ISSN 2042-2695

CENTRE *for* ECONOMIC PERFORMANCE

CEP Discussion Paper No 1532

March 2018

Beyond Tariff Reductions: What Extra Boost From Trade Agreement Provisions?

Swati Dhingra
Rebecca Freeman
Eleonora Mavroeidi

THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Abstract
There is a growing recognition that for developed economies, like the UK, tariff-free market access is just one of a number of measures that ease cross-border trade flows. Modern trade agreements go beyond tariff reductions by setting rules, such as market access and regulation of foreign service providers. We examine the contribution of deep non-tariff provisions on international trade in goods and services. Using a gravity model, we find that provisions related to services, investment, and competition make up half of the overall impact of economic integration agreements on trade flows. These deep provisions have larger effects for trade in services than for trade in goods, and their relative contribution is highest in sectors that facilitate supply chain activity, such as transportation and storage. We apply our sectoral estimates of deep provisions to examine two counterfactuals of the UK signing bilateral deals with the US and with China and India. We find that negotiating services, investment, and competition provisions in these future deals would boost trade relatively more in professional, scientific, and technical activities in the UK.

Key words: trade agreements, integration agreements, EIAs, trade policy, provisions, non-tariff barriers
JEL: F10; F13; F14; F15

This paper was produced as part of the Centre's Trade Programme. The Centre for Economic Performance is financed by the Economic and Social Research Council.

This paper benefited from useful comments from Richard Baldwin, Julia Cajal, Céliene Carrère, Marcelo Olarreaga, Angelos Theodorakopoulos, Gregory Thwaites, and participants at the DEGIT XXII conference, ETSG 2017 conference, as well as internal presentations at the Bank of England and the OECD.

Swati Dhingra, London School of Economics, Centre for Economic Performance and CEPR. Rebecca Freeman, The Graduate Institute, Geneva. Eleonora Mavroeidi, analysis completed while at the Bank of England.

Published by
Centre for Economic Performance
London School of Economics and Political Science
Houghton Street
London WC2A 2AE

1 *Introduction*

On June 23, 2016, the United Kingdom voted to leave the European Union and pursue new trading arrangements with the EU and the rest of the world. The EU is the UK's largest trade and investment partner. About half of the UK's cross-border flows of goods and services are with the EU, and membership determines provisions related to a vast number of policies and regulations that relate to these areas. Much of the discussion of future trading arrangements has focused on whether the UK should continue to have tariff-free trade with the EU, say, by staying in the European Free Trade Area or the EU's customs union.[1] There is growing recognition, however, that for developed economies, like the UK, tariff-free market access is just one of a number of provisions that are needed to ease cross-border trade. Modern trade agreements go beyond tariff reductions by setting rules such as market access and regulation of foreign service providers and promoting competition among domestic and foreign businesses.

This paper examines the extent to which deep provisions in trade agreements that go beyond reducing tariffs on goods ease the cross-border flows of goods and services. Looking at the distinct provisions that are contained in modern economic integration agreements, we determine the contribution of deep provisions in expanding trade in goods and services across different sectors of the UK economy. In the context of design and impacts of trade agreements, moving from aggregate to disaggregate trade flows is an important exercise for determining which sectors are most affected by various provisions. Using the granular estimates, we predict the sectoral impacts of including deep provisions in future trading arrangements with the UK's major trade partners.

A number of studies have examined the potential consequences of Brexit for the UK economy. Most studies, for example Dhingra et al. (2017), HM Treasury (2016) and Kierzenkowski et al. (2016), find that Brexit would have a negative impact on UK GDP, with estimates ranging from a 1.3% loss under a soft Brexit with largely unchanged levels of market access with the EU, to a 3% loss under a hard Brexit that has no new trading arrangements in place beyond the UK's membership in the World Trade Organization. These studies predict the potential impact of higher trade costs on trade flows and welfare, but they do not estimate which policies covered in economic integration agreements reduce trade costs. For instance, Dhingra et al. (2017) determine non-tariff barriers based on firm surveys of the ease of doing business across borders, so their estimates are likely to reflect the combined contribution of all deep provisions embedded in the trade agreement. We instead focus on determining which provisions contained in trade agreements are most effective in lowering non-tariff barriers to trade. Disentangling the relative contribution of deep provisions is relevant for the design of a trade agreement. After Brexit, the UK will face a choice regarding which provisions to include in its new arrangements, and a fundamental question is which of these are most important in reducing the non-tariff barriers to trade.

Economic integration agreements (EIAs)—perhaps the most widely used tool through which poli-

[1] UK Trade Options Beyond 2019, House of Commons International Trade Committee, page 4.

cymakers aim to foster strong trading relationships—have evolved greatly both in volume and scope since their introduction in the 1990s. Roughly 300 EIAs are in force today, compared to only about 20 in 1990. And these new EIAs contain a range of new policy provisions which go beyond the scope of traditional trade policy tools (like tariffs and quotas). Whereas the predominant focus of early trade arrangements was lowering tariffs and quantitative restrictions to ease trade in goods, today's EIAs include a range of non-tariff measures, or provisions, to ease bilateral flows of services and investments through reductions in barriers to cross-border market access and behind-the-border transaction costs. Such provisions typically encompass measures such as mutual recognition of professional qualifications for service providers and investment liberalization and protection commitments, which often go beyond the narrow remit of trade policy tools. EIAs which include these provision types are often referred to as deep trade agreements, and these agreements have become more prevalent over time. As such, Baldwin (2013) describes 21st century trade as more complex and interconnected, led by the nexus of trade, services, investment, and measures to protect competition. In light of this, we focus our analysis specifically on services, investment, and competition provisions and examine the extent to which these non-tariff provisions in EIAs ease bilateral trade.

Despite a growing literature which has examined the impact of EIAs on trade flows, there is limited empirical work studying *which* EIA provisions contribute most to expansion in bilateral trade. Understanding the additional boost to trade from deep provisions is particularly important in the current political economy, where major trading economies are seeking to re-negotiate existing EIAs or to negotiate new trade accords with both regional and extra-regional trade partners. For instance, the EU recently implemented the trade chapter (which includes tariff cuts on goods) of the Canada-EU EIA, but revised its deeper commitments on investments amid public concerns.[2] Deep provisions are likely to be just as crucial in the Brexit negotiations. As tariffs between developed countries are already low in many industries, most studies estimate that overall reductions in the UK's bilateral trade flows with the EU would be largely driven by higher non-tariff barriers after Brexit. Making up for these reductions in trade with the EU through deals outside the EU would also require addressing non-tariff barriers. Major trade partners, like the US, China and India, have even higher bilateral non-tariff barriers with the UK. We therefore determine the impact of including deep provisions in future deals with these trade partners.

At the aggregate level, we find that provisions related to services, investment, and competition determine close to 60% of the estimated overall impact of trade agreements on exports (goods and services combined). As production networks have become fragmented and dispersed, we examine both gross trade and value added trade of intermediate and final goods and services separately. Gross trade statistics need not represent the true value of countries' exports in the presence of global value chains, so we estimate the impacts for both the domestic and foreign content of any given sector. We find that trade agreements with deep provisions have the largest impact on domestic value added, and that services, investment, and competition provisions contribute roughly 50% to the overall impact of

[2]Investment in TTIP and Beyond - The Path for Reform, European Commission, page 3.

EIAs on trade in services, and between 30% and 35% on trade in goods. These results hold regardless of whether the goods or services are intermediates or final. As such, our analysis sheds light on which provisions are most effective in increasing export volumes or tapping into production networks through forward and backward linkages with trade partners. The findings are robust to the inclusion of additional provision categories, which, alongside services, investment, and competition provisions, encompass the universe of underlying clauses that make up deep agreements.

Unsurprisingly, the contribution of these provisions is statistically larger for trade in services than for trade in goods. Their contribution to the "total effect" of a deep agreement outweighs the pure "EIA effect" for trade in services, whereas the reverse is true for trade in goods.[3] Nonetheless, since the effect of services, investment, and competition provisions on trade in goods is about 30% of the overall effect, our results support recent empirical firm-level evidence on the servitization of manufacturing firms' exports

At a more granular level, we find that the impact of provisions related to services, investment, and competition on both gross and value added trade is statistically significant for the large majority of sectors, and thus positively contributes to the total effect of deep agreements on trade flows. However, we observe sectoral heterogeneity in terms of which effect—the EIA effect or the deep services, investment and competition effect—dominates. Interestingly, the services, investment and competition effect outweighs the EIA effect for trade in services sectors that facilitate the timely delivery of goods. Among others, these include accommodation and food service activities as well as transportation and storage. The latter encompasses land, water, and air transport industries, as well as warehousing and support activities for transportation and postal and courier activities. As such, our sectoral results hint that the inclusion of these provisions in trade agreements is a key element for integration into partner countries' production networks. Finally, we note that while the liberalization of these non-tariff measures is particularly important for financial services and insurance activities, the EIA effect alone is not.

Having decomposed the impact of EIAs into shallow and deep provisions, we use the results of our sectoral regressions to determine how the composition of the UK's bilateral exports to select trade partners might differ after entering into a deep EIA with provisions on services, investment, and competition. We examine two hypothetical EIAs: a bilateral deal with the US; and bilateral deals with China and India. These countries are among the UK's largest non-EU trading partners (and received its largest share of non-EU exports in 2014). In both cases, we find that in a post-agreement scenario, services exports increase on the whole relative to manufacturing exports and that sectoral domestic value added trade increases more than gross or foreign value added flows. We also find that the services sector that gains in particular is professional, scientific, and technical activities. Among other industries, this sector covers scientific research and development and marketing research. As such,

[3]Here, the total effect refers to the combined effect of having a trade agreement that includes services, investment, and competition provisions while the EIA effect is that attributable to having an EIA in place (without the extra provisions). The "services, investment and competition effect" refers to the effect of these specific provisions when there is an EIA in place. See Section 4.

our results suggest that deep trade agreements that encompass non-tariff liberalization of services, investment, and competition can increase economic activity in industries that are key to a country's innovative activity and which foster engagement in high-value stages of supply chains.

We contribute to three strands of empirical literature related to trade agreements, trade in services, and a growing body of studies on global value chains. With regards to the former, it is widely accepted that EIAs have a positive impact on bilateral trade flows, with their trade-enhancing effects being "phased in" over a period of 10 to 15 years (Baier and Bergstrand, 2007; for a survey of the literature see Limão, 2016). More recent studies have also accounted for trade agreement depth to identify the heterogeneous effects of EIAs based on either the type of agreement in place, or the number of behind-the-border provisions they include. In the first instance, Baier, Bergstrand, and Feng (2014) and Baier, Bergstrand, and Clance (2017) distinguish trade agreements based on six distinct categories, where a one-way preferential agreement is considered the shallowest agreement type, and an economic union the deepest. These studies show that, among other stylized facts, deeper agreements have a larger impact on overall trade flows. On the other hand, a second set of studies define depth based on counting the number of provisions covered in an agreement, regardless of its type (e.g. Mattoo et al., 2017; Mulabdic et al., 2017; Orefice and Rocha, 2014).[4] Measuring depth this way, Mattoo et al. (2017) find that the deepest EIAs boost trade among member countries by up to 44% relative to shallow agreements.

However, these methods do not disentangle the heterogeneous contribution of different non-tariff measures on trade flows. In terms of the first method, defining depth based on the type of agreement at hand ignores potential differences in the preferential nature of the same agreement category. For example, NAFTA stipulates many more trade preferences on both goods and services than does the Thailand-Peru FTA, although both are classified as free trade agreements. Second, measuring agreement depth by counting the number of provisions included implicitly assigns an equal weight to all provision categories. In reality, it is likely that some provisions have a stronger impact on trade than others. For example, Kohl et al. (2016) provide suggestive evidence of the heterogeneity of EIA provisions using a principal components approach for trade in goods. We instead estimate the heterogeneous contribution of individual provisions to determine which provisions are most important in expanding trade.

Our results also address a critical gap in the literature. Due to paucity of services data, the majority of research on the impact of trade agreements looks only at trade in goods, leaving much to be discovered about how EIAs affect trade in services. A notable exception is Mulabdic et al. (2017), who examine the impact of trade agreement depth (based on the count measure method) on gross and value added trade in services in a Brexit-specific context. We instead determine which services sectors are most affected by which provisions. We conclude that services sectors that see the biggest benefits from services, investment, and competition provisions are those that are most important for

[4]Specifically, Mattoo et al. (2017) and Mulabdic et al. (2017) calculate several depth measures normalized between 0 and 1, whereby 1 indicates the agreement with the highest number of provisions. They also make variants of this index which distinguish between policy areas covered, and those that are legally enforceable or weakly legally enforceable.

supply chain integration.

Lastly, we contribute to the rapidly growing body of literature that links global value chains (GVCs) and trade agreements. Both theoretical and empirical literature has noted that EIAs help countries integrate into their partners' supply chains. As production networks stretch many borders, each stage relies heavily on internationally sourced inputs, which may well embody value from a host of third countries. Such dynamics create the need for comprehensive integration strategies to ensure the smooth functioning of GVCs. From a theoretical standpoint, Antràs and Staiger (2012) present a formal model to this effect. Empirically, defining trade agreement depth either *à la* Baier, Bergstrand, and Feng (2014) or as a count index, Johnson and Noguera (2017) and Mulabdic et al. (2017) examine the impact of trade agreements on value added trade flows using gravity specifications and panel datasets, yielding somewhat mixed results.[5,6] Looking at the GVC story from a different angle, Orefice and Rocha (2014) and Mulabdic et al. (2017) also explore the distinction between intermediate and final gross trade flows. Our analysis distinguishes itself from the literature by estimating how specific trade agreement provisions complement the effect of EIAs on trade in goods and services. In addition to examining aggregate flows, we also look at the heterogeneity in sectoral impacts.

The rest of the paper is structured as follows. Section 2 documents general trends in EIAs and provisions over time. Section 3 gives our empirical specification which is moitvated by the gravity equation literature and explains the data sources used in our analysis. Section 4 presents the results at both the aggregate and sector level, along with extensions and robustness checks. Finally, Section 5 concludes.

