at different levels of income. Patterns of multinationals' (MNE) activity might in fact vary substantially depending on the country of origin of the MNE, and on where foreign suppliers are located. For this purpose we split our sample in high- and low-income countries[23] and create three

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[23]As the TiVA data exploited in this part of the work only feature 64 high-, upper-middle-, and lower-middle-income countries (as classified by the World Bank), we group upper- and lower-middle income countries in one group, which we define 'low-income'.

mutually exclusive binary variables identifying country-pairs at the same level of income (Equal pairs in figures 7 and 8), pairs with a low-income exporter of VA sourced from a high-income country (H → L pairs) and, *vice-versa* (L → H pairs). Note that we define the direction of the effect depending on where the VA is sourced from. We then interact these three binary variables with the indicators for the combinations of provisions in the two policy areas (as done in section 5 above), and estimate a different impact of each combination on the three subgroups of country-pairs jointly in the same model.[24] We present the results of these estimations in figures 7 and 8, which report the marginal effects (exponentiated coefficients) together with 90% confidence intervals for four combination of provisions in each policy area.[25]
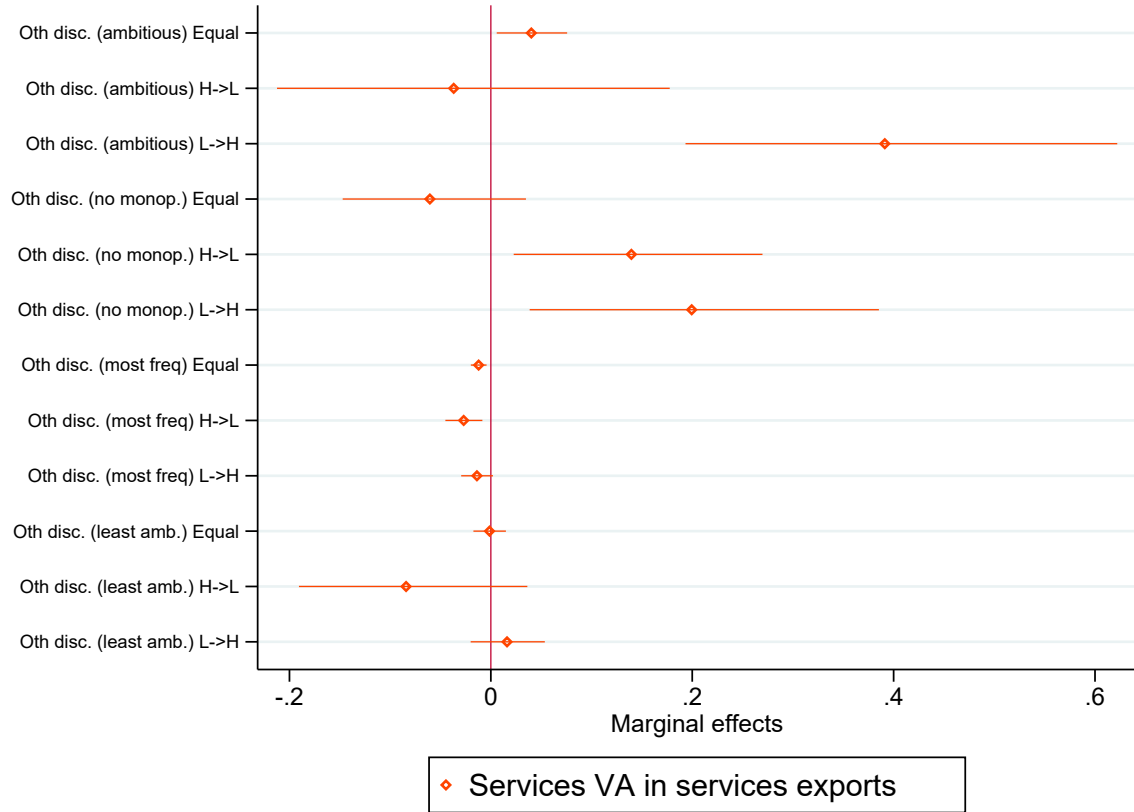
Figure 7 shows the impact on the share of services VA from PTA partners (in services exports) of the two most ambitious combinations of provisions (all provisions in Policy Area 5 are in the PTA, and all provisions except the discipline of monopolies to protect foreign suppliers), the most frequent combination (featuring only the discipline of monopolies), and the least ambitious combination (featuring none of the provisions in this Policy Area).

