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Abstract

Trade in services is often hampered by domestic administrative barriers, even when countries are members of the same regional trade agreement. We exploit a large reform in the European Union (the EU Service Directive) targeted to reduce such administrative hurdles in cross-border service provision to estimate its effects on service trade. We employ a difference-in-difference strategy and a Pseudo Poisson Maximum Likelihood (PPML) panel approach to estimate gravity equations with multiple high-dimensional fixed effects. On average, the reform increased intra-EU trade in targeted services by about 40%. This effect of the reform on trade volume is corroborated by several robustness and placebo checks. Finally, a disaggregated analysis reveals significant differences between countries and service sectors.

JEL-code: F13, F14, F15

Keywords: Service trade, trade liberalisation, gravity equation

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1 Introduction

International trade is hampered by a variety of administrative barriers and even when countries form regional trade agreements (RTA) these hurdles seem to persist (Hornok and Koren, 2015). Several studies show that a reduction of administrative barriers increases trade volumes (Engman, 2005), which motivated the members of the World Trade Organization (WTO) to sign the *Trade Facilitation Agreement* (TFA; WTO, 2014). However, the majority of WTO agreements, RTAs as well as the TFA focus on trade in goods. In contrast, the *General Agreement on Trade in Services* (GATS, 1995), also signed by the WTO members, provided only very little progress in terms of reducing administrative barriers regarding service trade (Adlung and Roy, 2005; Hoekman and Mattoo, 2013). In the case of services, such administrative hurdles are especially problematic, because the main impediments to trade are not tariffs or shipping costs, but regulations and entry barriers for service providers (Baldwin, 2011). Furthermore, only one percent of RTAs signed between 1950 and 2010 target services specifically, and more than half of the almost 600 agreements do not even mention services (Dür et al., 2014). Services are in most countries highly regulated due to information asymmetries between providers and consumers and due to possible externalities (Lim and De Meester, 2014). On these grounds, the access to service markets is often restricted, i.a., via licence and qualification requirements, entry quotas or even discriminatory regulations regarding the nationality and residence. Since restrictions for the same service differ between countries, a service exporter needs to fulfil country specific regulations for each and every host market (OECD, 2018).

These issues even exist in highly integrated markets, like the European Union (EU). Kox and Lejour (2006) claim that the principle of free movement of services in the EU is still far from being complete. The heterogeneity in regulation and rules regarding the provision of services has been identified as a major obstacle, making cross-border trade in services complicated and costly (Sejerøe et al., 2005; Badinger et al., 2008; Monteagudo et al., 2012). As a consequence, trade in services accounts only for about one quarter of total trade within the EU. This is in stark contrast to the fact that services constitute the most important sector in EU domestic markets, with a contribution of around 70% to GDP (Eurostat, 2017). The lack of service trade hinders competition, leading to higher prices for consumers and unused opportunities for job creation (Vogt, 2005).

To exploit the untapped potential, in 2006 the EU adapted directive 2006/123/EC on services in the internal market (in the following SD for 'Service Directive'). The particular aim of the SD was to reduce the administrative burden for businesses when trading services across borders, by a harmonisation of rules and regulations and by a facilitation of

bureaucratic requirements.[1] Due to the large scope of the reform, the final deadline for implementation into national law was 2010.

We make use of the SD as a major policy change and take it as a "natural experiment" (Nordås, 2012, p.60) to estimate the impact of service trade liberalisations via reductions of administrative barriers on trade in services. Doing so, we extend a recently published paper by Dettmer (2015), which examines the time period from 2004 to 2010. However, having service trade data available only until 2010 does not allow to estimate the ex-post effect of the SD. In addition, information on how rigorously the member states of the EU (MS) implemented the SD were not available in 2010. As acknowledged by the author, this inhibits the direct estimation of the effect of liberalisation on service trade (Dettmer, 2015, p. 450). In our study, we exploit bilateral service trade data between 2001 and 2014 and utilise information on how rigorously MS have implemented the SD. This, in turn, allows to evaluate directly the ex-post effects of the SD.

The SD can be interpreted as a deepening of an existing RTA, since it aims at completing the EU internal market of services. Thus, by investigating the SD, we contribute to an ongoing discussion about the role of administrative barriers for trade costs and about the impact of RTAs on trade in services. Kimura and Lee (2006), for instance, find increasing effects on service trade from RTAs, which are in size very similar to the effects on goods trade. Ceglowski (2006) also observes a positive link between RTA and trade in services. However, she argues that the effect might not result directly from the RTA but from the strong linkages between goods and services trade. Egger et al. (2012) show that services respond stronger to reductions of trade barriers than goods, because the domestic service sectors are bigger and trade costs are larger. Empirically, they observe strong positive effects on trade in services of RTAs. Miroudot et al. (2013) and Miroudot and Shepherd (2014), in contrast, find only slight service trade cost reductions due to RTAs as compared to goods trade costs. Grünfeld and Moxnes (2003) and Walsh (2006) argue that the formation of an RTA has no significant impact on trade in services, mainly because most RTAs target trade in services not explicitly enough. Mayer et al. (2018) find that the impact of RTAs on service trade is twice as small as for trade in goods. In line with this reasoning, Nordås (2018) argues that an RTA alone is not boosting trade in services enough, but stronger harmonisation and regulatory cooperation may have more substantial effects.

Our analysis of the SD is able to test this hypothesis, since the SD aimed exactly for stronger harmonisation and deeper cooperation. Nordås (2012) and Inklaar et al. (2008) emphasise

[1]Theoretically, Davies (2013) shows that governments make use of administrative barriers to limit the access to their home markets even though free entry is granted. In the equilibrium, governments make use of red tape to subsidise home firms only, although they committed their country to non-discrimination within an RTA. Hence, the SD reduced the possibility to use red tape as a barrier to a national market significantly.

that the SD provides an exogenous and substantial policy change which can be exploited to analyse the impact of service market liberalisation. Following them, we employ a difference-in-difference (DD) strategy with a gravity model, and use the implementation of the SD as a natural experiment. Using the World-Input-Output-Database (WIOD), we take intra-EU trade in services after the SD implementation as treated, and assign trade between non-EU countries and trade between EU and non-EU members to the control group. Through the inclusion of three high-dimensional fixed effects, we control for country-specific time-varying and country-pair time-invariant characteristics (Yotov et al., 2016). Furthermore, we control for EU membership and RTAs to isolate the SD reform effect from other influences due to the EU Single Market and bilateral trade agreements.