2 *Trends in economic integration agreements*

To motivate our empirical analysis, we start with the basic trends in the volume and complexity of EIAs since the 1990s, when they became an important policy tool for international integration. About 280 new EIAs have entered into force in the last 26 years. We first look at the share of EIAs with non-tariff provisions. In keeping with previous work, we document the number of provisions included over time for three main categories of EIAs. These are partial scope agreements (PSAs), free trade agreements (FTAs), and customs unions (CUs). These categories roughly align with the EIA depth variables used by Baier, Bergstrand, and Feng (2014) and Baier, Bergstrand, and Clance (2017). According to their definitions, a PSA would be the shallowest agreement type and a CU the deepest.

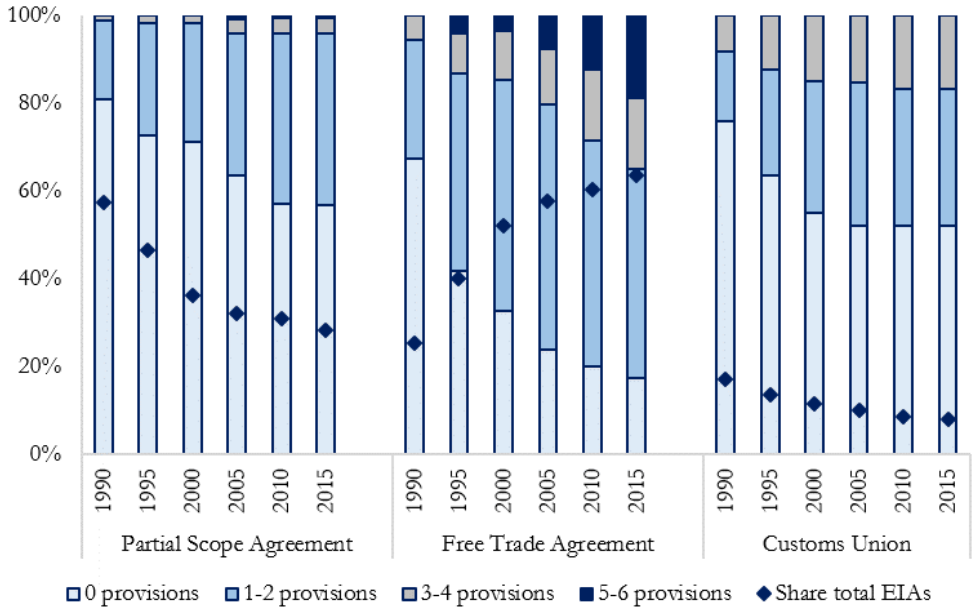
Figure 1 provides two main facts. First, FTAs have become much more prevalent in recent years, making up the majority of all agreement types (64%) in 2015. Second, in addition to their high share relative to other agreement types, the number of new policy areas they include which stretch beyond

[5]Johnson and Noguera (2017) use the value added to export (VAX) ratio as a left hand variable in a gravity model framework, while Mulabdic et al. (2017) use the value of either DVA or FVA.

[6]Osnago et al. (2015) also provide empirical evidence of a relationship between deep trade agreements and vertical foreign direct investment, driven by EIA provisions that improve the contractibility of supplied inputs.

the scope of pure tariff reduction has increased. FTAs encompass more non-tariff provision categories on average than CUs—identified in the literature as the deepest agreement type. Indeed, 16% of all FTAs covered three to four non-tariff provision categories in 2015, and close to one in five agreements included the maximum number of non-tariff liberalizing measures. In contrast, zero CUs included more than three to four provision categories.[7]

Figure 1: Non-tariff provisions share, 1990-2015



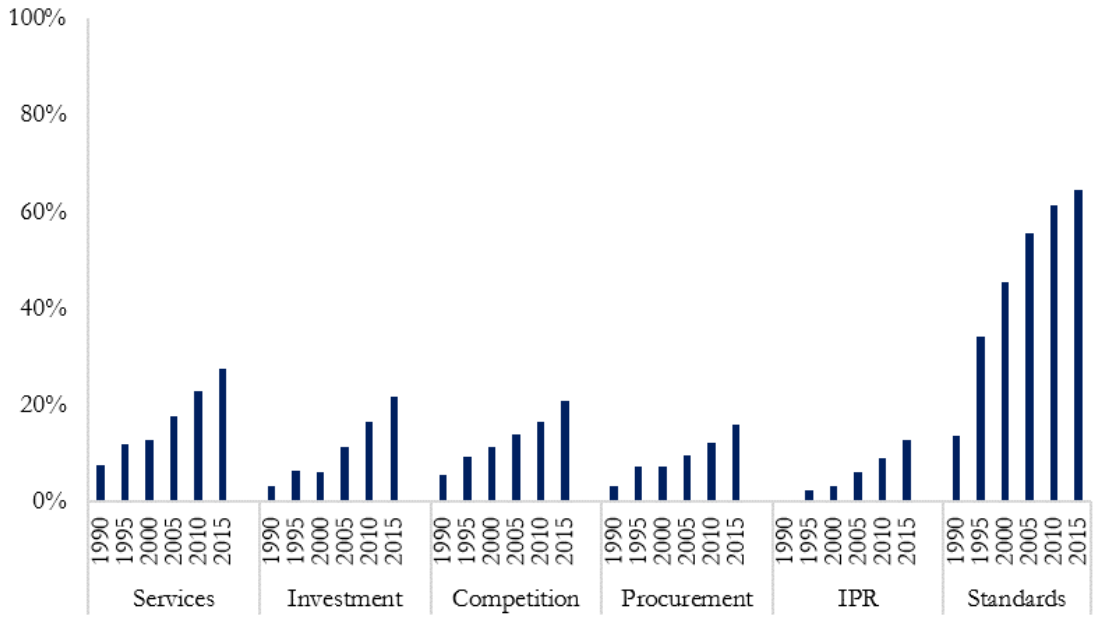
Source: Authors' calculations based on DESTA.

Figure 2 looks at the prevalence of the provision categories for the most frequent type of EIAs, FTAs. There has been a general increase in the use of all deep provisions in FTAs over time. Provisions related to services, investment, and competition have become an increasingly popular feature of modern trade agreements. In 2015, 38% of all FTAs included provisions related to services liberalization—three times more than the share in 1990 and over two times more than in 2000. Similarly, 30% of FTAs included an investment chapter in 2015 versus 5% in 1990. And 27% included competition provisions in 2015, compared to 3% in 1990.

While extensive research has been carried out on the impact of having an EIA (or a "deep" EIA) on trade, there is limited work on *which* provisions contribute the most to easing trade flows. This is an important question for the design of trade agreements, and the next Section decomposes the overall EIA effect on trade flows into the contribution of shallow versus deep provisions.

[7]To be sure, there are of course additional advantages to being in a customs union that are not included here, such as potentially larger reductions in tariff rates than an FTA would award.

Figure 2: Prevalence of provisions in FTAs, 1990-2015



Source: Authors' calculations based on DESTA.

3 *Empirical strategy and data sources*

This Section starts with a theoretical motivation for the gravity equation which forms the basis for our empirical specifications. We then discuss the data sources for the variables in the empirical specifications

3.1 Micro-foundations of the gravity equation framework

Our empirical model is based on the gravity equation framework of Head and Mayer (2014). They define general gravity in trade flows from origin country i to destination country j as the set of models that yield a bilateral trade equation:

$$X_{ji} = GS_i M_j \phi_{ji} \varepsilon_{ji} \tag{1}$$

where G is a "gravitational constant," S_i represents "capabilities" of exporter i as a supplier to all destinations, M_j captures all characteristics of destination market j that promote imports from all sources and ε_{ji} is an error term. Bilateral accessibility of importer j to exporter i is captured in $0 \leq \phi_{ji} \leq 1$, which proxies for the impact of bilateral trade costs on bilateral trade flows.

Head and Mayer (2014) show that benchmark trade models yield gravity equations of the form in Equation 1. For example, the Dixit-Stiglitz-Krugman model generates a gravity equation. It considers a representative consumer with CES utility $U_j \equiv \left(\sum_{ic} q_{j,ic}^{1-1/\sigma}\right)^{\sigma/(\sigma-1)}$ defined over varieties indexed by c from each country i. Each consumer has a unit of labor with wage rate w. Firms have constant unit costs c and pay a fixed entry cost f to produce. In equilibrium, firms enter until there are zero

profits to be made and all labor, L, is exhausted in production and entry of home firms. In this setting, the country-specific terms S_i and M_j depend on aggregate outcomes. $S_i = N_i w_i^{1-\sigma}$ depends on the wage rate and the number of firms from the exporting country and $M_j = \sum_i X_{ji}/\Phi_j$ depends on the total real expenditures of the importing country. Φ_j and Ω_i are "multilateral resistance" terms defined as:

$$\Phi_j = \sum_l \frac{\phi_{jl} X_l}{\Omega_l} \qquad \text{and} \qquad \Omega_i = \sum_l \frac{\phi_{li} X_l}{\Phi_l}. \tag{2}$$

The term Φ_j is the accessibility-weighted sum of the exporter capabilities which denotes the degree of competition in the importing market and Ω_i is an expenditure-weighted average of relative access which equals Φ_i under symmetric trade costs $\phi_{ji} = \phi_{ij}$ and balanced trade. The country-specific terms therefore map model specifics to aggregate variables and the direct impact of trade costs on trade flows can be determined from the bilateral term ϕ_{ji}.

Writing in logs, the gravity equation of bilateral trade flows is: $lnX_{jit} = lnG + lnS_{it} + lnM_{jt} + ln\phi_{jit} + \varepsilon_{jit}$. As is standard, we assume that the impact of trade agreements can be specified as $ln\phi_{jit} = \beta TA_{jit} + \gamma_{ji}$ where TA_{jit} is equal to one when countries j and i have a trade agreement in operation at time t. The use of country-pair fixed effects, γ_{ji}, has been widely shown to be the most effective method to account for endogeneity bias between trade agreements and trade flows as they capture time-invariant reasons for signing trade agreements such as geographical distance and common language among countries. To avoid making structural assumptions on the specific forms of the country-specific terms S_i and M_j, the gravity equation can be estimated with these country-specific fixed effects as $lnX_{jit} = \alpha + \beta TA_{jit} + \delta_{it} + \varphi_{jt} + \gamma_{ji} + \varepsilon_{jit}$ where δ_{it} and φ_{jt} are exporter-time and importer-time fixed effects that subsume the country-specific terms S_{it} and M_{jt}. These country-time fixed effects control for time-varying factors that could influence trade (such as exchange rate shocks) and they account for the multilateral resistance terms which have been theoretically shown (Anderson and Van Wincoop, 2003) and empirically demonstrated to bias the effects of trade agreements on trade if not controlled for (Baldwin and Taglioni, 2006). The coefficient of interest is β, which gives the extent to which trade agreements raise bilateral trade flows, holding economy-wide outcomes fixed.

3.2 Empirical specification for gross and value added exports

We are interested in how deep provisions could raise bilateral trade flows beyond those from shallow clauses that typically feature in trade agreements (such as tariff reductions and removal of technical barriers to trade). We therefore estimate the following reduced-form equation:

$$ln\boldsymbol{X_{ijt}} = \alpha + \beta_1 EIA_{ijt} + \beta_2 \boldsymbol{provision_{ijt}} + \delta_{it} + \varphi_{jt} + \gamma_{ij} + \varepsilon_{ijt} \tag{3}$$

where $\boldsymbol{X_{ijt}}$ represents bilateral exports between origin country i and destination country j in time t. We estimate Equation 3 for three categories of bilateral exports of goods and services: gross; domestic

value added (DVA); and foreign value added (FVA). For each of these categories, we then further disaggregate the type of bilateral exports into into intermediate versus final categories.

The TA_{ijt} variable is decomposed into shallow and deep components ($provision_{ijt}$). EIA_{ijt} is 1 if countries i and j have either a partial scope agreement, free trade agreement, or customs union in place at time t. $\boldsymbol{provision_{ijt}}$ is a vector of binary variables (described below), each equal to 1 if a specific provision category is present in the agreement at time t. Importantly, $\boldsymbol{provision_{ijt}}$ is never equal to 1 if $EIA_{ijt} = 0$. Various provisions can "switch" from 0 to 1 over time (e.g. for EU accession countries after each EU enlargement). The main sources of variation thus come from the entry into force of a new EIA and adding of provisions into pre-existing EIAs.

To better understand whether certain sectors are more sensitive than others to EIA provisions, we re-estimate Equation 3 at the sectoral level:

$$ln\boldsymbol{X_{ijst}} = \alpha + \beta_{1s}EIA_{ijt} + \beta_{2s}\boldsymbol{provision_{ijt}} + \delta_{it} + \varphi_{jt} + \gamma_{ij} + \sigma_{st} + \psi_{is} + \kappa_{js} + \varepsilon_{ijst} \qquad (4)$$

where $\boldsymbol{X_{ijst}}$ now represents bilateral *total* exports (goods or services; gross, DVA, or FVA) between countries i and j in sector s and at time t. σ_{st}, ψ_{is}, and κ_{js} are sector-time, exporter-sector, and importer-sector fixed effects, respectively. They capture sector-wide shocks such as technological change and time-invariant reasons for higher trade such as comparative advantage based on technology, factor endowments, and Armington product differentiation.

In both Equation 3 and Equation 4, our main coefficient of interest is β_2, which represents the partial effect of switching on a particular provision category within an agreement. Then $e^{\beta_{1(s)}+\beta_{2(s)}} - e^{\beta_{1(s)}}$ gives the direct impact of having deep provisions on bilateral trade flows. To isolate our results from year to year variability and to account for the fact that EIA effects likely do not adjust in a single year's time, we adopt the common convention of avoiding estimating our specifications of interest using annual data (e.g. Baier, Bergstrand, and Feng, 2014; Baier, Bergstrand, and Clance, 2017). Instead, we pool our data over two-year intervals.[8]

3.3 Primary data sources

The dependent variable for Equations 3 and 4 is based on bilateral trade data for goods and services from the 2016 release of the World Input-Output Database (WIOD), made available by the University of Groningen and described in Timmer et al. (2015). The data cover years 2000-2014 and comprise information for 43 countries and 56 industries (Appendix 4.1).[9] We group these industries into 19 sectors (3 goods and 16 services), as per the International Standard Industrial Classification Revision 4 (ISIC Rev.4). Given that gross exports measure the total value of a good or service that country i sends to country j either in the form of intermediates (to be used in subsequent production) or

[8]The literature cited typically uses panel data over four-year or five-year intervals. However, given the relatively short time dimension of our dataset, we chose to include two-year intervals instead. Nonetheless, our results are robust to larger time intervals (see Section 4.4 and Appendix 5.3).