PTAs featuring the most ambitious set of provisions appear to have a positive impact on the share of services VA for equal-income PTA pairs and, interestingly, on VA sourced from low-income countries and exported by high-income countries. This latter effect is very large, and is suggestive of such PTAs leading to more VA sourced from subsidiaries in low-income countries in exports of high-income countries. Also the second most ambitious combination is found to lead to more services VA from PTA partners, but only for unequal pairs. Importantly, no effect is detected for PTAs with few or no provisions in this policy

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[24]The estimation is performed separately by policy area.

[25]All combinations are of course included in the estimated models, we report only four for presentational ease.

Figure 7: Disciplines affecting investment and GVCs

Source: Authors' elaboration.

area, which is what we expect.

Figure 8 shows the impact on the share of services VA from PTA partners (in services exports) of PTAs with liberal definitions about which firms and professionals qualify to benefit from the the PTA, i.e. ambitious at liberalizing Mode 3 and Mode 4 services trade. This is compared to the impact of PTAs that are less liberal in Mode 3 and 4, but with specific provisions on certain categories of professionals, as well as PTAs featuring the two most frequent combination of provisions in this policy area, both of which are a great deal less liberal on Mode 3 and 4 trade. Similarly to Figure 7, significant effects in Figure 8 are found where they are expected, and none for shallow provisions. PTAs that facilitate the exchange of capital and people result in an increased share of services value added sourced from PTA partners. The impact is found for all types of pairs, and

Figure 8: Disciplines affecting Mode 3 and Mode 4
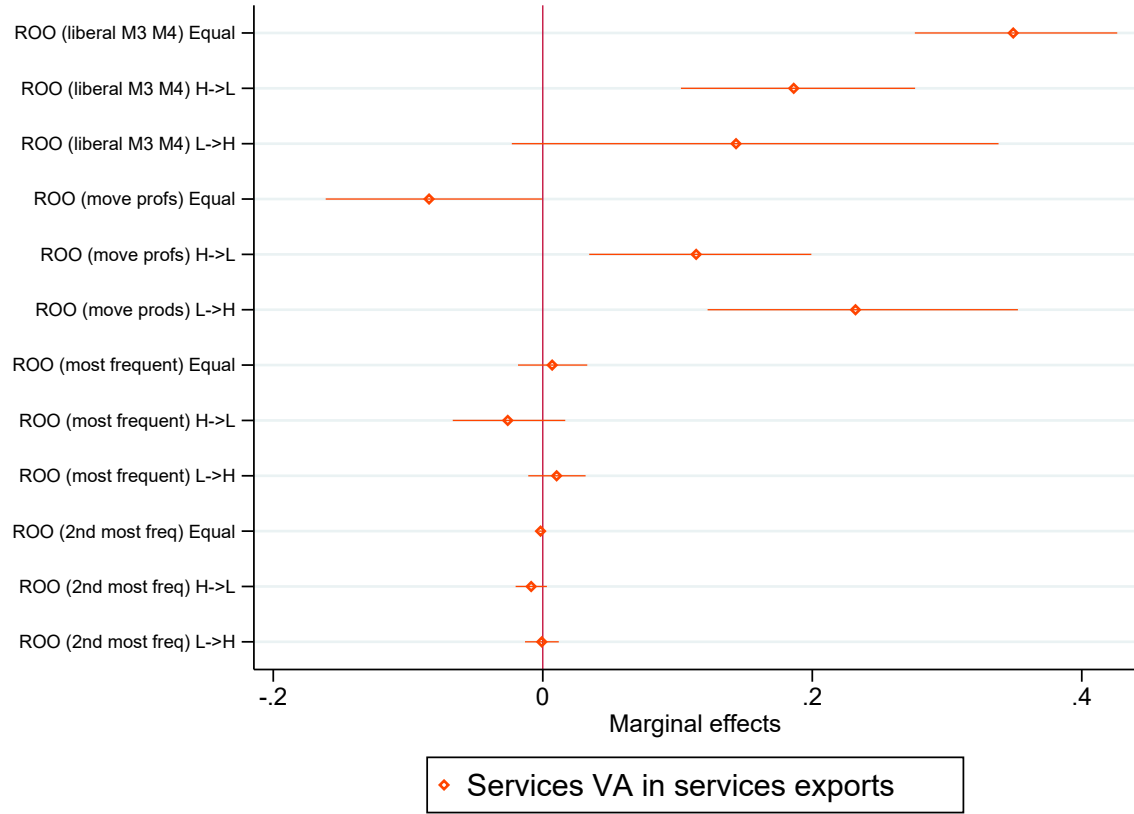
Source: Authors' elaboration.