Overall, we find that the SD increased intra-EU service exports on average by about 40%, an effect which survives a series of robustness and plausibility checks. First, we exploit the fact that a number of sectors were explicitly excluded (i.e., non-treated) from the SD to perform placebo tests. As expected, we find no effects of the SD on these excluded service sectors. In addition, we make use of the heterogeneity in the quality of SD implementation across the MS. We show that countries with strong (poor) implementation of the SD experienced a higher and more significant (lower and less significant) increase in service trade. At the country level, we observe that the majority of MS was able to increase their exports due to the reform. This holds for old and new MS alike, but the magnitude of trade effects varies significantly over the economies. The trade effects of the SD also appear to be heterogeneous on the sectoral level, with wholesale and retail, management and professional services showing the largest impacts on service trade.

The remainder of the paper is organised as follows. Section 2 provides further details on the implementation of the SD and gives a short overview over the related literature. Section 3 presents the data and the empirical strategy to identify the causal effects of the SD. Section 4 discusses the results, and Section 5 concludes.

2 Background

2.1 The Service Directive

The SD was a reform package to complete the Single Market for services within the EU. Its draft version, also known as the *Bolkestein proposal*, aimed to remove all barriers regarding the free movement of services between the EU MS and the freedom of establishment of service providers within the EU. The publication of the proposal induced unprecedented protests throughout Europe, but mainly in the old EU15 (Bertola and Mola, 2010; Menz, 2010). Two arguments were at the centre of the discussion: First, since the proposal

included a stronger reliance on the origin principle, it was suspected that employment conditions, wages and consumer as well as employment protection would be levelled down within the EU. Second, it was feared that the proposal would lead to a commercialisation in core areas of public service provision, such as education, health care and social work. In the end, the opponents of the proposal were able to prevent the inclusion of such sensitive sectors, and some of its most controversial elements were watered down. These excluded sectors will be used as placebos to check the plausibility of our empirical results. After considering the opponents' demands, a revised version of the original Bolkestein proposal came into force in June 2006 with a period of implementation until the 29th of December 2009. It included still 65% of service activities, which contribute about 45% to the EU GDP (European Commission, 2012).[2]

Following the publication of the SD, a period of fundamental revision and verification of national laws and bureaucratic structures started. Between 2006 and the end of 2009, national governments were tasked with identifying the restrictions prevailing in their legislation and audit their justification. These findings were discussed in country groups and plenary meetings. The MS were allowed to only keep restrictions that passed the audit, and to abolish or to amend the remaining ones (Corugedo and Ruiz, 2014). Furthermore, the MS had to install a single point of contact (SPC), which serves as a one-stop shop by providing all the necessary documents and information and allowing the foreign service supplier to complete all obligations and formalities at a distance and by electronic means to get the permission to supply a service (Matei and Doleys, 2011). The granting of authorisation needs to follow common criteria and, most importantly, any discriminatory obligation regarding residence, presence and registration are only acceptable if they are justified, for example, by the protection of public security or public health (Hatje, 2008).

2.2 Previous Literature

Some studies predicted the *ex-ante* impact of the SD (see Monteagudo et al. 2012, for a comprehensive overview). Accordingly, the increase in intra-EU trade ranges from 5% (Sejerøe et al., 2005) to $30 - 60\%$ (Kox et al., 2004). Further, due to increased trade and competition, it was predicted that GDP growth increases by about $0.3 - 0.7\%$ (De Bruijn et al., 2006), and by about 1.5% in the medium- to long-run (Badinger et al., 2008). The employment effects were estimated by about 0.5% (Sejerøe et al., 2005) to $0.6 - 2.2\%$ (Breuss and Badinger, 2006). These differences can be explained by alternative coverages

[2] Article 2 of the SD lists the excluded services: Non-economic services of general interest, financial services, electronic communications services and networks, transport, services of temporary work agencies, healthcare, audiovisual services, gambling, services connected with public authorities, social services, and private security services (see also Table A.1 in the Appendix).

regarding countries, sectors, time spans and different types of service trade (Nordås, 2012). Due to the implementation of a revised and less ambiguous version compared to the original proposal, which underlies these studies, the authors lowered their expectations by around $7-9\%$ (Sejerøe et al., 2005) and one third (Kox and Lejour, 2006).

Most of the *ex-ante* studies focus on the reduction of trade barriers due to a stronger harmonisation of regulations. In order to measure barriers to trade from regulation, they mainly rely on the Product Market Regulation (PMR) index of the OECD.[3] However, Monteagudo et al. (2012) object that the PMR is not able to account for the legal situation of the SD. Furthermore, all mentioned studies assume a full and homogeneous implementation of the SD in all countries, which seems critical given that the SD kept space for detailed adoptions by the MS. Considering a heterogeneous and incomplete implementation of the SD, Monteagudo et al. (2012) investigate for the European Commission (EC) the gains from the SD. They estimate in their "central scenario" an increase of trade by 7% and of GDP between 0.8% and 1.6% in the very short-run.

There is only one *ex-post* study quantifying the impact of the SD on trade in services. Dettmer (2015) uses a DD-design to estimate these effects. She finds insignificant effects on intra-EU commercial service exports and a significant negative effect on intra-EU business service exports. Considering the quality of the SD implementation by employing the PMR, she observes insignificant effects for intra-EU service trade. However, by using the *announcement* of the SD (year 2006) as the treatment year, this approach implicitly assumes immediate implementation of the SD regulations. In fact, the MS had time until 2010 to implement the SD into national law, and especially the review of bureaucratic structures was a long-lasting process.[4] Thus, using 2006 as treatment year may be too early to uncover the potential effects of the SD, since implementation was incomplete at that time. In our study, we employ data from 2001 to 2014, and use the implementation deadline of 2010 as the treatment year. Moreover, information on how rigorously the MS implemented the SD were not available to Dettmer (2015) in 2010, and her proxy for the quality of the SD implementation (i.e., the PMR index) does not capture the restrictions of the SD precisely enough (Monteagudo et al., 2012). To explicitly account for the differences in SD implementation, we extract detailed information from Eurochambres (2010) on the implementation progress of each MS.