[9]Specifically, the 2016 release of the WIOD includes data for 28 European countries and 15 other major economies. See Appendix 4.1 for a list of countries and sectors included in the analysis.

for final consumption, breaking down gross trade flows into intermediate versus final categories lends some indication of whether a good or service is part of a larger production network.

However, it is well known by now that gross trade statistics mask the true value that origin country i contributes to its exports by "double counting" the value of goods and services that potentially cross international borders many times. Decomposing gross trade into its domestic and foreign value added components allows this double counting term to be isolated, and makes it possible to determine the export value which is sourced domestically (DVA), compared with that which is sourced from other countries (FVA). A relatively high DVA content indicates that the home country contributed a large share of the total export value of the good or service (be it intermediate or final). On the other hand, a relatively high FVA content indicates that the home country contributed relatively little to the total export value of the good or service.

We decompose the WIOD tables for each year into DVA, FVA, and pure double counting components, following the methodology of Koopman, Wang, and Wei (2014) and Wang, Wei, and Zhu (2013) (which we refer to as WWZ for brevity). In short, the methodology decomposes gross (sectoral) bilateral exports into four main categories: domestic value added absorbed abroad; domestic value added that returns home; foreign value added; and pure double-counted trade in intermediates. In line with the distinction between intermediate and final categories in gross trade data, the decomposition methodology proposed by WWZ allows for the distinction between flows of intermediate and final goods and services for domestic and foreign value added.

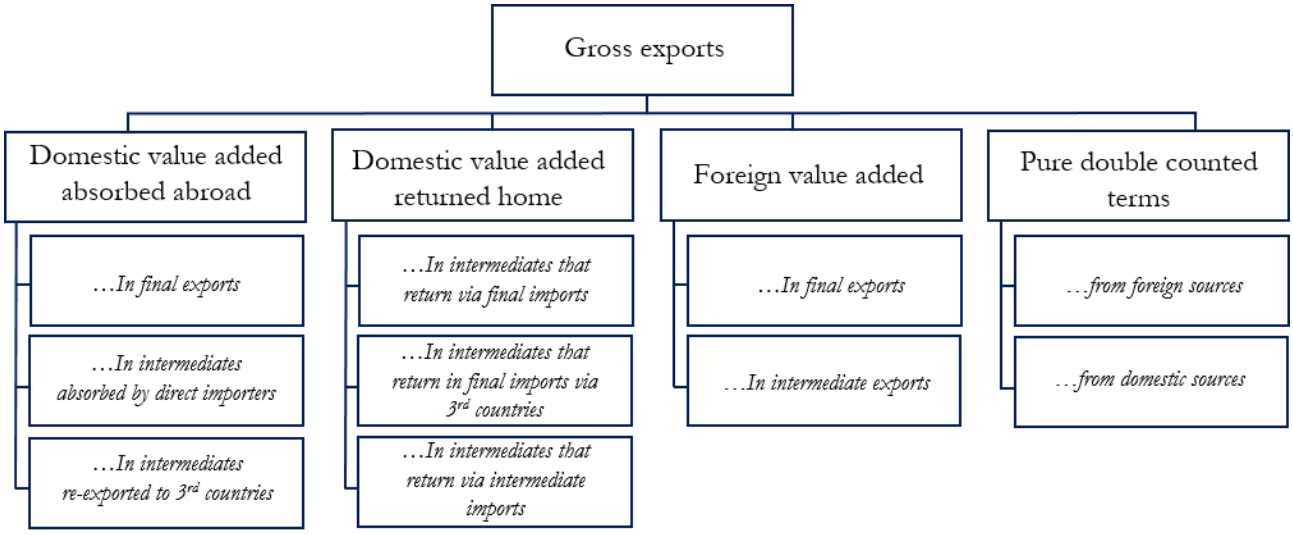
Figure 3 presents this accounting framework diagrammatically. For our analysis, we focus on the "domestic value added absorbed abroad" (DVA) and "foreign value added" (FVA) components for intermediate and final exports, which we further categorize into services and goods based on the ISIC Rev.4 sectoral breakdown. Data Appendix 4.3 discusses the WWZ decomposition methodology we use in detail.[10]

Information on trade agreements and trade agreement provisions is drawn from the Design of Trade Agreements (DESTA) database, made publicly available by the World Trade Institute, and described in Dür et al. (2014). Beyond reporting the presence of an EIA for bilateral trading partners, this database also houses detailed information on the content of trade agreements, spanning the period 1948-2016. The types of trade arrangements (both bilateral and multilateral) included in DESTA are: partial scope agreements; free trade agreements; customs unions; and framework agreements. We exclude framework agreements from our analysis, as this category is extremely shallow, does not necessarily contain any specific information on provisions or tariff reductions, and makes up only 1.2% of all agreements in force.

Particularly relevant for our analysis, DESTA classifies trade agreement provisions into six main categories, each of which aims to capture whether there are substantive clauses or a whole chapter related to areas that go beyond reductions in tariff barriers. These categories are constructed based on

[10]The aggregate we use for total DVA includes both DVA absorbed abroad and DVA returned home. As such, the aggregates we use for final DVA and intermediates DVA do not sum to total DVA.

Figure 3: Decomposition of Gross Bilateral Exports per WWZ



Source: Authors' rendition based on Wang, Wei, and Zhu (2013).

information on the design features of various types of agreements and include: services; investment; competition; public procurement; intellectual property; and standards.

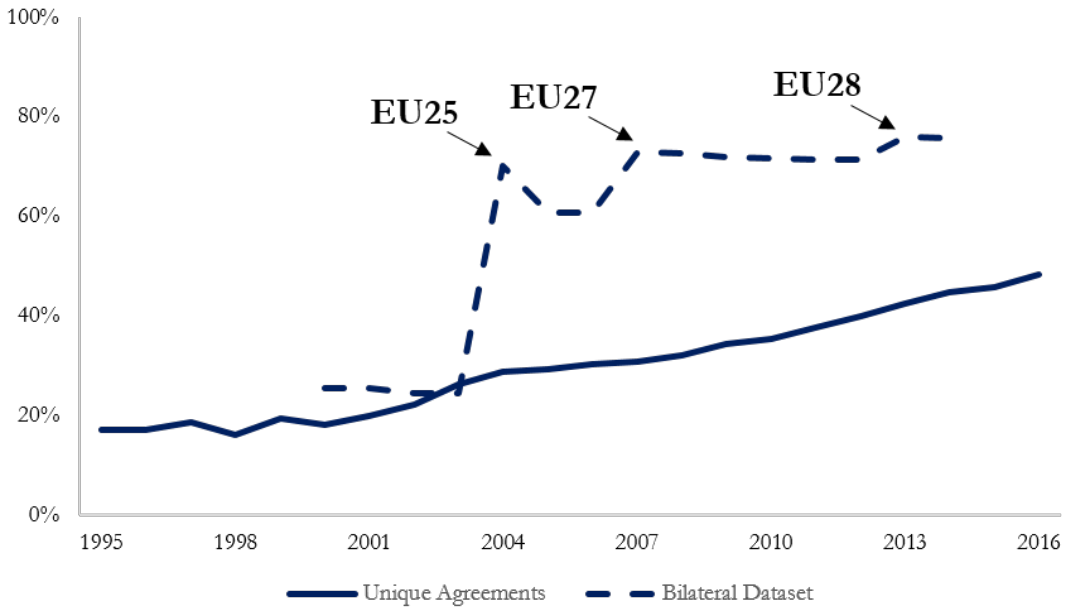
In short, variables on services, procurement, intellectual property, and competition provisions refer to the fact that significant mention of these areas appears elsewhere in the agreement than the general aim outlined in the preamble. In the case of services in particular, DESTA reports whether a trade agreement chapter on services contains mention of provisions that cover national treatment obligations or schedules of commitments. In the case of investment provisions, DESTA categorizes whether the agreement includes an investment chapter based on a bilateral investment treaty (see Appendix 4.2 for detailed definitions of each variable).

In terms of the provisions included in $\boldsymbol{provision_{ijt}}$, it is important to note that several categories tend to be included simultaneously and are thus highly colinear with one another. More so than other categories, this is particularly the case for provisions on services, investment, and competition. Figure 4 shows the co-existence of these three provision categories as a share of agreements that have a services provision, for all unique EIAs, and those specific to the countries in our bilateral trade dataset. As can be seen, in the year 2014, 45% of all trade agreements that had a provision on services liberalization also had a provision on competition and investment.

Given the bilateral nature of our dataset and limited country sample, the co-existence of these provision categories is amplified. In particular, 65% of our country sample is in the EU trading bloc in 2014 (our last year of trade data), and all EU members have the same agreement characteristics amongst themselves, as well as the same provisions with non-EU partners. As such, 75% of country-pairs in our sample that had an agreement with a services provision in 2014 also had a provision on competition and investment (Figure 4).

The high correlation between services, investment and competition is shown in Table 1 below. To

Figure 4: Co-existence of svs., inv., & com. provisions, 1995-2016
share of services provisions



Source: Authors' calculations based on DESTA and WIOD.
Notes: This figure shows the co-existence of services, investment, and competition provisions in an EIA, as a share of all agreements that have a services provision. The solid blue line refers to all unique trade agreements available in DESTA. The dashed blue line refers to the agreements used in our analysis (i.e. the agreements for which we also have trade data) and takes into account the bilateral nature of our dataset.

overcome multicollinearity problems, we group services, investment, and competition provisions in our empirical specifications. The RHS variable in our baseline specifications is $provision_{ijt}$=svs & inv & com_{ijt} which equals 1 if countries i and j have an agreement that contains provisions on services, investment, and competition. To verify that our results are not driven by omitted variable bias from other provisions, we include all provision categories in subsequent specifications for robustness. Alongside those on services, investment, and competition, the additional provision categories are meant to encompass the full set of non-tariff provisions that can be included in deep EIAs. These are: pro_{ijt}; ipr_{ijt}; and std_{ijt}, which are dummy variables equal to 1 if countries i and j have an agreement that contains concrete provisions on public procurement; intellectual property protection; and standards, respectively.

Table 1: Correlation Table: DESTA Provisions, 2000-2014

	svs & inv & com	pro_{ijt}	ipr_{ijt}	std_{ijt}	svs_{ijt}	inv_{ijt}	com_{ijt}
svs & inv & com	1.000						
pro_{ijt}	0.183	1.000					
ipr_{ijt}	-0.074	0.128	1.000				
std_{ijt}	0.651	0.480	0.247	1.000			
svs_{ijt}	0.830	0.444	0.049	0.794	1.000		
inv_{ijt}	0.994	0.180	-0.067	0.655	0.828	1.000	
com_{ijt}	0.872	0.318	-0.003	0.754	0.907	0.865	1.000

Notes: N = 14,153. Underlying data is the full sample on which the baseline Equation 3 is run.

3.4 Secondary data sources

The main advantage of using the WIOD as a primary data source is that it provides detailed information on trade flows of both goods and services at a detailed industry level. From this information, it also allows for the decomposition of trade flows into value added components. To test the robustness of our results, we use alternative sources for trade flows. Specifically, because input-output tables, which are based on National Accounting principles, rely in part on imputed trade values, we test our results for gross (goods) trade using the NBER-UN dataset, described in Feenstra et al. (2005).[11] This dataset provides annual, 4-digit Standard Industrial Trade Classification (SITC) Rev. 2 data on bilateral trade flows for a panel of 185 countries over the years 1962-2011. We conduct our robustness check for the period 1994 onward, reflecting the entry into force of most modern trade agreements.

4 *Results*

We start with our baseline specification of the role played by services and investment liberalization in increasing trade flows. First, we focus on these provisions' overall impact on total gross and value added trade, without making the distinction between goods and services. Second, we look at their effect on gross and value added trade in goods *versus* services and show that their positive effect is (unsurprisingly) statistically larger for trade in services than for trade in goods. Third, we explore their effect at the sector level to provide insights about how these deep provisions can help exporters' integration into supply chains. Finally, our sector-level results are fed into a policy application whereby we examine two hypothetical FTAs with the UK's largest non-EU trading partners (US and China/India) to determine how the UK's bilateral exports to these countries might differ if they were to enter into a deep FTA with provisions on services, investment and competition. For ease of presentation, all results tables are shown in Appendix 1.

4.1 Aggregate results - gross and value added

We find that deep provisions on services, investment, and competition make up about 60% of the overall estimated impact of trade agreements on total, intermediate and final exports, and that this impact is highest for domestic value added (Tables A1, A2, and A3). From a policy standpoint, this finding provides empirical backing to the notion that deep trade agreements that include non-tariff provisions have a stronger effect on exports, given their ability to address behind-the-border trade barriers that can hinder participation in supply networks. This is reflected in the overall impact of these provisions categories being strongest for DVA exports.

We next address exports of goods and services, in turn. Our first important finding is that services, investment, and competition provisions (herein $svs \,\&\, inv \,\&\, com$) have a positive and significant impact on both goods and services exports. This result holds irrespective of the type of trade flow—gross,

[11] Based on underlying information from UN-COMTRADE, this dataset covers merchandise trade statistics only.

DVA, or FVA; total, intermediate, or final (Tables A4, A6, and A8)—and is robust to including the full set of provision measures (Tables A5, A7, and A9).