is economically large, with the value added share being 15-35% higher (top three entries in figure 8). PTAs with specific provisions on professionals also have a positive impact on value added, but only for unequal pairs, and more so for value added originating in low-income countries in exports of high-income countries. The impact of PTAs that are not particularly ambitious in this policy area is essentially nil.

7 Conclusions

Services trade is a dynamic and fast-growing area. Policy making for services trade is no less dynamic: over the last twenty years, well over a hundred preferential trade agreements (PTAs) with services and investment provisions have been concluded. The number of

services PTAs has surged against the backdrop of rising value chain trade, a stalemate of services negotiations at the multilateral level, as well as digitisation, which has positively affected the tradability of many services. All told, today's large number of services PTAs provides the governance framework that underpins much of current services trade. This begs the question of how an agreement's architecture, scope and depth affects trade and value added in services.

This paper offers evidence on those sets of provisions in services trade agreements that have a material impact on bilateral trade and value added in services. As a benchmark, and broadly consistent with earlier literature, we find that the value of trade between the two partners is on average 20% higher compared to non-preferential trade flows two years after a *bilateral* services PTA came into force, whereas the effect of a *plurilateral* PTA is much lower.

Yet the main findings derive from exploiting the rich policy information in the newly released World Bank Deep Trade Agreements 2.0 (WB-DTA) dataset. We find that ambitious configurations of provisions in areas such as the structure of the agreement, rules of origin for judicial and natural persons, and accountability increase bilateral services trade by 15-65%. At the same time, no effects at all are associated with shallow, unambitious policy choices, which is what one would expect from a "placebo test." We also show that PTA provisions are particularly effective for financial services, business services and the exchange of intellectual property rights. These are typically regulation-intensive types of services that stand to benefit from the aforementioned disciplines in services PTAs. These results are derived under a demanding fixed effects structure and with three-way clustered standard errors, including dyadic country-pair effects that mitigate against potential endogeneity concerns.

We also show how the existence of services PTAs affects the international sourcing of services *inputs*. Using information from the Trade in Value Added (TiVA) database, we find that economies source more services value added from PTA partners for their services exports, relative to non-preferential imports or domestic services inputs. For instance, in agreements with liberal definitions as to which firms and service professionals qualify to benefit from the PTA (Mode 3 and Mode 4 trade, respectively) the share of services value added from PTA partners is higher by 15-35%. This finding is consistent with service PTAs playing a role in facilitating value-chain trade that relies on commercial presence abroad and the movement of natural persons.

Our results represent reduced form, average partial effects and therefore should not be interpreted in a general equilibrium or welfare sense; nevertheless, they demonstrate the substantial impact that deep services PTAs can have on trade and value added. The findings are also robust to controlling for the depth of other agreement chapters outside of services.

In future work, we plan to study in greater detail the differential effects of provisions that confer benefits exclusively to the PTA partner, as opposed to non-discriminatory provisions that may generally improve trading conditions. Also more work needs to be done that recognises the endogenous nature of services PTAs.