[3]The PMR is a comprehensive index, measuring the degree to which policies promote or inhibit competition. It combines information from questionnaires and public available sources and contains three subcategories: state control, barriers to entrepreneurship and barriers to trade and investment (Koske et al., 2015).

[4]Matei and Doleys (2011) investigate the progress made by the MS in implementing the SD. In February 2010, the implementation of the horizontal legislation was only achieved by 13 MS, and in December 2010 by 25 MS. This corroborates the large scale of the SD, and suggests 2010 as treatment year.

3 Data and Empirical Strategy

3.1 Data

Reliable data on trade in services is scarce, especially at the sectoral level. The SD is a complex legislation, whose applicability differentiates between service sectors (see footnote 2). Therefore, it is indispensable to use disaggregated rather than aggregated trade data to analyse the impact of the SD on bilateral service trade flows. In particular, we employ the World Input Output Database (WIOD, Timmer et al. 2015), which contains domestic and bilateral cross-border trade data at the sectoral level between 2000 and 2014. In our study, we focus on business-to-business (B2B) and exclude possibly distortive business-to-consumer (B2C) transactions. The WIOD includes all 28 EU MS and 15 non-EU countries (Australia, Brazil, Canada, China, India, Indonesia, Japan, Mexico, Norway, Russia, South Korea, Switzerland, Taiwan, Turkey, USA). Taken together, these countries covered more than 85% of the world GDP in 2008 (Timmer et al., 2015). The remaining world trade volume is treated as "rest of world".

The sectoral disaggregation follows the ISIC Revision 4 and offers bilateral trade flows by 56 sectors, from which 31 are classified as services. Table A.1 in the Appendix shows intra-EU trade shares and growth rates by service category for the years 2002 to 2006 (pre-reform), 2006 to 2010 (years of implementation) and 2010 to 2014 (post-reform). The upper block of the table reports the included sectors, the lower one the excluded sectors. Notice that educational and health services (sectors P and Q) are excluded from the SD in case of public provision. However, if these services are predominantly organised by the private sector, service providers are covered by the SD. In our empirical analysis, we account for the specific role of these sensitive sectors and treat them as included, but also provide robustness checks where they are left out from the regressions.

Table A.1 reveals that trade in services increased substantially within the EU. We also observe different patterns in growth rates of service trade between included and excluded sectors and among the pre- and post-reform years. Most importantly, while the included sectors had lower growth rates than the excluded ones before 2006, the opposite is true for the years 2006 to 2010 and the years after 2010. Regarding its relative importance, we can see that wholesale (G45 and G46), transport (H49-H52, not included in the SD) and business services (M69-M75) account for the largest trade shares.

The WIOD is based on balance of payments (BoP) information and, therefore, it captures cross-border service trade, which is classified as Mode 1.[5] Focusing on Mode 1 is reasonable

[5]The collection of trade in services data for the national BoP follows the classification of the GATS. Accordingly, trade in services is classified in four modes. **Mode 1** is cross-border supply and takes place if the service provider and recipient stay in their respective home countries. The service is then transferred

for at least two reasons. First, the freedom to provide cross-border services, hence Mode 1, is at the core of the SD (Hatje, 2008). Second, an explicit goal of the SD was to enable small and medium enterprises (SME) to participate in the EU service trade. Most SMEs trade via Mode 1, because installing a permanent establishment often comes with non-negligible costs (Sejerøe et al., 2005).

3.2 Gravity Equation for Service Trade

To estimate the impact of the SD on bilateral trade in services within the EU, we use a standard gravity model as applied in the trade literature. The traditional gravity model dates back to Tinbergen (1962) and explains the volume of trade between two countries by their relative market size and trade costs. These costs are typically measured by time-invariant (e.g., common language or distance) and time-varying determinants (e.g., tariffs or administrative burdens).

We rely on the gravity equation, formulated by Anderson and van Wincoop (2003), i.e.,

$$x_{ij} = \frac{y_i y_j}{y^W} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma}, \tag{1}$$

where x_{ij} indicates bilateral exports from country i to country j. y_i (y_j) denotes GDP in i (j) in proportion to world GDP y^W. t_{ij} represents trade costs, Π_i and P_j are outward and inward multilateral resistance terms, which reflect the general equilibrium effects of trade with third countries or, in other words, an average trade barrier for countries i and j to all their trading partners (Larch et al., 2017).

Most empirical work on the various determinants of bilateral trade relations focuses on trade in goods. This is mainly due to the higher volume of trade in goods, but also due to limited data availability for trade in services. Yet, in the last years more and more authors have shown that the standard gravity equation is also suitable for trade in services (e.g. Ceglowski, 2006; Kimura and Lee, 2006; Walsh, 2006; Egger et al., 2012; Nordås, 2018). However, the most difficult task for an analysis of trade relations is still the measurement of trade costs t_{ij}. Anderson and Van Wincoop (2004) discuss the difficulty of measuring and collecting reliable data on trade costs regarding trade in goods. For service trade, this becomes even more challenging, because trade costs for services are very specifically related to their industry characteristics (Borchsenius et al., 2010). Since we are not interested in

to the host country, often by the means of Information and Communication Technology (ICT). **Mode 2** requires the temporary movement of the consumer to the service supplier's residence country, mainly tourism services. **Mode 3** is trade via an affiliate of the service provider in the host country of the consumer. **Mode 4** occurs when the service provider moves temporarily to the host country of the consumer and provides her service on-site, e.g. posted workers.

the estimation of certain determinants of trade costs, we rely on a fixed effects approach commonly used to estimate the impact of RTAs or currency unions (Yotov et al., 2016).