Second, an F-test on a pooled regression for goods and services shows that the effect of $svs \,\&\, inv \,\&\, com$ provisions is statistically larger for trade in services than trade in goods, regardless of whether the type is total, intermediate, or final. Again, this holds for whether the trade flow is gross, DVA, or FVA.[12,13] Nonetheless, while the overall effect of $svs \,\&\, inv \,\&\, com$ provisions is statistically smaller for trade in goods, our results still suggest that services liberalization, easing of investment, and measures related to competition policy positively impact goods exports in a non-trivial way. This finding supports empirical results that rely upon granular data to explore the "servitization of exports," i.e. the phenomenon whereby manufacturing firms bundle goods and services exports to achieve product differentiation. This is documented at the aggregate level (Miroudot and Cadestin, 2017) and at the micro level across manufacturing firms (Ariu et al., 2016; Kelle, 2013).[14]

Third, as was the case for our estimates with goods and services combined, we observe that the overall impact of EIAs with $svs \,\&\, inv \,\&\, com$ provisions is largest for DVA of exports of both goods and services. The suggested lower impact on FVA exports can potentially be explained in two ways. First, by construction, the decomposition of gross trade into its value added components does not capture the origin of exported foreign goods and services. As a result, we are unable to trace where the FVA component is sourced from in our analysis. Thus, the ij FVA flow potentially contains value from other countries that participated in previous parts of the value chain. Second, it is expected that a trade agreement—encompassing various deep provisions—between countries i and j would necessarily boost the domestic value added content of exported goods and services. To support increased domestic production, therefore, the FVA component of exports would naturally rise as well.

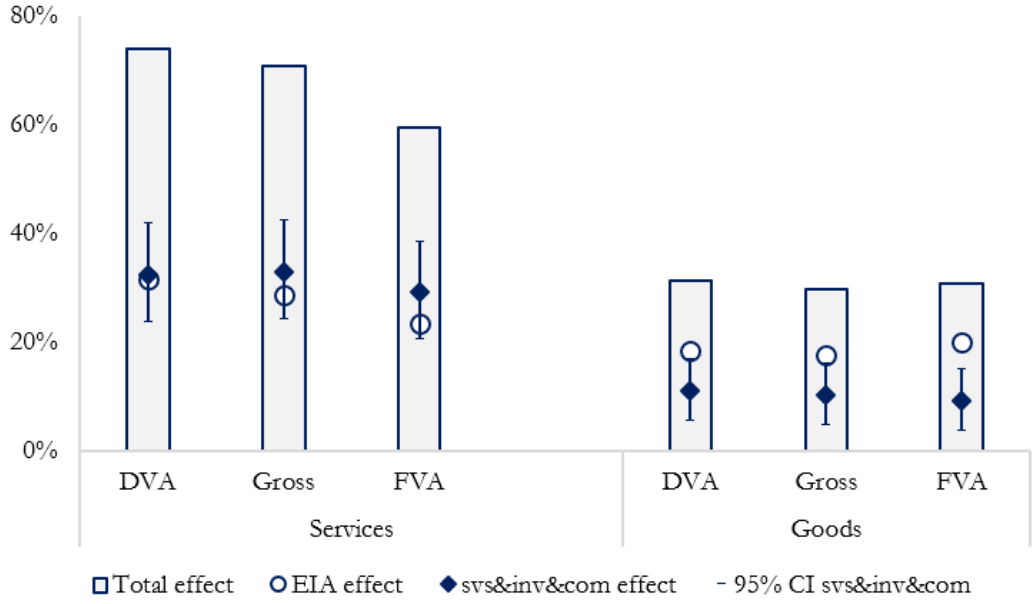
To further interpret these results, we next use coefficients from columns with total exports in Tables A5, A7, and A9 to calculate the "total effect" of having a bilateral trade agreement with $svs \,\&\, inv \,\&\, com$ provisions on gross, DVA, and FVA exports, respectively. This is $e^{\beta_1+\beta_2} - 1$. We then examine the effect that is attributed to the EIA alone, and that which is attributed to services, investment, and competition provisions specifically. Results are shown in Figure 5.

[12]Test results refer to pooled regression results for the specifications in Tables A5 (gross), A7 (DVA), and A9 (FVA). For total gross exports: $F_{1,23424} = 18.17, p = 0.000$; for intermediate gross exports: $F_{1,23424} = 11.07, p = 0.001$; for final gross exports: $F_{1,23424} = 10.99, p = 0.001$. For total DVA exports: $F_{1,23424} = 16.26, p = 0.000$; for intermediate DVA exports: $F_{1,23424} = 9.43, p = 0.002$; for final DVA exports: $F_{1,23424} = 9.13, p = 0.003$. For total FVA exports: $F_{1,23424} = 14.61, p = 0.000$; for intermediate FVA exports: $F_{1,23424} = 10.24, p = 0.001$; for final FVA exports: $F_{1,23424} = 10.54, p = 0.001$.

[13]While the magnitude of the effect on intermediate inputs is larger than that for final goods and services, the difference between the two is not statistically significant.

[14]Specifically, Miroudot and Cadestin (2017) show through an empirical study using aggregate data from the OECD Trade in Value Added (TiVA) database that services inputs, whether domestic or foreign, account for about 37% of the value of manufacturing exports. Using detailed Belgian firm-level data, Ariu et al. (2016) demonstrate that the performance of goods exports is strongest for firms that also export services.

Figure 5: Relative impact of *EIA* and *svs & inv & com* on total exports



Source: Authors' calculations.
Notes: This figure shows the total, *EIA*, and *svs & inv & com* effects for total gross, DVA, and FVA exports, calculated from coefficients in Tables A5, A7, and A9. 95% confidence intervals are shown for our effect of interest. All *svs & inv & com* effects and *EIA* effects are significant at at least the 1% and 5% significance levels, respectively.

A couple of points stand out. In line with the above, we see that the total effect of an EIA that includes provisions on services, investment, and competition is largest for services DVA exports (74.02%), followed by gross services exports (70.92%) and FVA services exports (59.52%). This is at least two times larger than the total effect of the same agreement type on DVA, gross, and FVA goods exports (31.39%, 29.69%, and 30.87%, respectively). Moreover, for all types of services export flows, the *svs & inv & com* effect outweighs the *EIA* effect, while the reverse is true for goods exports.[15] This shows that while tariff cuts are important for both goods and services flows, they are relatively (and unsurprisingly) more important for goods exports. On the flip side, *svs & inv & com* are relatively more important for trade in services.

4.2 Sectoral results - gross and value added

We next take a look at the impact of non-tariff provisions on services, investment, and competition at a more granular level. While we find that *svs & inv & com* provisions are significant for the large majority of cases, our sectoral results highlight substantial heterogeneity across services activities.

Figure 6 shows our results for gross exports, weighted by sectoral gross exports in the year 2014.[16] Results for DVA and FVA exports are presented in Figures A1 and A2 in Appendix 2, respectively. As in Figure 5, the gray bar represents the (now trade-weighted) total effect of an EIA that includes pro-

[15] The difference between the two is marginal, however, for services DVA.

[16] We weight our results using trade data from 2014 because this is the last year for which we have trade data. Nonetheless, differences in results are trivial when using trade weights from different years or averages across years. Results are presented pictorially for brevity, however, full regression output tables for each sector are available upon request.

visions on services, investment, and competition, and the blue diamonds represent the trade-weighted *svs* & *inv* & *com* effect with 95% confidence interval bands. Unless shaded in gray, all *svs* & *inv* & *com* effects are statistically significant at the 10% significant level or above.

This exercise highlights that sectors for which the *svs* & *inv* & *com* effect (with a relatively tight 95% confidence band) is greater than half of the total effect are those which are particularly important for participation in supply networks. These include: accommodation and food service activities; and transportation and storage. Especially in the case of the latter, the transportation and storage sector facilitates the timely delivery of goods, which is crucial for cross-border flows of intermediate parts and components used as inputs into to final products. Specific industries that make up the this sector include land transport, air transport, courier activities, and warehousing and support activities for transportation, all of which ease shipping and handling.

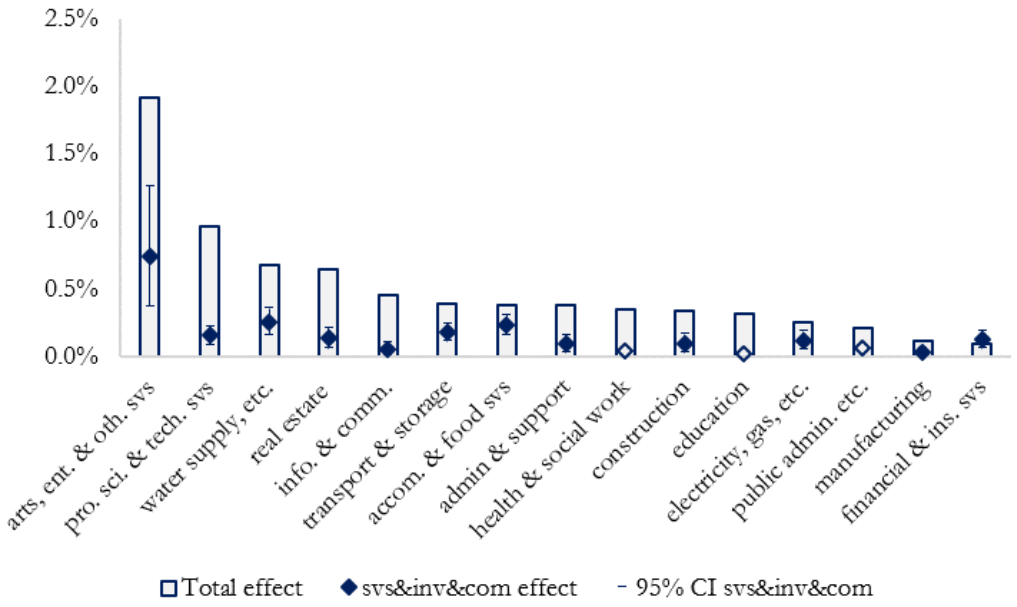
Furthermore, the *svs* & *inv* & *com* effect for transportation and storage (34% for gross and DVA exports, and 45% for FVA exports) ranks either third (FVA) or fourth (gross and DVA) among all sectors. This strengthens the above argument that not only are these deep provisions important for trade in services (in addition to trade in goods), but that they have a particularly strong effect on services sectors that are key to the smooth functioning of value chains through forward and backward linkages.

One of the major sectors in the UK is financial services, which makes up over 7% of gross value added (GVA).[17] For total gross, DVA, and FVA exports, we also note that the *svs* & *inv* & *com* effect is statistically significant at the 1% significance level for financial and insurance activities whereas the EIA effect is not statistically significant. Moreover, the *svs* & *inv* & *com* effect for this sector ranks 7$^{\text{th}}$ (out of 15) for all trade flows.

Our result on the financial and insurance activities sector is particularly interesting for services-oriented economies, such as the United Kingdom. It highlights that, by design, *svs* & *inv* & *com* provisions embedded in deep trade agreements have a specific role to play in boosting trade in industries such as financial and monetary intermediation, or fund management—all which are included in this sector. Such activities are not targeted or affected by traditional tariff preferences. Therefore, while the standard use of a trade agreement to reduce tariff barriers might not be targeted at services which cross borders electronically (and are thus not subject to customs controls, etc.), our results show that deep provisions which liberalize investment policy, a range of services, and set rules on competition have the potential to do just this.

[17] GVA share for 2016 from: The financial sector's contribution to the UK economy, House of Commons.

Figure 6: Trade-weighted impact of *EIA* and *svs & inv & com* on gross exports



Source: Authors' calculations. Notes: This figure shows the total and *svs & inv & com* effects for total gross exports, calculated from coefficients from specification 4. 95% confidence intervals are shown for our parameter of interest, the *svs & inv & com* effect. Unless shaded in gray, all *svs & inv & com* effects are significant at the 10% significance level or above.

4.3 Policy application: Trade effects of a hypothetical FTA

To put our analysis into context and demonstrate how our results relate to the negotiation of trade agreements, we use the estimated effects from Equation 4 to back out how the composition of sectoral exports might differ among trading partners after entering into an EIA with provisions on services, investment, and competition. To do this, we consider a hypothetical deep FTA with these provisions between the United Kingdom and the United States, and the United Kingdom and China/India. These countries are among the UK's largest non-EU trade partners and received the largest share of its non-EU exports in 2014 (the last year for which we have trade data).[18] In 2014, the UK sent roughly 19% percent of its non-EU gross exports to the US, and 8% percent to China and India combined. Relatedly, these countries are central to GVC activity and global trade networks.

For this application, we use data for the year 2014 and the estimated total, *EIA*, and *svs & inv & com* effects calculated from our parameters of interest in Equation 4 (estimated with the full set of provision categories as shown in Tables A5, A7, and A9) which represent the average elasticity for a trade agreement with our provisions of interest. With these granular estimates, we then analyze how signing an EIA with these provisions might change the composition of sectoral exports for the countries in question. The estimated sectoral impacts in levels and as a fraction of overall trade are shown in Equations 5 and 6 below:

[18]To be sure, there are fifteen non-EU countries in our dataset and a rest of the world (ROW) aggregate. The UK's exports to the ROW comprised 50% of non-EU gross exports.

$$X^1_{ijst} = (e^{\hat{\beta}_{1s}+\hat{\beta}_{2s}} - 1) \sum_{s=1}^{S} X^0_{ijst} \tag{5}$$

$$\frac{X^1_{ijst}}{\sum_{s=1}^{S} X^1_{ijst}} = \frac{(e^{\hat{\beta}_{1s}+\hat{\beta}_{2s}} - 1) X^0_{ijst}}{(e^{\hat{\beta}_{1s}+\hat{\beta}_{2s}} - 1) \sum_{s=1}^{S} X^0_{ijst}} \tag{6}$$

where X^0_{ijst} represents sectoral (s) gross, DVA, or FVA exports from the United Kingdom to either the US or China and India in year 2014 and X^1_{ijst} is the calculated sectoral trade flow after the average effect of interest is applied. $\hat{\beta}_{1s}$ and $\hat{\beta}_{2s}$ are our estimates from Equation 4 for either gross, DVA, or FVA exports.[19]

Figures 7, 8, and 9 present the results of this exercise for gross, DVA, and FVA exports from the UK to the US, respectively. Figures A3, A4 and A5 in Appendix 3 present the corresponding analysis for an FTA between the UK and China/India. In each figure, the "initial gross export share" corresponds to the sectoral breakdown of bilateral UK exports in 2014 and the "post export share (total effect)" refers to our estimated sectoral breakdown of bilateral UK exports if there were to be an average EIA between the UK and the partner countries in question. As the initial and post export shares are normalized by total and estimated exports, respectively, it is important to keep in mind that increases (decreases) in the post-agreement scenario represent a rise (fall) in a given sector's expected performance relative to other sectors.