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8   Appendix

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Figure 9: New Agreements entered into over 2000-2016 period
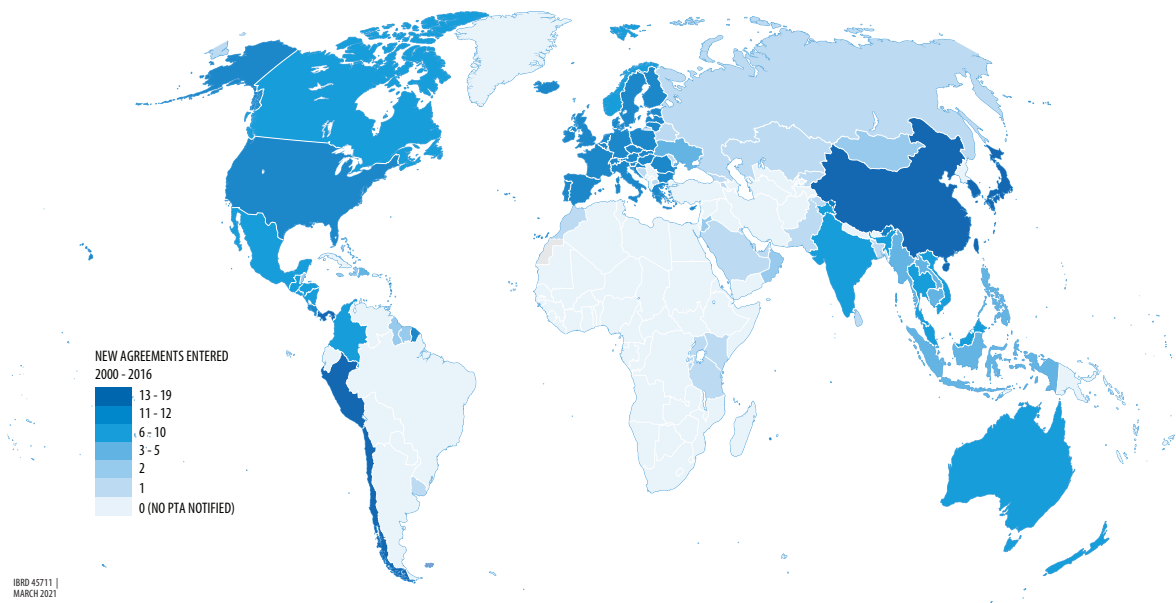
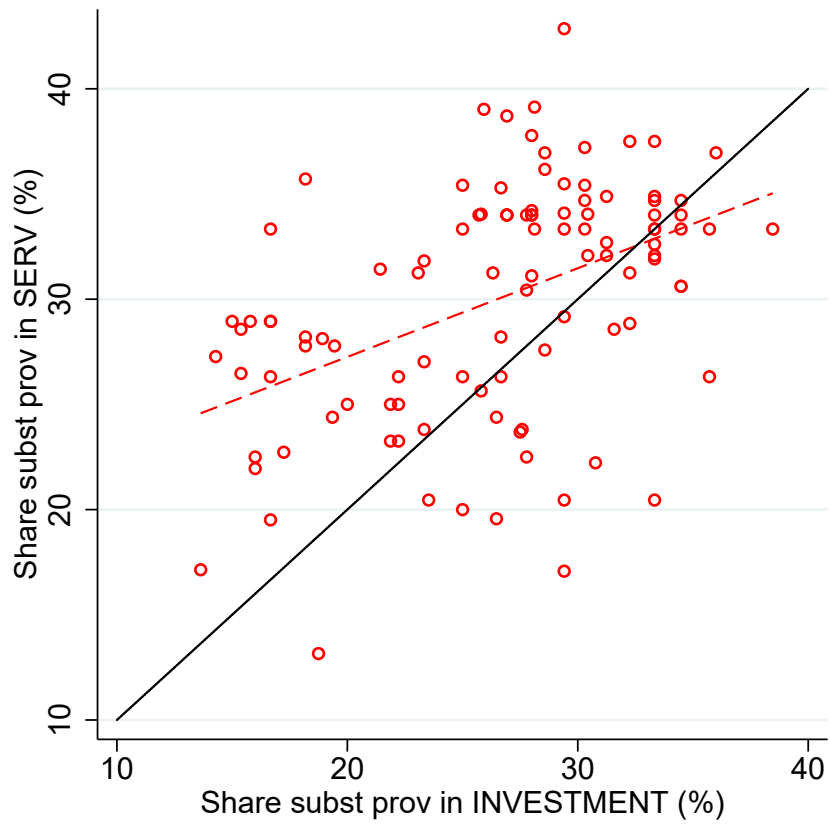

Source: Authors' elaboration using WB-DTA 2.0 data.