Specifically, country-pair fixed effects account for all time-invariant variables which may influence trade relations between two countries, such as distance, language or common border (Baier and Bergstrand, 2007). In addition, these effects control for the endogeneity of forming trade agreements, taking into account that countries with heavier trade relations are more likely to sign a trade agreement. Ignoring this potential source of endogeneity would lead to overestimated effects of an RTA (Dai et al., 2014). Furthermore, we include exporter- and importer-time fixed effects to control for the unobservable inward and outward multilateral resistance terms. In addition, these fixed effects account for any time-varying observable and unobservable country specific characteristics (Yotov et al., 2016).

Equation (1) describes a multiplicative relation. For practical reasons, the empirical trade literature estimated the gravity model by a log-linearised OLS approach (Anderson and van Wincoop, 2003), which is accompanied by two main issues: First, parameter estimates would be inconsistent if standard errors are heteroskedastic, and, second, zero trade flows are lost by taking the logarithm of x_{ij}. To overcome these problems, Santos and Tenreyro (2006) proposed the Poisson-Pseudo-Maximum-Likelihood (PPML) estimator, which became the workhorse to estimate gravity models.

To allow for different trade adjustments over the course of the implementation of the SD we do not estimate annual trade flows, but collapse the average bilateral trade data into five time periods:[6] Three periods before the reform (P_1: 2001 – 2003, P_2: 2004 – 2006, P_3: 2007 – 2009), and two periods after the reform (P_4: 2010 – 2012, P_5: 2013 – 2014). This is commonly used in the investigation of trade policies, since it is well proven that market players need time to get to know and to adjust to reformed regulations. As already mentioned, Matei and Doleys (2011) showed that a number of national governments delayed the implementation of the SD, which in turn also justifies the use of time intervals in our specific case. In addition, relying on time intervals may balance out economic fluctuations (Yotov et al., 2016).

To isolate the SD reform effect, we control for the existence of RTAs using data from Egger and Larch (2008). In addition, we control for time-varying EU membership, because many EU countries signed RTAs previously, wherefore the formation of the European Single Market is blurred for some country-pairs in the RTA database. Furthermore, Mayer et al. (2018) show that the Single Market increases trade more than three times as much as a "normal" RTA. Thus, we follow them and include both, RTA and EU membership, in the

[6]Building five periods seems a reasonable compromise given the relatively short time coverage available. However, we also used alternative spells of time periods, leaving our empirical results almost unchanged.

estimation equation.[7]

The goal of the SD was to boost intra community trade in services further than the original formation of the European common market has achieved so far, which we estimate as

$$X_{ij,t} = \exp[\beta_1 EU_{ij} R_t + \beta_2 EU_{ij,t} + \beta_3 RTA_{ij,t} + \sum_{t=1}^{4} \beta_{4,t} INTL_{ij} P_t + \mu_{ij} + \lambda_{i,t} + \chi_{j,t}] \times \epsilon_{ij,t}. \quad (2)$$

$X_{ij,t}$ is total service exports from exporter i to importer j in time period t. The interaction $EU_{ij}R$ consists of a time-invariant EU dummy, where EU_{ij} takes entry one if both countries are EU MS in P_4, and zero otherwise. R indicates the time after the reform deadline (i.e., P_4 and P_5) and, thus, the years between 2010 and 2014. To capture the variation in EU membership, $EU_{ij,t}$ is a time-variant indicator variable, which controls for trade effects due to the three waves of Eastern enlargement. $RTA_{ij,t}$ is set to one if countries i and j are part of the same RTA at time t, and zero else. $INTL_{ij}$ takes a value of zero if trade is intranational ($j = i$), and one for international trade ($j \neq i$). The interaction terms $INTL_{ij}P_t$ capture a general trade increase over time (Bergstrand et al., 2013).

The variable of interest to analyse the impact of the SD is the interaction term between the EU dummy and the reform dummy, given by

$$\beta_1 = \{E[X_{ij,t}|EU = 1, t = 1] - E[X_{ij,t}|EU = 1, t = 0]\} - \{E[X_{ij,t}|EU = 0, t = 1] - E[X_{ij,t}|EU = 0, t = 0]\}. \quad (3)$$

β_1 equals to the DD-parameter for intra-EU trade after the implementation of the reform. It estimates whether intra-EU trade increased after the reform compared to trade between non-EU countries and trade between EU and non-EU countries (i.e., our control group). μ_{ij} are country-pair fixed effects to control for bilateral time-invariant determinants, $\lambda_{i,t}$ are exporter-time and $\chi_{j,t}$ are importer-time fixed effects to control for inward and outward multilateral resistance. $\epsilon_{ij,t}$ is the remainder error term. Standard errors are clustered by country-pair.

[7] In contrast to Mayer et al. (2018), we define RTA and EU *inclusive*, meaning that $RTA = 1$ remains even though the EU treaties replaced the RTA treaties. Alternatively, we follow their *exclusive* definition ($RTA = 0$ after EU accession), resulting in a larger coefficient for EU, but the variable of interest and the remaining control variables remain unchanged. See Table A.2 in the Appendix.

4 Empirical Results

4.1 EU-Average

Table 1 reports the average effect for the sum of exports of all included service sectors covered by the SD. As can be seen from column (1) of the table, the general trade effects (INTL_2 to INTL_5) exert a significantly positive impact on service trade, proving increases of trade in services between all country pairs on average over this time period. The EU-dummy enters significantly positive with a marginal effect of about 36% $[(e^{0.305}-1)\times 100 = 35.6]$. More importantly, we observe an increase of service trade by about 40% through the implementation of the SD. This effect is significant not only in statistical but also in economic terms when compared to the parameter estimates of EU-membership and RTAs. On average, an RTA is associated with a significantly positive service trade effect of around 20%, which is generally in line with recent contributions (e.g., Baier et al., 2016; Felbermayr et al., 2018). This rather goes against the notion of ineffective RTAs for services (e.g., Grünfeld and Moxnes, 2003; Walsh, 2006), but indicates that bilateral trade agreements might be a first step in fostering directly or indirectly (e.g., via spillovers from trade in goods) cross-border service activities. Taken together, trade liberalisation through RTAs, EU membership and the SD induced an increase in service trade within the EU by about 127% $[= (e^{0.181+0.305+0.336}-1)\times 100]$. The lion's share of this effect (around 90%) is purely due to a country's EU integration.