In our counterfactual trade agreements, manufacturing exports account for the large majority of sectoral exports, both initially and in the post scenario. Nonetheless, we see that the implementation of an EIA with clauses on services, investment, and competition changes this sector's weight relative to other services sectors (from 47% to 37% in the case of UK-US gross exports and from 69% to 61% in the case of UK-China/India gross exports). The overall ranking of services sectors also changes for UK-US exports.

For both the counterfactual TAs, among the largest relative increase in gross services exports is in the professional, scientific, and technical activities sector (12.43 percentage points for the UK-US and 3.21 percentage points for the UK-China/India, representing double the initial export shares). This sector includes scientific research and development (R&D); architectural and engineering activities; management consultancy activities; legal and accounting activities; and marketing research. This suggests that deep trade agreements can benefit industries that feed into innovation and knowledge transfer (e.g. through R&D and other activities that are of high value creation in GVCs).

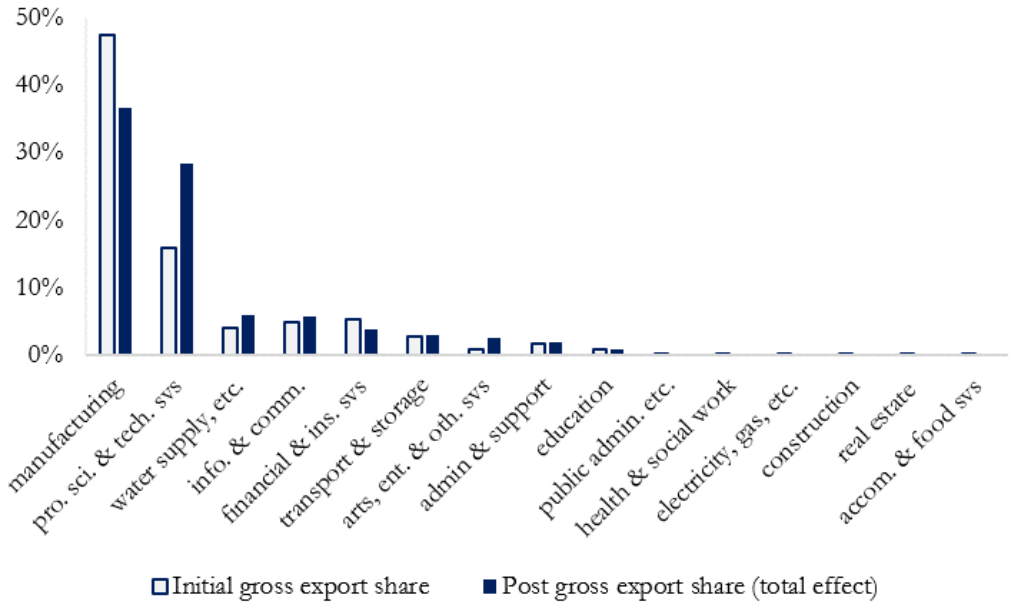
This sector also shows larger relative increases in DVA exports (Figure 8 for UK-US and Figure A4 for UK-China/India) and has the largest absolute difference between increases in gross and DVA exports.[20] Notably, in the UK-US case, relative total DVA exports in the professional, scientific,

[19] We only use $\hat{\beta}$ coefficients that are statistically different from zero at a significance level of at least 10%.

[20] The net increase in DVA exports of the professional, scientific, and technical activities sector is 13.42 percentage points in the case of the UK-US and 3.85 percentage points for the UK-China/India. The absolute difference between the increases in DVA and gross trade shares for UK-US and UK-China/India is 0.99 percentage points and 0.64 percentage points, respectively.

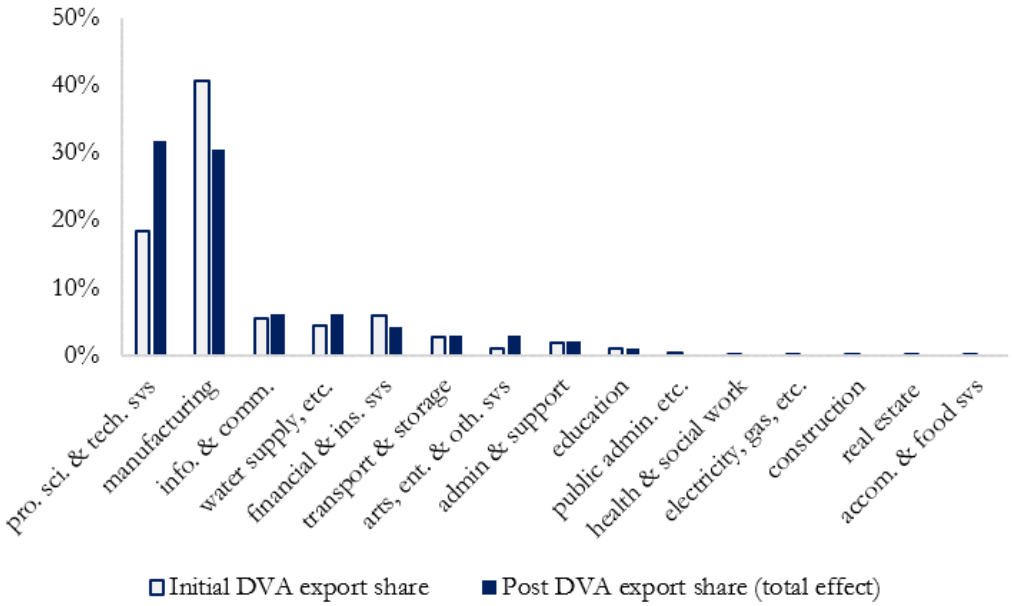
and technical activities sector exceed manufacturing exports after the counterfactual trade agreement scenario, ranking first among all fifteen sectors in question. Results for sectoral FVA exports follow the same overall trends, but are smaller than for gross and DVA.

Figure 7: Estimated change in sectoral composition of gross exports from the UK to the US



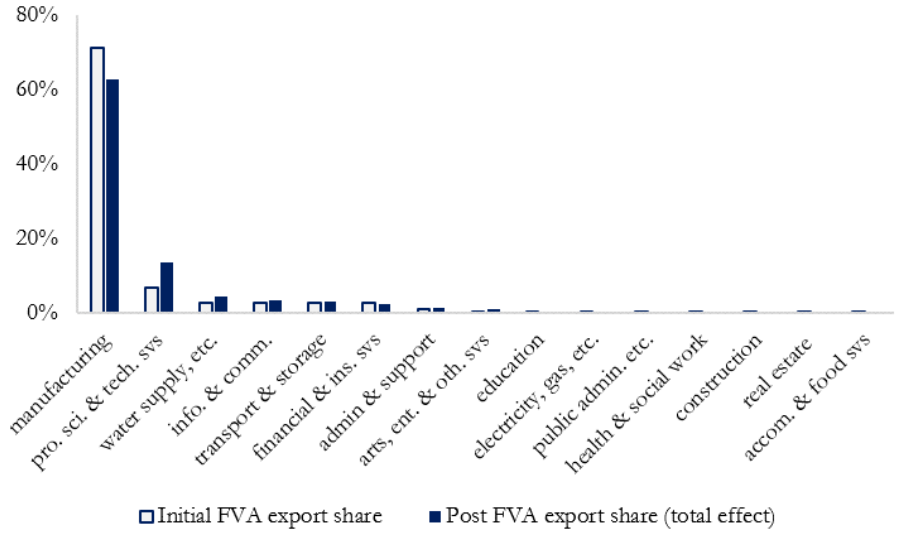
Source: Authors' calculations. Notes: This figure shows the sectoral decomposition of gross exports between the UK and the US both before and after the signature of a hypothetical EIA, per equation 6.

Figure 8: Estimated change in sectoral composition of DVA exports from the UK to the US



Source: Authors' calculations. Notes: This figure shows the sectoral decomposition of DVA exports between the UK and the US both before and after the signature of a hypothetical EIA, per equation 6.

Figure 9: Estimated change in sectoral composition of FVA exports from the UK to the US



Source: Authors' calculations. Notes: This figure shows the sectoral decomposition of FVA exports between the UK and the US both before and after the signature of a hypothetical EIA, per equation 6.

4.4 Robustness

We conduct three main robustness checks to confirm the consistency of our results across estimation methods and datasets, as well as to test the external validity of our results by using a larger country sample. First, to compare with the literature that examines the effect of EIAs on trade flows, we re-estimate our gross and sectoral results using panel data over four-year intervals. As explained in Section 4, given the relatively short time dimension of our bilateral trade data, our basline specifications use two-year intervals, giving a total of 8 years of trade data (spanning a time period of 15 years). Using panel data over four-year intervals thus leaves us with four years of data (spanning a time period of 13 years). To use the latest trade data available, we include years 2002, 2006, 2010, and 2014. This does not eliminate much variation in our variables of interest, as the first EU enlargement we capture was in 2004. Results for this exercise are presented in Appendix 5.3 and corroborate those in Section 4.1.

Second, we estimate Equations 3 and 4 using the Poisson pseudo maximum-likelihood (PPML) estimator, proposed by Silva and Tenreyro (2006). This method is more robust to different patterns of heteroskedasticity and measurement error, and allows for the inclusion of zeros in disaggregated bilateral trade flows. As it concerns our analysis, the presence of zeros is not of large concern. Indeed, at the aggregate level there are no zeros in our trade variables. At the ISIC Rev. 4 sectoral level, a maximum of 10% of the bilateral gross, DVA, and FVA flows in our sample are zeros, depending on the sector. Results for this exercise are presented in Appendix 5.2. In short, we find that the impact of services, investment, and competition provisions is positive and significant for goods and services for all bilateral trade flows (gross, DVA, and FVA).

Finally, we re-estimate Equations 3 and 4 for gross goods trade using the NBER-UN dataset

described in Section 3.4. In order to verify the consistency of our results using this dataset, we first restrict the country sample to that which is available in the 2016 release of the WIOD. Subsequently, in order to provide external validity to our results for gross goods we allow for the full country sample available in the NBER-UN dataset (185 countries). Overall, we confirm the positive impact of services, investment, and competition provisions when using both two-year and four-year time intervals.

5 *Conclusion*

This paper examines the extent to which deep trade agreements that stretch beyond tariff reduction ease the cross-border flows of goods and services. From a policy perspective, the question of which provisions are most important from a trade-enhancing point of view is important in designing and understanding the impacts of trade agreements. Disentangling the effect of specific non-tariff provisions is particularly relevant in today's political climate when there is political interest in negotiating new trade agreements and renegotiating old ones, as in the UK's decision to withdraw from the EU.

At the aggregate level, two main findings are notable. First, we show that provisions related to services, investment, and competition contribute the most to the overall impact of trade agreements on trade in goods and services, for both gross and value added trade. Second, while the impact of these provisions categories is statistically significant for both goods and services, it is statistically larger for trade in services than for trade in goods. These results indicate that deep EIAs that include substantive provisions that stipulate the liberalization of trade in services, as well as other chapters on investment and competition, play an important role for trade in services overall. To our knowledge, this is the first analysis to explore this question. We also confirm that these non-tariff provisions also give an extra boost to goods exports. This finding complements recent firm-level studies, which show that goods exporters that also provide services internationally outperform those that do not.

We observe heterogeneity across sectors when unpacking the additional boost to trade that non-tariff provisions on services, investment, and competition ($svs \,\&\, inv \,\&\, com$ effect) provide when included in a trade agreement. Interestingly, the $svs \,\&\, inv \,\&\, com$ effect proves most important for services sectors important for value-chain efficiency, including accommodation and food service activities as well as transportation and storage. The latter encompasses land, water, and air transport industries, as well as warehousing and support activities for transportation and postal and courier activities. This suggests that the inclusion of these provisions in EIAs can help integrate into partner countries' supply chains.

Finally, we conduct counterfactual policy applications to determine the sectoral impact of the UK negotiating deep trade agreements with the US and with China and India—the partners to which the UK sent the largest share of its non-EU exports in 2014. In both cases, we find that trade in services sectors increase the most relative to manufacturing exports and that this relative increase is largest for domestic value added exports. In a post-agreement scenario, the professional, scientific, and and technical activities sector sees particular gains. Given that this sector is comprised of scientific

research and development and marketing research industries (among others), this result suggests that trade agreements which include non-tariff provisions have the potential to stimulate activity in sectors which are important for innovation and integration into supply chains. As the quality of services and value chains data improve, future work could provide further granularity on the role of deep provisions on specific services and investments.

References

Anderson, J. E. and E. Van Wincoop (2003). Gravity with gravitas: a solution to the border puzzle. *The American Economic Review 93*(1), 170–192.

Antràs, P. and R. W. Staiger (2012). Offshoring and the role of trade agreements. *The American Economic Review 102*(7), 3140–3183.

Ariu, A., F. Mayneris, and M. Parenti (2016). Providing services to boost goods exports: Theory and evidence. *ECARES Working Paper 2016-43*.

Baier, S. L. and J. H. Bergstrand (2007). Do free trade agreements actually increase members' international trade? *Journal of International Economics 71*(1), 72–95.

Baier, S. L., J. H. Bergstrand, and M. W. Clance (2017). Heterogeneous economic integration agreements' effects, gravity, and welfare. *Unpublished manuscript*.

Baier, S. L., J. H. Bergstrand, and M. Feng (2014). Economic integration agreements and the margins of international trade. *Journal of International Economics 93*(2), 339–350.

Baldwin, R. (2013). Global supply chains: why they emerged, why they matter, and where they are going. *Global value chains in a changing world (editors: Elms, D.and Low, P.), WTO, Geneva*.

Baldwin, R. and D. Taglioni (2006). Gravity for dummies and dummies for gravity equations. *National Bureau of Economic Research Working Paper 12516*.