Note: Zero ('0') means that an economy has not notified any new agreements to the WTO. This could be because there is in fact no services PTA (the vast majority of cases), or because an economy is not a member of the WTO, or even if it is, an agreement may not been notified to the WTO until well after it has taken effect.

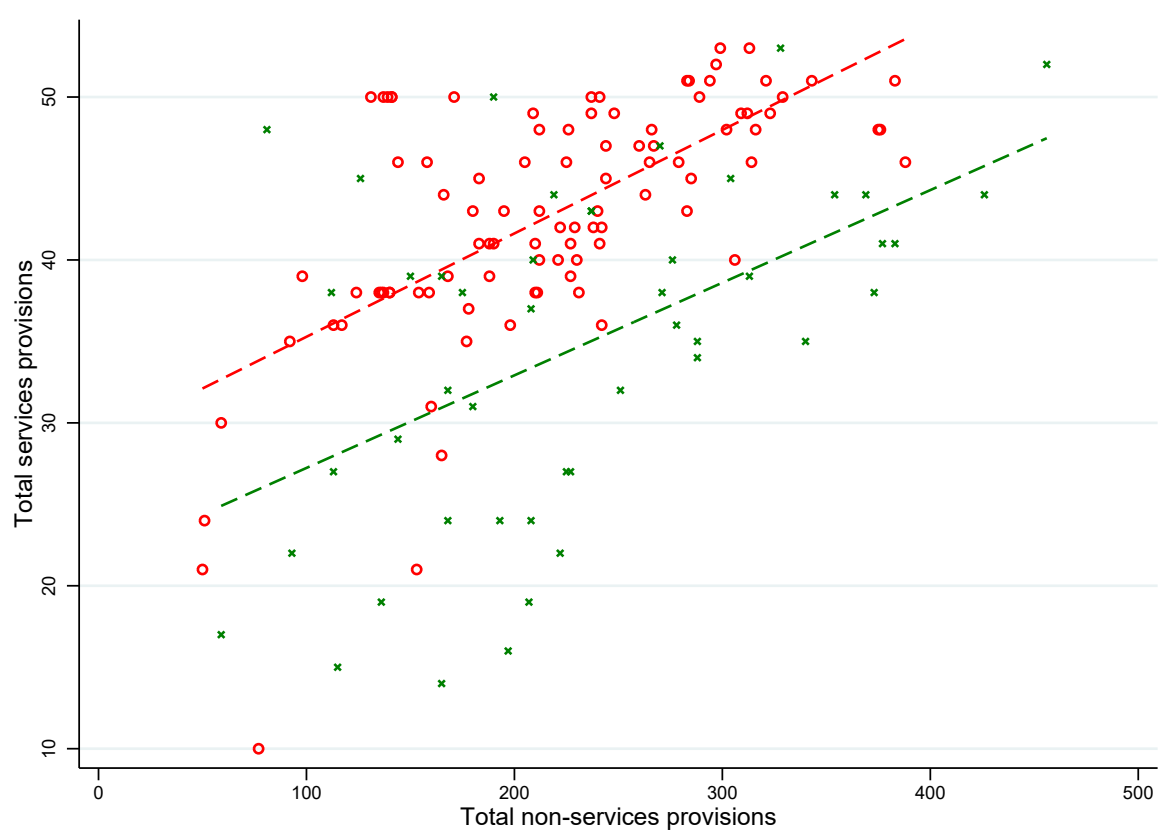Figure 10: Increasing number of bilateral pairs covered by Services PTAs

Source: Authors' elaboration.

Figure 11: Share of substantial provisions in Services vs Investment

Figure 12: Number of provisions in services vs overall number