Column (2) of Table 1 accounts for the specific role of educational and health services in the SD by leaving out these sectors from the gravity equation. Our estimation results remain virtually unchanged, suggesting that our specification is robust against the inclusion of these sensitive sectors. Further, column (3) of Table 1 summarises the estimation results of a placebo test which uses only exports of service sectors that are *excluded* from the SD (a detailed list of these sectors is reported in the lower block of Table A.1). As expected, we do not find any significant effect of the SD on these sectors. The intra-EU dummy is significant as well and the remaining controls variables are insignificant.

To test the identifying assumption underlying the DD-approach, we include two leads of the reform, shown in column (4) of Table 1. The first (second) lead forwards the reform by one (two) period(s), i.e., SD_{t-1} (SD_{t-2}). The insignificant parameter estimates of both effects supports the common trend assumption of treated and control group prior to the reform. In addition, we can use the results of column (4) to make statements about anticipatory and delayed responses. SD_{t-1} refers to P_3 (2007 – 2009), the period between the announcement and the implementation deadline of the SD, and therefore equals the treatment effect in Dettmer (2015). In line with her results, this lead is insignificant which goes against anticipatory effects. This finding is also consistent with Monteagudo et al.

Table 1: Impact of the SD on intra-EU service exports

	(1) included	(2) included w/o P and Q	(3) excluded	(4) leads	(5) lag
SD	0.336***	0.349***	−0.057	0.336***	0.265***
	(0.051)	(0.053)	(0.051)	(0.043)	(0.043)
intra-EU	0.305***	0.307***	0.601***	0.316***	0.297***
	(0.047)	(0.047)	(0.057)	(0.053)	(0.048)
RTA	0.181**	0.195***	−0.120	0.181**	0.193***
	(0.071)	(0.070)	(0.082)	(0.071)	(0.072)
$INTL_2$	0.045***	0.050***	0.013	0.051***	0.045***
	(0.015)	(0.015)	(0.015)	(0.018)	(0.015)
$INTL_3$	0.092***	0.097***	0.041	0.095***	0.092***
	(0.024)	(0.024)	(0.028)	(0.030)	(0.024)
$INTL_4$	0.095***	0.107***	0.007	0.099**	0.112***
	(0.037)	(0.037)	(0.040)	(0.040)	(0.036)
$INTL_5$	0.120***	0.136***	−0.006	0.124**	0.106**
	(0.046)	(0.047)	(0.041)	(0.049)	(0.046)
SD_{t-1}				0.013	
				(0.024)	
SD_{t-2}				−0.032	
				(0.023)	
SD_{t+1}					0.135***
					(0.033)
Exporter-time FE	yes	yes	yes	yes	yes
Importer-time FE	yes	yes	yes	yes	yes
Country-pair FE	yes	yes	yes	yes	yes
Observations	9,680	9,680	9,680	9,680	9,680

Notes: Column (1) reports the results of all sectors included in the SD, column (2) the ones of column (1) excluding education (P) and health (Q), column (3) the ones for all excluded sectors from the SD, column (4) the ones for included sectors incorporating leads and column (5) includes one lag. Clustered standard errors on country-pair level in parentheses. *,** ,*** indicate significance at the 10%-, 5%- and 1%-level.

(2012) and Matei and Doleys (2011), arguing that even though the SD was announced in 2006, it took quite a long time to get implemented. In order to check for the presence of a delayed response, we further include a lag which shifts the SD treatment to P_5 (SD_{t+1}). We find this coefficient to be significantly positive (column (5) of Table 1), which supports the claims of the European Commission (2012) that several MS implemented the SD belatedly.[8]

[8]Only in May 2012, the EC confirmed that all MS had officially transposed the SD into national law. Moreover, it seems reasonable to assume that service providers need time to learn about the new rules and adapt their trade relations accordingly. Thus, a lagged impact in addition to a positive impact in P_4 is in line with these expectations.

The political debate related to the SD was dominated by fears that the SD will lead to an inflow of cheap services from the new (EU accession in 2004 or 2007) into the old MS (EU accession at the latest in 1995). However, there existed also contrary fears that the new MS may get flooded with high-skilled services from the old MS (Bertola and Mola, 2010). In Table 2, we split the SD impact into four variables changing the EU dummy in the $EU_{ij}R_t$-term of equation (2): *Intra-old* is an indicator variable that refers to the SD impact on trade between the old MS. Here, the EU dummy is replaced by a dummy with entry one if the exporter and the importer joined the EU at latest in 1995, and zero otherwise. Similarly, *intra-new* is set to one for MS that joined the EU during its enlargements between 2004 and 2007. *Old-to-new* turns to one if the exporter is an old EU MS and the importer joined the EU after 2003, and vice versa for *new-to-old*. All four variables show a significant and positive effect of the SD and the control variables do not change considerably, compared to the results in Table 1. The largest impact is reported for *intra-new*, indicating that the service markets of the new MS got stronger interconnected due to the SD. The effect of *new-to-old* exceeds the coefficient for *old-to-new*, indicating that the SD enhanced the inflow of services from the new to the old MS is stronger than in the opposite direction. Nevertheless, exports from and within the old MS also show substantial effects.

Table 2: Old vs. new MS

	SD exports
SD × intra-old	0.328***
	(0.058)
SD × intra-new	0.516***
	(0.062)
SD × new-to-old	0.402***
	(0.077)
SD × old-to-new	0.326***
	(0.092)
intra-EU	0.274***
	(0.033)
RTA	0.180**
	(0.071)
$INTL_2$	0.046***
	(0.015)
$INTL_3$	0.093***
	(0.024)
$INTL_4$	0.096***
	(0.037)
$INTL_5$	0.121***
	(0.046)
Exporter-time FE	yes
Importer-time FE	yes
Country-pair FE	yes
Observations	9,680

Notes: See Table 1.