Dhingra, S., H. Huang, G. Ottaviano, J. Paulo Pessoa, T. Sampson, and J. Van Reenen (2017). The costs and benefits of leaving the eu: trade effects. *Economic Policy 32*(92), 651–705.

Dür, A., L. Baccini, and M. Elsig (2014). The design of international trade agreements: Introducing a new dataset. *The Review of International Organizations 9*(3), 353–375.

Feenstra, R. C., R. E. Lipsey, H. Deng, A. C. Ma, and H. Mo (2005). World trade flows: 1962-2000. *National Bureau of Economic Research Working Paper 11040*.

Head, K. and T. Mayer (2014). Gravity equations: Workhorse, toolkit, and cookbook. *Handbook of International Economics 4*, 131.

HM Treasury (2016). Hm treasury analysis: the long-term economic impact of eu membership and the alternatives. *Parliament by the Chancellor of the Exchequer by command of Her Majesty, April*.

Johnson, R. C. and G. Noguera (2017). A portrait of trade in value added over four decades. *Review of Economics and Statistics 99*(5), 896–911.

Kelle, M. (2013). Crossing industry borders: German manufacturers as services exporters. *The World Economy 36*(12), 1494–1515.

Kierzenkowski, R., N. Pain, E. Rusticelli, and S. Zwart (2016). The economic consequences of brexit. *OECD Economic Policy Papers, No. 16*.

Kohl, T., S. Brakman, and H. Garretsen (2016). Do trade agreements stimulate international trade differently? evidence from 296 trade agreements. *The World Economy 39*(1), 97–131.

Koopman, R., Z. Wang, and S.-J. Wei (2014). Tracing value-added and double counting in gross exports. *The American Economic Review 104*(2), 459–494.

Larch, M., J. Wanner, Y. V. Yotov, and Z. Thomas (2017). The currency union effect: A ppml re-assessment with high-dimensional fixed effects. *Drexel University School of Economics Working Paper 2017-07*.

Limão, N. (2016). Preferential trade agreements. *Handbook of Commercial Policy 1*, 279–367.

Mattoo, A., A. Mulabdic, and M. Ruta (2017). Trade creation and trade diversion in deep agreements. *World Bank Working Paper 8206*.

Miroudot, S. and C. Cadestin (2017). Services in global value chains: From inputs to value-creating activities. *OECD Trade Policy Paper 197*.

Mulabdic, A., A. Osnago, and M. Ruta (2017). Deep integration and uk-eu trade relations. *World Bank working paper 7947*.

Orefice, G. and N. Rocha (2014). Deep integration and production networks: an empirical analysis. *The World Economy 37*(1), 106–136.

Osnago, A., N. Rocha, and M. Ruta (2015). Deep trade agreements and vertical fdi: the devil is in the details. *World Bank Working Paper 7464*.

Silva, J. S. and S. Tenreyro (2006). The log of gravity. *The Review of Economics and Statistics 88*(4), 641–658.

Timmer, M. P., E. Dietzenbacher, B. Los, R. Stehrer, and G. J. Vries (2015). An illustrated user guide to the world input–output database: the case of global automotive production. *Review of International Economics 23*(3), 575–605.

Wang, Z., S.-J. Wei, X. Yu, and K. Zhu (2017). Measures of participation in global value chain and global business cycles. *National Bureau of Economic Research Working Paper No 23222*.

Wang, Z., S.-J. Wei, and K. Zhu (2013). Quantifying international production sharing at the bilateral and sector levels. *National Bureau of Economic Research Working Paper 19677*.

Appendix 1 Main Results - Aggregate

Appendix 1.1 Baseline: Goods and services combined

Table A1: Baseline: Gross exports, Goods & Services

	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.119***	0.143***	0.092**	0.096**	0.121***	0.074*
	(0.040)	(0.046)	(0.042)	(0.041)	(0.046)	(0.043)
$svs \,\&\, inv \,\&\, com$				0.160***	0.149***	0.127***
				(0.026)	(0.029)	(0.028)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,153	14,153	14,153	14,153	14,153	14,153
R-squared	0.979	0.974	0.978	0.979	0.974	0.978

Notes: This table shows the estimation results for Equation 3 for gross exports. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

Table A2: Baseline: DVA exports, Goods & Services

	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.121***	0.115**	0.097*	0.097**	0.088*	0.079*
	(0.040)	(0.045)	(0.042)	(0.041)	(0.046)	(0.042)
$svs \,\&\, inv \,\&\, com$				0.168***	0.185***	0.130***
				(0.025)	(0.029)	(0.027)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,153	14,153	14,153	14,153	14,153	14,153
R-squared	0.980	0.976	0.979	0.980	0.976	0.979

Notes: This table shows the estimation results for Equation 3 for DVA exports. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

Table A3: Baseline: FVA exports, Goods & Services

	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.115***	0.110**	0.088**	0.095**	0.091*	0.072
	(0.041)	(0.046)	(0.045)	(0.041)	(0.047)	(0.045)
$svs \,\&\, inv \,\&\, com$				0.139***	0.132***	0.111***
				(0.026)	(0.029)	(0.029)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,153	14,153	14,153	14,153	14,153	14,153
R-squared	0.978	0.974	0.975	0.978	0.974	0.975

Notes: This table shows the estimation results for Equation 3 for FVA exports. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

Appendix 1.2 Baseline for gross exports: goods and services

Table A4: Baseline: Gross exports, *svs & inv & com* provisions

	Gross Goods			Gross Services		
	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.052	0.010	0.078*	0.187***	0.206***	0.127**
	(0.041)	(0.048)	(0.046)	(0.053)	(0.057)	(0.051)
svs & inv & com	0.098***	0.104***	0.075**	0.276***	0.257***	0.222***
	(0.026)	(0.031)	(0.030)	(0.035)	(0.037)	(0.035)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,153	14,153	14,153	14,153	14,153	14,153
R-squared	0.982	0.977	0.977	0.967	0.964	0.968

Notes: This table shows the estimation results for Equation 3, with the log of gross exports as the LHV. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

Table A5: Baseline: Gross exports, all provisions

	Gross Goods			Gross Services		
	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.162**	0.115	0.147*	0.251***	0.311***	0.146*
	(0.074)	(0.086)	(0.076)	(0.083)	(0.089)	(0.079)
svs & inv & com	0.098***	0.102***	0.073**	0.285***	0.263***	0.225***
	(0.026)	(0.031)	(0.030)	(0.035)	(0.037)	(0.035)
pro_{ijt}	-0.051	-0.074	-0.060	0.023	-0.017	-0.029
	(0.052)	(0.060)	(0.060)	(0.067)	(0.073)	(0.065)
ipr_{ijt}	-0.009	0.040	0.010	-0.271***	-0.237***	-0.251***
	(0.052)	(0.060)	(0.059)	(0.063)	(0.068)	(0.064)
std_{ijt}	-0.122*	-0.109	-0.063	-0.062	-0.102	0.022
	(0.073)	(0.086)	(0.074)	(0.077)	(0.083)	(0.073)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,153	14,153	14,153	14,153	14,153	14,153
R-squared	0.982	0.977	0.977	0.967	0.964	0.969

Notes: This table shows the estimation results for Equation 3 but including the full set of EIA provisions, with the log of gross exports as the LHV. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

Appendix 1.3 Baseline for DVA exports: goods and services

Table A6: Baseline: DVA exports, *svs & inv & com* provisions

	DVA Goods			DVA Services		
	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.046	-0.005	0.086*	0.190***	0.186***	0.129**
	(0.041)	(0.048)	(0.046)	(0.053)	(0.056)	(0.051)
svs & inv & com	0.105***	0.129***	0.082***	0.272***	0.262***	0.216***
	(0.026)	(0.031)	(0.030)	(0.035)	(0.037)	(0.035)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,153	14,153	14,153	14,153	14,153	14,153
R-squared	0.983	0.978	0.978	0.967	0.965	0.969

Notes: This table shows the estimation results for Equation 3, with the log of DVA exports as the LHV. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

Table A7: Baseline: DVA exports, all provisions

	DVA Goods			DVA Services		
	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.168**	0.115	0.170**	0.274***	0.312***	0.165**
	(0.074)	(0.086)	(0.076)	(0.083)	(0.087)	(0.079)
svs & inv & com	0.105***	0.125***	0.081***	0.280***	0.272***	0.219***
	(0.026)	(0.031)	(0.030)	(0.035)	(0.037)	(0.035)
pro_{ijt}	-0.060	-0.112*	-0.056	0.025	0.024	-0.032
	(0.051)	(0.059)	(0.059)	(0.066)	(0.072)	(0.065)
ipr_{ijt}	0.005	0.035	0.013	-0.258***	-0.267***	-0.237***
	(0.051)	(0.058)	(0.058)	(0.061)	(0.067)	(0.063)
std_{ijt}	-0.135*	-0.111	-0.086	-0.092	-0.147*	-0.002
	(0.073)	(0.087)	(0.074)	(0.077)	(0.081)	(0.073)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,153	14,153	14,153	14,153	14,153	14,153
R-squared	0.983	0.978	0.978	0.967	0.965	0.969

Notes: This table shows the estimation results for Equation 3 but including the full set of EIA provisions, with the log of DVA exports as the LHV. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

Appendix 1.4 Baseline for FVA exports: goods and services

Table A8: Baseline: Foreign value added, goods and services

	FVA Goods			FVA Services		
	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.085**	0.014	0.072	0.160***	0.174***	0.108**
	(0.042)	(0.049)	(0.047)	(0.054)	(0.058)	(0.053)
svs & *inv* & *com*	0.088***	0.094***	0.060*	0.246***	0.238***	0.206***
	(0.027)	(0.031)	(0.031)	(0.035)	(0.037)	(0.035)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,153	14,153	14,153	14,153	14,153	14,153
R-squared	0.980	0.976	0.974	0.967	0.963	0.967

Notes: This table shows the estimation results for Equation 3, with the log of FVA exports as the LHV. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

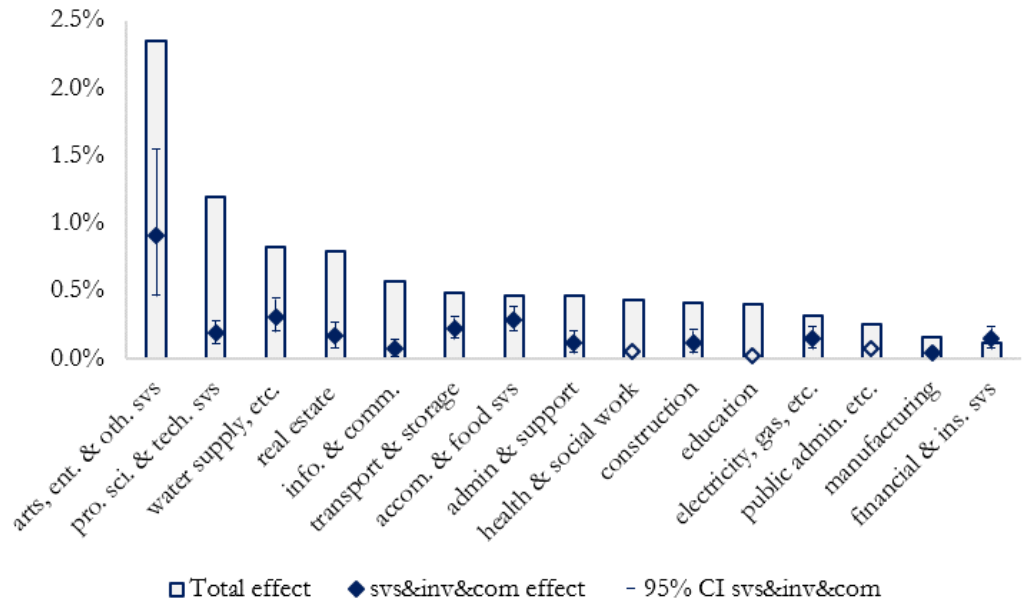
Table A9: Baseline: Foreign value added, goods and services

	FVA Goods			FVA Services		
	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.182**	0.126	0.120	0.211***	0.266***	0.128
	(0.075)	(0.089)	(0.077)	(0.081)	(0.088)	(0.080)
svs & *inv* & *com*	0.087***	0.092***	0.056*	0.256***	0.246***	0.209***
	(0.027)	(0.031)	(0.031)	(0.035)	(0.037)	(0.035)
pro_{ijt}	-0.074	-0.092	-0.077	0.050	0.022	-0.022
	(0.055)	(0.062)	(0.063)	(0.067)	(0.073)	(0.067)
ipr_{ijt}	-0.040	0.003	-0.012	-0.277***	-0.275***	-0.260***
	(0.054)	(0.061)	(0.061)	(0.064)	(0.069)	(0.065)
std_{ijt}	-0.089	-0.105	-0.026	-0.058	-0.099	0.018
	(0.074)	(0.090)	(0.076)	(0.073)	(0.080)	(0.073)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,153	14,153	14,153	14,153	14,153	14,153
R-squared	0.980	0.976	0.974	0.967	0.963	0.967

Notes: This table shows the estimation results for Equation 3 but including the full set of EIA provisions, with the log of FVA exports as the LHV. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

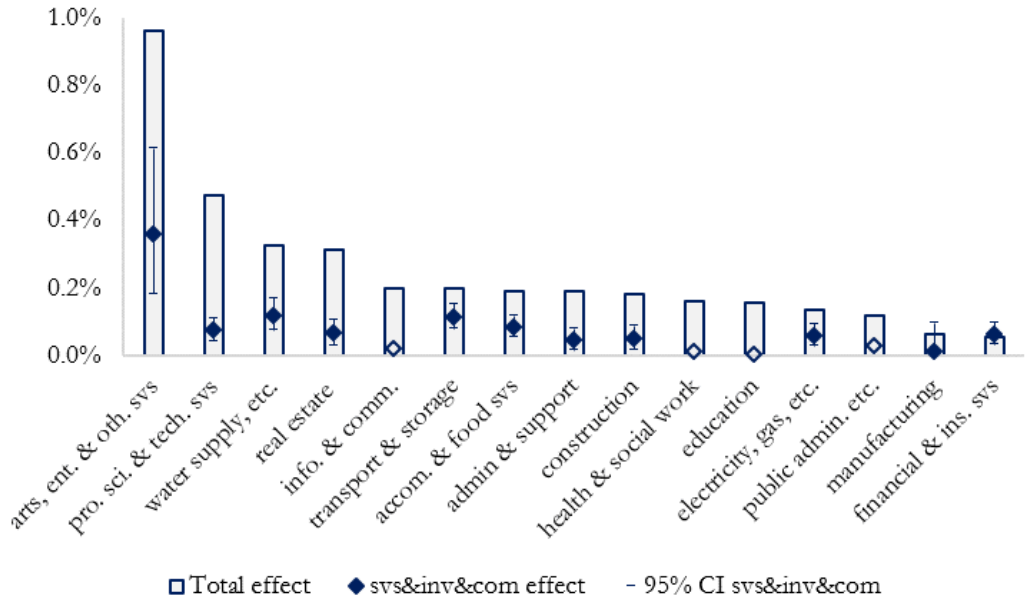
Appendix 2 Main Results - Sector

Figure A1: Trade-weighted impact of *EIA* and *svs & inv & com* on total DVA



Source: Authors' calculations. Notes: This figure shows the total and *svs & inv & com* effects for total DVA exports, calculated from coefficients from specification 4. 95% confidence intervals are shown for our parameter of interest, the *svs & inv & com* effect. Unless shaded in gray, all effects are significant at the 10% significance level or above.