4.2 Heterogeneity in the Implementation Progress

Monteagudo et al. (2012) emphasised that an evaluation of the SD should consider different qualities of SD-implementation, which was very heterogeneous at the country level. The reduction of entry barriers was no uniform process, but country-specific. This was partly due to differences in effort by the responsible authorities, but also due to differences in the need for renewal. As a consequence, the number of adapted measures varies strongly. For example, the Netherlands adapted 20, Finland 35, the UK 15 and Sweden 60 measures. In contrast, Hungary adapted 464 measures and Greece implemented 109 in order to meet the demands of the SD.[9]

Eurochambres – the Association of European Chambers of Commerce and Industry – conducted a policy survey among its national chambers to review the MS' implementation progress from a business perspective (Eurochambres, 2010). It was conducted in December 2009, shortly before the implementation deadline of December 29, coinciding with our treatment period. It evaluated the progress regarding entry barrier reductions and facilitation of service provision in the MS. The survey was based on a list of questions and aimed at investigating whether the SD has been fully implemented from both a legal and an operational perspective. As a result, Eurochambres constructed a three-category classification regarding the quality of implementation of each MS.

In the following, we use this variation in SD transposition to check whether a thorough and comprehensive implementation of the SD is reflected in a greater impact of the SD on service trade. For this purpose, we assign the importer (host) country in one of Eurochamber's three categories of implementation progress:

- **Category 1** (C1) for countries with *poor* implementation: Bulgaria, Greece, Ireland, Italy, Latvia, Poland and Slovakia.
- **Category 2** (C2) for countries with *sufficient* implementation: Austria, Belgium, Cyprus, Spain, France, Luxembourg, Malta, Portugal and Romania.
- **Category 3** (C3) for countries with *good* implementation: Czech Republic, Germany, Denmark, Estonia, Finland, UK, Hungary, Netherlands and Sweden.[10]

Columns (1) to (3) in Table 3 present the results of three separate regressions. In each column, we only use countries which fall in the same category. For instance, the SD

[9] `https://eur-lex.europa.eu/legal-content/EN/NIM/?qid=1529912419726&uri=CELEX:32006L0123`.

[10] For example, Denmark got classified as good, because (i) the SD has been fully implemented into Danish law, (ii) the single point of contact was installed and completely translated into English and applications can be down- and uploaded easily, and (iii) the screening of unjustified entry barriers in Danish law was finalised in December 2009.

Table 3: Impact of SD by implementation progress in the importer country (included services only)

	DD approach			**DDD approach**	
	(1) C1	(2) C2	(3) C3	(4) C3	(5) C2/C3
SD	0.265**	0.367***	0.335***		
	(0.115)	(0.078)	(0.078)		
SD×C3				0.374***	
				(0.077)	
SD×C2/C3					0.352***
					(0.060)
intra-EU	0.419***	0.244***	0.214**	0.404***	0.373***
	(0.108)	(0.090)	(0.092)	(0.047)	(0.048)
RTA	0.217***	0.192**	0.200***	0.160**	0.176**
	(0.077)	(0.076)	(0.072)	(0.070)	(0.070)
$INTL_2$	0.050*	0.045*	0.072***	0.041***	0.042***
	(0.027)	(0.026)	(0.022)	(0.015)	(0.015)
$INTL_3$	0.091**	0.094**	0.112***	0.088***	0.089***
	(0.044)	(0.042)	(0.035)	(0.024)	(0.024)
$INTL_4$	0.091	0.096*	0.103**	0.127***	0.103***
	(0.055)	(0.052)	(0.044)	(0.037)	(0.037)
$INTL_5$	0.044	0.076	0.089	0.151***	0.127***
	(0.064)	(0.064)	(0.055)	(0.046)	(0.046)
Exporter-time FE	yes	yes	yes	yes	yes
Importer-time FE	yes	yes	yes	yes	yes
Country-pair FE	yes	yes	yes	yes	yes
Observations	5,720	5,940	5,940	9,680	9,680

Notes: The table is based on the sum of included services only. Columns (1) to (3) show separate regressions for each implementation category. Columns (4) and (5) interact the DD term $EU_{ij}R$ of equation (3) with an additional dummy variable taking 1 for importers with good or at least sufficient implementation, respectively. Clustered standard errors on country-pair level in parentheses. *,** ,*** indicate significance at the 10%-, 5%- and 1%-level.

parameter in column (1) suggests that for Category 1 countries with poor implementation, the SD had a smaller and less significant impact on service trade. Countries in Category 2 and 3, in contrast, experience a larger and more significant positive impact of the SD on service trade.

In column (4) and (5) of Table 3, we use the variation in quality of implementation described above to apply a triple-difference (DDD) approach. To do so, we interact $EU_{ij}R$ from equation (3) with an additional indicator variable for the implementation progress: one for countries of Category 3 (column (4)), and one for countries either of Category 2 or 3 (column(5)). In both columns, we estimate a significantly positive DDD-parameter,

suggesting that better SD-implementation leads to higher service imports. These results illustrate that the quality of SD-implementation matters, and that the benefits of the reform are obviously heterogeneous due to varying transpositions into national law.

Table 4: Placebo-Impact of SD by implementation progress in the importer country (excluded services only)

	DD approach			**DDD approach**	
	(1) C1	(2) C2	(3) C3	(4) C3	(5) C2/C3
SD	−0.175	0.041	−0.058		
	(0.109)	(0.094)	(0.073)		
SD×C3				−0.046	
				(0.074)	
SD×C2/C3					−0.027
					(0.058)
Controls[1)]	yes	yes	yes	yes	yes
Exporter-time FE	yes	yes	yes	yes	yes
Importer-time FE	yes	yes	yes	yes	yes
Country-pair FE	yes	yes	yes	yes	yes
Observations	5,720	5,940	5,940	9,680	9,680

Notes: The table is based on the sum of excluded services only. The specification is identical to the one in Table 3. [1)] Control variables from Table 1 (intra-EU, RTA, $INTL_2$-$INTL_5$) included but not reported.

Finally, we conduct a placebo test applying the Eurochambres classification on *excluded* (i.e., non-treated) service sectors only. For these sectors, we would expect insignificant results on the variables indicating the implementation progress. Table 4 summarises the corresponding findings.[11] We find insignificant parameter estimates on the Eurochambres classification variables throughout. Thus, the results of the placebo experiment go against the notion that our results presented in Table 3 may be driven by some systematic bias of the Eurochambres classification. Specifically, if Eurochambres would have classified countries with increases in trade volumes more positively than countries with decreasing trade, this should also show up in the placebo tests provided in Table 4. In sum, we find an overall positive impact of the SD on service trade of included sectors, with the strength of the effect depending on the quality of SD-implementation. In contrast, we do not find any effects of the SD on sectors which were excluded (i.e. unaffected) by the Service Directive.

[11] In all regressions, we include the same control variables as in Table 1, finding almost unchanged parameter estimates of EU membership, RTA and general trade ($INTL_2$ to $INTL_5$). For the sake of brevity, we only focus on the SD-effects in this placebo exercise, but the detailed estimation results are available from the authors upon request.

4.3 Country-specific Effects

The empirical trade literature has shown that the gains of an RTA do not spread out uniformly among the involved countries (e.g., Baier et al., 2016). To identify winners and losers of the reform, we replace the EU dummy in $EU_{ij}R_t$ of equation (2) by 27 separate EU country dummies. For instance, the Austrian reform dummy $AUT_{ij}R_t$ takes a value of one if the exporter is Austria and the importer is a EU MS within the time period after 2009.

Table 5: Country-specific SD-effects on service trade

		95%-CI	
Country	**SD-effect**	lower bound	upper bound
Netherlands	1.113	0.899	1.326
Poland	0.761	0.557	0.965
France	0.692	0.458	0.926
Slovakia	0.640	0.280	0.999
Belgium	0.611	0.388	0.834
Ireland	0.490	0.102	0.879
Lithuania	0.326	0.108	0.544
Hungary	0.326	0.125	0.527
Bulgaria	0.316	0.127	0.504
Germany	0.297	0.156	0.439
Sweden	0.265	0.082	0.447
Luxembourg	0.255	−0.199	0.709
Slovenia	0.248	0.057	0.438
Cyprus	0.235	−0.421	0.891
Malta	0.198	−0.216	0.612
UK	0.187	−0.073	0.448
Latvia	0.156	−0.104	0.416
Estonia	0.127	−0.105	0.359
Denmark	0.124	−0.064	0.312
Finland	0.080	−0.217	0.378
Portugal	0.078	−0.177	0.332
Romania	0.051	−0.162	0.265
Czech Republic	0.038	−0.228	0.303
Austria	−0.064	−0.175	0.048
Italy	−0.181	−0.486	0.124
Greece	−0.394	−0.644	−0.144
Spain	−0.459	−0.725	−0.192

Notes: The table reports the point estimate and the confidence interval (CI) of the SD-parameter by country. It only covers sectors that are included in the SD. Control variables from Table 1 are included but not reported.

Table 5 reports the estimated country-specific SD effects along with their confidence inter-

vals. The table is sorted in descending order, starting with the country taking the largest trade impact from the reform. Our findings suggest that 12 out of the 27 EU MS clearly gained from the SD, in the sense that they were able to increase their exports after implementing the directive significantly. The largest gains are observed for the Netherlands, indicating an export increase of about 204% $[= (e^{1.113} - 1) \times 100]$.[12]

Table 5 also shows that the size of the trade effects varies considerably over countries. We observe insignificant effects for 13 countries, and significantly negative effects only for Greece and Spain, both losing around 30% of the pre-reform service trade. One explanation might be the economic backslash in both countries after the recent financial crisis, making it hard to reap the benefits of service market liberalisation in an environment of severe macroeconomic instabilities. Finally, the figures in Table 5 reveal that old and new MS are equally represented among winning and losing countries. This, together with the evidence presented in Table 2, let us conclude that fears about reciprocal gains and losses from the SD are not warranted by the empirical data.

4.4 Sector-specific Effects

To consider heterogeneities at the industry level, we estimate equation (2) for each service sector separately. Table 6 provides the SD coefficients and the confidence intervals from this exercise. Again, the table is sorted in descending order, starting with the sector where we observe the largest gains in service trade (i.e., wholesale and retail).

First, we find a significantly negative impact for "accommodation and food" (I), "advertising and market research" (M73) and "scientific research" (M72). These effects might be explained by a shift from Mode 1 to Mode 3 initiated by the SD. The focus of the SD is mainly on Mode 1, but it also aims to promote service trade Mode 3. Since our dataset (i.e., the WIOD) does not include Mode 3 we can only observe changes in Mode 1. Theoretically, Mode 1 and Mode 3 can work as substitutes or complements, depending on sectoral, time, company and country characteristics (Christen and Francois, 2017). For example, advertising demands a specific cultural understanding and expertise about local preferences. Hence, working in the sector "advertising and market research" usually requires market knowledge from the service provider (Nordås, 2008). Therefore, operating through Mode 1 might have been substituted by Mode 3 in this case, which would explain the negative SD-coefficient in Table 6.

[12]This enormous impact is rooted in large trade increases for several sectors. A sectoral analysis for the Netherlands reveals significantly positive impacts for 9 out of 16 sectors, e.g. the sectors Wholesale (G45: 353%), ICT (J62_63: 55%), Business (M69_70: 517%) and Administration services (N: 94%) present huge effects. In a similar vein, Mayer et al. (2018) identify the Netherlands as one of the biggest winners of EU integration with intra-EU trade growth effects of 175% for services and 240% for goods.

Table 6: Sector-specific SD-effects on service trade

			95%-CI	
Sector		**SD-effect**	lower bound	upper bound
Wholesale and retail	G45	0.875	0.658	1.093
Wholesale	G46	0.746	0.590	0.902
Professionals	M74/M75	0.684	0.263	1.106
Retail	G47	0.632	0.438	0.826
Construction	F	0.626	0.411	0.841
Legal, management, consultant	M69/M70	0.386	0.136	0.636
ICT	J62/J63	0.212	0.094	0.329
Publishing	J58	0.053	−0.251	0.357
Administration	N	−0.024	−0.394	0.347
Architects and engineers	M71	−0.158	−0.418	0.103
Sound and video production	J59/J60	−0.156	−0.325	0.013
Real estate	L68	−0.175	−0.562	0.211
Advertising	M73	−0.395	−0.690	−0.100
Accommodation and food	I	−0.408	−0.637	−0.179
Scientific research	M72	−0.606	−0.761	−0.451
Education	P85	0.650	0.442	0.858
Health	Q	0.506	0.191	0.820

Notes: The table reports the point estimate and the confidence interval (CI) of the SD-parameter of separate regressions for each sector. Control variables from Table 1 are included but not reported.