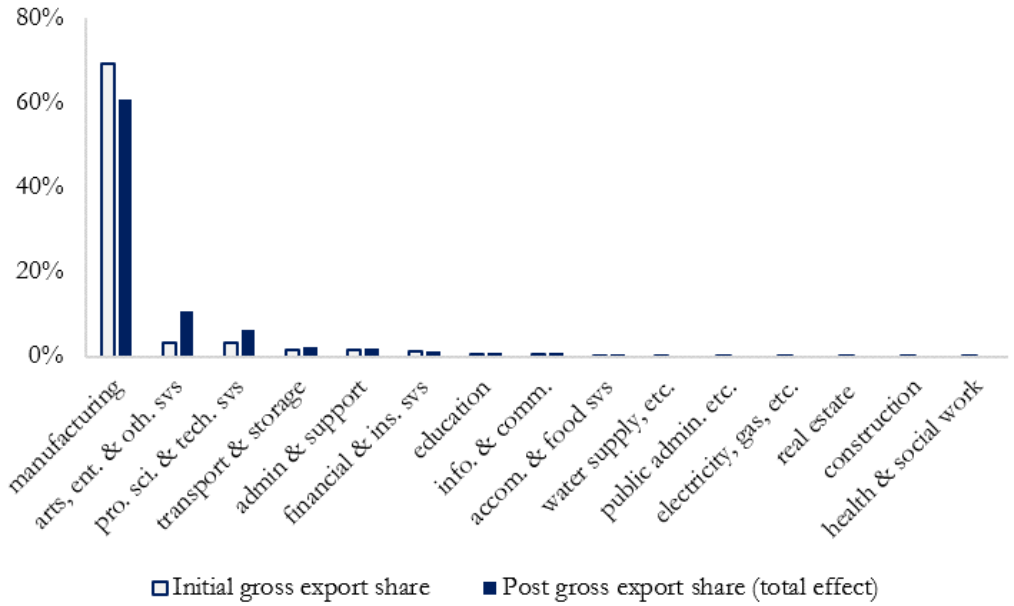
Figure A2: Trade-weighted impact of *EIA* and *svs & inv & com* on total FVA



Source: Authors' calculations. Notes: This figure shows the total and *svs & inv & com* effects for total FVA exports, calculated from coefficients from specification 4. 95% confidence intervals are shown for our parameter of interest, the *svs & inv & com* effect. Unless shaded in gray, all effects are significant at the 10% significance level or above.

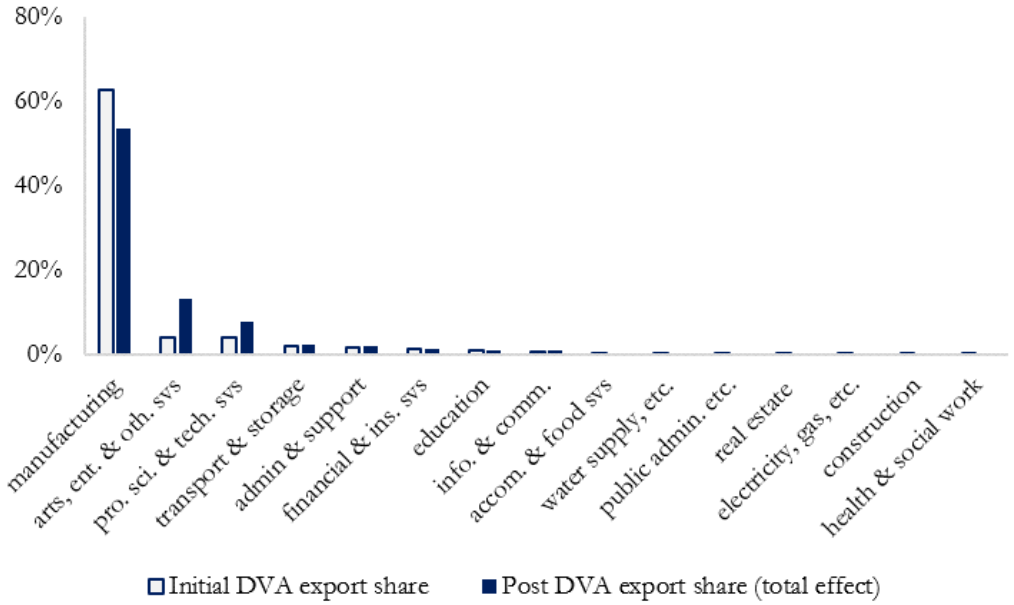
Appendix 3 Main Results - Policy Application

Figure A3: Estimated change in sectoral composition of gross exports from the UK to China and India



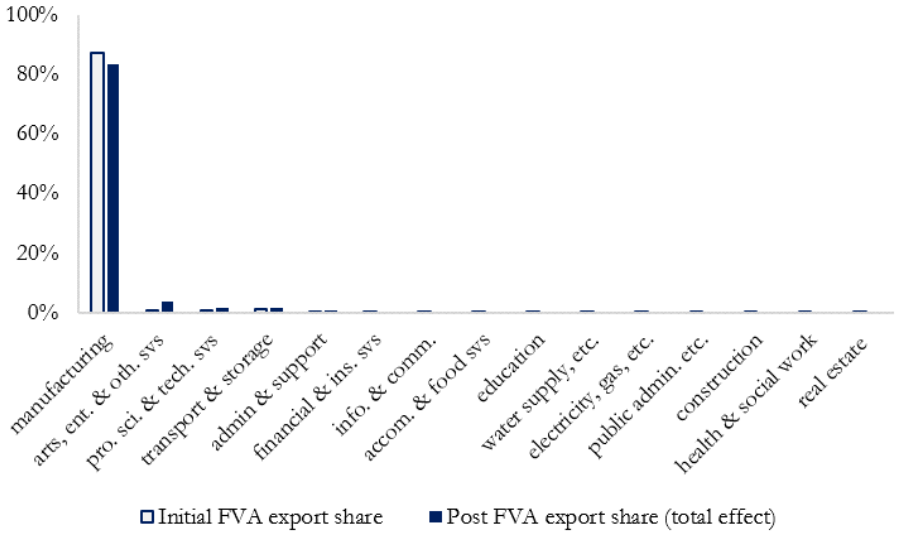
Source: Authors' calculations. Notes: This figure shows the sectoral decomposition of gross exports between the UK and the US both before and after the signature of a hypothetical EIA, per Equation 6.

Figure A4: Estimated change in sectoral composition of DVA exports from the UK to China and India



Source: Authors' calculations. Notes: This figure shows the sectoral decomposition of DVA exports between the UK and the US both before and after the signature of a hypothetical EIA, per Equation 6.

Figure A5: Estimated change in sectoral composition of FVA exports from the UK to China and India



Source: Authors' calculations. Notes: This figure shows the sectoral decomposition of FVA exports between the UK and the US both before and after the signature of a hypothetical EIA, per Equation 6.

Appendix 4 Data Appendix

Appendix 4.1 Countries and sectors in 2016 World Input Output Database (WIOD)

The 2016 release of the WIOD covers 43 countries (Table A10) and is broken down into 56 industries, per the ISIC Rev. 4 classification (Table A11). Data are avalable for years 2000-2014.

Table A10: WIOD Country list

EU-28		Non-EU
Austria	Latvia	Australia
Belgium	Lithuania	Brazil
Bulgaria	Luxembourg	Canada
Croatia	Malta	China
Cyprus	Netherlands	India
Czech Republic	Poland	Indonesia
Denmark	Portugal	Japan
Estonia	Romania	Korea
Finland	Slovakia	Mexico
France	Slovenia	Norway
Germany	Spain	Russian Federation
Greece	Sweden	Switzerland
Hungary	United Kingdom	Taiwan
Ireland		Turkey
Italy		United States

Table A11: WIOD industry mapping to ISIC Rev. 4 sectors

WIOD industry	ISIC Rev. 4 mapping	ISIC Rev. 4 description	No. WIOD industries
1	A.	Agriculture, forestry, and fishing	3
2	B.	Mining and quarrying	1
3	C.	Manufacturing	18
4	D.	Electricity, gas, steam and air conditioning supply	1
5	E.	Water supply; sewerage, waste management and remediation activities	2
6	F.	Construction	1
7	G.	Wholesale and retail trade; repair of motor vehicles and motorcycles	3
8	H.	Transportation and storage	5
9	I.	Accommodation and food service activities	1
10	J.	Information and communication	4
11	K.	Financial and insurance activities	3
12	L.	Real estate activities	1
13	M.	Professional, scientific and technical activities	5
14	N.	Administrative and support service activities	1
15	O.	Public administration and defence; compulsory social security	1
16	P.	Education	1
17	Q.	Human health and social work activities	1
18	R.	Arts, entertainment and recreation	1
18	S.	Other service activities	1
19	T.	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	1

Appendix 4.2 DESTA variable definitions

The Design of Trade Agreement Database (DESTA), described in described in Dür et al. (2014), is made publicly available by the World Trade Institute and houses detailed information on the content of trade agreements, spanning the period 1948-2016. The types of trade arrangements (both bilateral and multilateral) included in DESTA are: partial scope agreements; free trade agreements; customs unions; and framework agreements. We exclude framework agreements from our analysis, as this category is extremely shallow, does not necessarily contain any specific information on provisions or tariff reductions, and accounts for only 1.2% of all EIAs. Descriptions of the trade agreement provisions are in Table A12 below.

Table A12: DESTA variable definitions

Provision	Criteria
Services	Includes substantive provisions stipulating the liberalization of trade in services
Investment	Includes an investment chapter, such that the aim of protecting investment relies on an existing BIT
Competition	Contains a full chapter on competition (e.g. not to distort or promote competition)
Procurement	Contains concrete provisions on public procurement
IPR	Includes a substantive provision on protecting IPR beyond a general objective mentioned in the agreement's preamble
Standards	Contains at least one clause on SPS or on removing TBT

Appendix 4.3 WIOD decomposition

To decompose trade in value added indicators and gross exports we use the UIBE GVC Index 2 provided by Wang, Wei, Yu, and Zhu (2017) that follows the gross bilateral trade accounting framework proposed by Koopman, Wang, and Wei (2014) and Wang, Wei, and Zhu (2013). In particular, Koopman, Wang, and Wei (2014) provide a method to decompose a country's gross exports into value-added indicators by source and include additional double-counting terms at the aggregate level. Wang, Wei, and Zhu (2013) further provide a methodology to decompose all bilateral intermediate trade flows into major final demand groups according to their final destination.

This accounting framework decomposes bilateral exports per sector into 16 terms, corresponding to four main categories and 8 subcategories. The four main categories (i.e. those presented in Figure 3) include: domestic value added exports; domestic value-added that returns home; foreign value added exports; and double-counted intermediate trade. At each level of disaggregation these terms sum up to 100% of gross trade.

For our analysis, we use the 8 subcategories, and in particular we focus on the variables for DVA

and FVA. Figure A6 depicts this decomposition of bilateral gross exports. For consistency, we keep the same notation as in the main text, where the subscript or superscript i refers to the origin county; j the destination country; and s and g represent different sectors. In this figure, L^{ii} refers to the local Leontief inverse, V to the vector of value added, Y^{it} and X^i are the final demand between country and total input vectors. A^{ij} is the matrix of direct IO coefficients whose element a_{sg}^{ij} gives units of intermediate goods produced in sector s of country i that are used in the production of one unit of gross output in sector g of country j. B^{jt} is the matrix of total IO coefficients with elements b_{sg}^{ij} representing the total amount of gross output in sector s in country i needed to produce an extra unit of sector g's final goods in country j. For a detailed derivation of the accounting framework see Wang, Wei, and Zhu (2013).

Figure A6: Decomposition of bilateral gross exports from country i to country j

Value Added Flow	Variable	Description	Formula
DVA – Domestic value added	DVA_FIN	DVA embodied in final exports	$(V^iB^{ii})^T\#Y^{ij}$
	DVA_INT	DVA in intermediate exports used by direct importer (j) to produce local final products	$(V^iL^{ii})^T\#(A^{ij}B^{jj}Y^{jj})$
	DVA_INTrex	DVA in intermediate exports used to produce intermediates that are re-exported to third countries, ultimately absorbed abroad	$(V^iL^{ii})^T\#(A^{ij}(\sum_{t\neq i,j}^{G}B^{jt}\sum_{u\neq i}^{G}Y^{tu}$ $+B^{jj}\sum_{t\neq i,j}^{G}Y^{jt}))$
	RDV	DVA that is first exported and then returned home, and ultimately absorbed by the home country (i)	$(V^iL^{ii})^T\#(A^{ij}(\sum_{t\neq i}^{G}B^{jt}Y^{ti}$ $+B^{ji}Y^{ii}))$
FVA – Foreign value added	FVA_FIN	FVA in final exports	$(V^iL^{ii})^T\#(A^{ij}B^{ji}\sum_{t\neq i}^{G}B^{it})$ $+[V^i(B^{ii}-L^{ii})]^T\#(A^{ij}X^j)$
	FVA_INT	FVA in intermediate exports	$(\sum_{t\neq i}^{G}V^tB^{ti})^T\#Y^{ij}$
PDC – Pure double counting terms	FDC	Foreign double counted terms	$(\sum_{t\neq i}^{G}V^tB^{ti})^T\#(A^{ij}L^{jj}Y^{jj})$
	DDC	Domestic double counted terms	$(\sum_{t\neq i}^{G}V^tB^{ti})^T\#(A^{ij}L^{jj}E^j)$

Source: UIBE GVC index system, Wang, Wei, Yu, and Zhu (2017).

Appendix 5 Robustness Checks

Appendix 5.1 High-dimensional fixed effects with 4-year time intervals

To be consistent with international trade literature that examines the effect of EIAs on trade flows, we re-estimate our gross and sectoral results using panel data over four-year intervals. This leaves us with a panel covering years 2002, 2006, 2010, and 2014. As noted in the main text, this does not eliminate much variation in our variables of interest, as the first EU enlargement we capture was in 2004. Results of this exercise for gross, DVA, and FVA are presented below for the most robust version of our baseline specification, i.e. when including the full set of non-tariff provisions (Tables A13, A14, and A15, respectively).[21]

Overall, results are similar to those presented in Section 4. In particular, the coefficient on our variable of interest, $svs \,\&\, inv \,\&\, com$, is consistently statistically significant in all three specifications, and the effect for trade in services (gross, DVA, and FVA) is statistically larger than for trade in goods. As in our baseline specification, the coefficient on $svs \,\&\, inv \,\&\, com$ is also positive and highly significant for goods exports, regardless of the type of flow. We note that the magnitudes of the coefficients on $svs \,\&\, inv \,\&\, com$ are slightly larger than those in the main text in the case of goods exports, and slightly smaller than those in the main text in the case of services exports.

Table A13: 4-year intervals - Gross exports, goods and services

	Gross Goods			**Gross Services**		
	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.244**	0.136	0.316**	0.231	0.312*	0.105
	(0.109)	(0.116)	(0.123)	(0.152)	(0.163)	(0.140)
$svs \,\&\, inv \,\&\, com$	0.109***	0.114**	0.101**	0.253***	0.231***	0.202***
	(0.039)	(0.047)	(0.043)	(0.053)	(0.057)	(0.052)
pro_{ijt}	-0.039	-0.096	-0.014	0.098	0.061	-0.009
	(0.107)	(0.124)	(0.119)	(0.142)	(0.155)	(0.137)
ipr_{ijt}	-0.122	-0.080	-0.038	-0.416***	-0.375***	-0.413***
	(0.123)	(0.136)	(0.125)	(0.114)	(0.122)	(0.124)
std_{ijt}	-0.204*	-0.164	-0.251*	-0.021	-0.100	0.124
	(0.124)	(0.130)	(0.138)	(0.158)	(0.170)	(0.146)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,014	7,014	7,014	7,014	7,014	7,014
R-squared	0.983	0.978	0.979	0.969	0.965	0.970

Notes: This table shows the estimation results for Equation 3 including the full set of EIA provisions, with the log of gross exports as the LHV. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

[21] Sectoral results have been excluded here for space reasons, but are available upon request to the authors.

Table A14: 4-year intervals - Domestic value added, goods and services

	DVA Goods			DVA Services		
	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.254**	0.143	0.342***	0.250	0.296*	0.118
	(0.109)	(0.111)	(0.123)	(0.152)	(0.161)	(0.140)
$svs \,\&\, inv \,\&\, com$	0.114***	0.140***	0.106**	0.250***	0.240***	0.197***
	(0.039)	(0.047)	(0.042)	(0.052)	(0.056)	(0.052)
pro_{ijt}	-0.046	-0.140	-0.000	0.112	0.126	0.004
	(0.104)	(0.122)	(0.117)	(0.141)	(0.153)	(0.136)
ipr_{ijt}	-0.102	-0.073	-0.033	-0.397***	-0.382***	-0.390***
	(0.121)	(0.130)	(0.124)	(0.109)	(0.117)	(0.119)
std_{ijt}	-0.224*	-0.172	-0.272**	-0.056	-0.133	0.090
	(0.123)	(0.129)	(0.138)	(0.158)	(0.167)	(0.146)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,014	7,014	7,014	7,014	7,014	7,014
R-squared	0.984	0.980	0.981	0.969	0.967	0.971

Notes: This table shows the estimation results for Equation 3 including the full set of EIA provisions, with the log of DVA exports as the LHV. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

Table A15: 4-year intervals - Foreign value added, goods and services

	FVA Goods			FVA Services		
	Total	***Int.***	***Final***	***Total***	***Int.***	***Final***
EIA_{ijt}	0.274**	0.154	0.282**	0.163	0.241	0.074
	(0.110)	(0.117)	(0.126)	(0.147)	(0.160)	(0.139)
$svs \,\&\, inv \,\&\, com$	0.106***	0.108**	0.090**	0.214***	0.207***	0.179***
	(0.040)	(0.046)	(0.045)	(0.053)	(0.057)	(0.053)
pro_{ijt}	-0.071	-0.105	-0.049	0.107	0.091	-0.038
	(0.112)	(0.127)	(0.124)	(0.145)	(0.159)	(0.143)
ipr_{ijt}	-0.154	-0.126	-0.073	-0.422***	-0.414***	-0.438***
	(0.130)	(0.141)	(0.131)	(0.117)	(0.121)	(0.126)
std_{ijt}	-0.177	-0.158	-0.207	0.033	-0.059	0.168
	(0.126)	(0.134)	(0.141)	(0.151)	(0.165)	(0.146)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,014	7,014	7,014	7,014	7,014	7,014
R-squared	0.981	0.978	0.977	0.968	0.965	0.969

Notes: This table shows the estimation results for Equation 3 including the full set of EIA provisions, with the log of FVA exports as the LHV. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

Appendix 5.2 Poisson Pseudo-Maximum Likelihood

As a way to address the presence of zeros in our sectoral data, as well as to control for potential heteroskedasticity in our trade data, we re-estimate the impact of EIAs on trade flows using the Poisson pseudo maximum-likelihood (PPML) estimator, proposed by Silva and Tenreyro (2006). In particular, we estimate the following Equations:

$$X_{ijt} = exp[\beta_1 EIA_{ijt} + \beta_2 \boldsymbol{provision_{ijt}} + \delta_{it} + \varphi_{jt} + \gamma_{ij}] + \varepsilon_{ijt} \quad \text{(A1)}$$

$$X_{ijst} = exp[\beta_{1s} EIA_{ijt} + \beta_{2s} \boldsymbol{provision_{ijt}} + \delta_{it} + \varphi_{jt} + \gamma_{ij} + \sigma_{st} + \psi_{is} + \kappa_{js}] + \varepsilon_{ijst} \quad \text{(A2)}$$

over 2-year and 4-year intervals during the period 2000-2014.[22] Results for aggregate trade over 4-year intervals for Equation 3 with the full set of EIA provisions are depicted in Table A16 below.[23] As in the main body of the text, all estimations were specified with robust standard errors, and were clustered by country-pair. While the coefficient on EIA_{ijt} is not statistically significant in most cases, we do find a positive and significant effect of services, competition and investment provisions, with the magnitude for services statistically larger than that for goods, supporting the main results of our analysis.

Table A16: PPML - Gross, DVA, and FVA

	Gross		**DVA**		**FVA**	
	Goods	**Services**	**Goods**	**Services**	**Goods**	**Services**
$\boldsymbol{EIA_{ijt}}$	-0.005	-0.152	-0.116	0.225	0.278***	0.047
	(0.121)	(0.151)	(0.132)	(0.174)	(0.102)	(0.231)
$\boldsymbol{svs}$ & $\boldsymbol{inv}$ & $\boldsymbol{com}$	0.108***	0.395***	0.139***	0.231***	0.031	0.429***
	(0.039)	(0.074)	(0.041)	(0.076)	(0.039)	(0.106)
$\boldsymbol{pro_{ijt}}$	-0.089	0.187	-0.050	0.001	-0.255***	0.116
	(0.103)	(0.131)	(0.112)	(0.166)	(0.089)	(0.174)
$\boldsymbol{ipr_{ijt}}$	-0.145**	-0.559***	-0.119	-0.190	-0.204***	-0.860***
	(0.072)	(0.131)	(0.076)	(0.151)	(0.066)	(0.232)
$\boldsymbol{std_{ijt}}$	-0.016	0.099	0.016	-0.331***	-0.077	0.133
	(0.106)	(0.127)	(0.116)	(0.114)	(0.086)	(0.200)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,056	7,056	7,056	7,056	7,056	7,056
R-squared	0.997	0.980	0.997	0.989	0.997	0.977

Notes: This table shows the estimation results for Equation A1 including the full set of EIA provisions, with total gross, DVA, and FVA exports of goods and services as LHVs. Robust standard errors, clustered by country-pair are in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

[22] We use the STATA function *ppml_panel_sg* developed by Larch et al. (2017).

[23] Results over 2-year intervals are not included here for conciseness, nor are sectoral results over 4-year intervals. All results are available upon request.

Appendix 5.3 NBER-UN dataset for gross goods exports

We re-estimate Equations 3 and 4 for gross goods exports using the NBER-UN dataset described in Feenstra et al. (2005). This dataset provides annual, 4-digit SITC Rev. 2 figures on bilateral trade flows for 185 countries over the years 1962-2011. Based on underlying data from UN-Comtrade, gross trade statistics in this dataset are available for merchandise trade only. Nonetheless, this source allows us to verify our results for trade in gross goods using reported product-level trade statistics. We limit our sample time period to years 1994 onward to account for the inclusion of modern trade agreements only.

In order to verify the consistency of our results using this dataset, we first restrict the country sample to that which is available in the 2016 release of the WIOD (Table A10). Subsequently, we include the full country sample available in the NBER-UN dataset to provide external validity to our results. To allow for comparison with the exercise carried out in Appendix 5.3, we complete this analysis using both two-year and four-year time intervals. Results using 4-year time intervals are presented in Table A17. Those using 2-year time intervals are extremely similar and are available upon request. Regardless of the country sample or time-dimension at hand, we find the coefficient on $svs \,\&\, inv \,\&\, com$ to be positive and statistically significant.

Table A17: Gross goods (total), 4-year time intervals

	WIOD Sample			**UN-NBER Sample**		
$\boldsymbol{EIA_{ijt}}$	0.023	0.016	-0.002	0.037	0.023	0.064*
	(0.045)	(0.045)	(0.071)	(0.025)	(0.025)	(0.033)
$\boldsymbol{svs \,\&\, inv \,\&\, com}$		0.102***	0.094**		0.240***	0.251***
		(0.038)	(0.038)		(0.034)	(0.034)
$\boldsymbol{pro_{ijt}}$			-0.059			0.087**
			(0.054)			(0.039)
$\boldsymbol{ipr_{ijt}}$			0.078			-0.188***
			(0.056)			(0.046)
$\boldsymbol{std_{ijt}}$			0.044			-0.052**
			(0.067)			(0.026)
FEs (it, jt, ij)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,409	8,409	8,409	61,135	61,135	61,135
R-squared	0.973	0.973	0.973	0.932	0.932	0.932

Notes: This table shows the estimation results for Equation 3 including the full set of EIA provisions, with the log of gross exports from the UN-NBER dataset as the LHV. Robust SEs in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1% levels.

CENTRE FOR ECONOMIC PERFORMANCE
Recent Discussion Papers

1531	Doruk Cengiz Arindrajit Dube Attila Lindner Ben Zipperer	The Effect of Minimum Wages on Low-Wage Jobs: Evidence from the United States Using a Bunching Estimator
1530	Stephen Gibbons Vincenzo Scrutinio Shqiponja Telhaj	Teacher Turnover: Does it Matter for Pupil Achievement?
1529	Ghazala Azmat Stefania Simion	Higher Education Funding Reforms: A Comprehensive Analysis of Educational and Labour Market Outcomes in England
1528	Renata Lemos Daniela Scur	All in the Family? CEO Choice and Firm Organization
1527	Stephen Machin Matteo Sandi	Autonomous Schools and Strategic Pupil Exclusion
1526	Stephan E. Maurer	Oil Discoveries and Education Spending in the Postbellum South
1525	Paola Conconi Manuel García-Santana Laura Puccio Roberto Venturini	From Final Goods to Inputs: The Protectionist Effect of Rules of Origin
1524	Zack Cooper Fiona Scott Morton Nathan Shekita	Surprise! Out-of-Network Billing for Emergency Care in the United States
1523	Zack Cooper Amanda Kowalski Eleanor Neff Powell Jennifer Wu	Politics, Hospital Behaviour and Health Care Spending

1522	Philippe Aghion Ufuk Akcigit Ari Hyytinen Otto Toivanen	The Social Origins of Inventors
1521	Andrés Barrios F. Giulia Bovini	It's Time to Learn: Understanding the Differences in Returns to Instruction Time
1520	Sara Calligaris Massimo Del Gatto Fadi Hassan Gianmarco I.P. Ottaviano Fabiano Schivardi	The Productivity Puzzle and Misallocation: An Italian Perspective
1519	Alex Bell Raj Chetty Xavier Jaravel Neviana Petkova John Van Reenen	Who Becomes an Inventor in America? The Importance of Exposure to Innovation
1518	Randolph Bruno Nauro Campos Saul Estrin Meng Tian	Economic Integration, Foreign Investment and International Trade: The Effects of Membership of the European Union
1517	Fabrice Defever José-Daniel Reyes Alejandro Riaño Miguel Eduardo Sánchez-Martín	Special Economic Zones and WTO Compliance: Evidence from the Dominican Republic
1516	Philippe Aghion Ufuk Akcigit Matthieu Lequien Stefanie Stantcheva	Tax Simplicity and Heterogeneous Learning

The Centre for Economic Performance Publications Unit
Tel: +44 (0)20 7955 7673 Email info@cep.lse.ac.uk
Website: http://cep.lse.ac.uk Twitter: @CEP_LSE