"Wholesale and retail" (G45), "Wholesale (only)" (G46) and "Retail (only)" (G47) show strongly significant and positive impacts of the SD. These sectors are one of the most important sectors for EU countries, contributing around 9% to value added and 13% to employment in 2007. As can be seen from Table A.1 in the Appendix, they also transact the largest share of service trade of Mode 1. In addition, they gained substantially from the emerging e-commerce, which relies on the well-functioning of the wholesale and retail sector (European Commission, 2010). The SD targeted wholesale and retail services to generate more competition and the strongly significant and positive effects confirm its success. This result complements the work by Olbrecht (2016), who also shows a positive impact of the SD on the productivity in the wholesale and retail sector.

One of the core ideas of the SD was to facilitate the cross-border provision by specialised professionals. The strong positive impacts for "professionals" (M74_M75), "legal, management, consultant" (M69_M70) and "Information and Communication Technology (ICT)" (J62_J63) seem to confirm the achievement of this goal.

Finally, the relatively strong positive effects for "education" (P85) and "health" (Q) are interesting, since both sectors are generally classified as public services and, therefore,

sheltered from international competition. Education is not explicitly named as an excluded sector, but the preamble of the SD mentions that governments may prevent the access to the education market if the general educational attainment of the population is at risk. Thus, the exclusion holds for public funded education, but not for the private education market. Hence, the positive and significant coefficient for education might be driven by private education services (Larsen et al., 2002). In contrast, health services are explicitly excluded from the SD, but *household support* is promoted. For example, privately organised domestic care for elderly people from foreign carers is included in the SD. Note, that the sending of carers falls under the Posting Workers Directive (96/71/EC), but the underlying operative services of agencies were facilitated through the SD (Rossow and Leiber, 2017). The WIOD does not distinguish between those types of health services, which might explain the positive impact of the SD in this sector.

5 Conclusion

International trade in services still lacks behind trade in goods. This observation is surprising given the service sector's paramount role for domestic output and employment, but is rooted by a number of country-specific obstacles to protect national service sectors. For many years, we observed such trade-impeding measures even in highly-integrated economies, such as the European Union (EU). In 2006, the EU launched the Service Directive (SD) with the explicit aim to reduce administrative barriers for businesses when trading services across borders.

This paper exploits the SD as a natural experiment to estimate the impact of trade liberalisation on trade in services. Using a large database of bilateral service trade, we employ a difference-in-difference design to identify the causal effect of the SD. In addition, we rely on novel information on how rigorously the member states have implemented the SD. We find that the SD had a significantly and economically relevant impact on intra-EU service trade. This effect is confirmed by various robustness and placebo checks. In our preferred specification, we estimate an average trade impact of the SD of around 40%. This effect varies over countries and sectors, but is generally in order of the impact of the Single Market on goods trade. For instance, Egger and Pfaffermayr (2013) estimated a trade effect of the Single Market by about 45% (see Felbermayr et al. 2018, for similar estimates).

Furthermore, our results indicate positive effects of both forming an RTA and EU-membership, which become significantly larger through the introduction of the SD. This highlights the deepening effect of some of the SD provisions: For instance, the principle of mutual recognition or the introduction of the point of single contact go far beyond regular harmonisation efforts of ordinary RTAs. It also underlines the fact that additional efforts were

needed to help the European service economy to fully reap the benefits from the Single Market. Thus the SD renders a decisive step towards finalising the Internal Market and its Four Freedoms.

Finally, it is important to note that our analysis only captures direct effects of the SD on service trade. However, other dimensions of the Single Market are likely to be affected, too. For instance, it is well known from the theoretical literature that the reduction of administrative hurdles regarding service trade may also facilitate trade in goods, since selling complementary services increases the profitability of manufacturing exporters (Ariu et al., 2016). Thus, analysing these cross-industry linkages seems a valuable avenue for further research. In addition, it should be acknowledged that our analysis only accounts for service trade via Mode 1. In fact, the main focus of the SD is on Mode 1, but some of its provisions also promote service trade via Mode 3. While our study employs the most-widespread and reliable data available to study the cross-border flows of services, further research may develop new measures to also capture service trade via Mode 3. This would allow for a complete picture of the differential impact of the SD on all Modes of cross-border trade.

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Table A.1: Intra-EU trade volume in current (2015) millions of US$ by service sectors

			%-Change		
Industry Code	**Industry Name**	**Share (2014)**	2002-2006	2006-2010	2010-2014
Included sectors					
F	Construction	5.5	27.1	70.2	96.0
G45	Wholesale, retail trade, repair of motor vehicles	2.7	−17.3	203.1	14.7
G46	Wholesale trade	25.9	−10.2	110.0	13.9
G47	Retail trade	4.7	−24.7	65.2	19.4
I	Accommodation and food services	1.3	−23.3	−4.8	−20.9
J58	Publishing activities	1.5	−18.4	−19.6	−2.1
J59_J60	Sound, video production, publishing	0.8	−41.5	−5.3	2.9
J61	Telecommunications	3.8	12.8	−1.7	−4.0
J62_J63	Computer programming, consultancy and ICT	6.0	23.1	74.0	46.8
L68	Real estate activities	0.9	2.8	1.0	19.2
M69_M70	Legal, accounting, management, consultancy	16.0	18.3	38.8	74.9
M71	Architectural, engineering, testing, analysis	4.5	35.8	−10.2	19.1
M72	Scientific research and development	0.8	14.3	−75.9	20.3
M73	Advertising and market research	3.9	48.9	20.9	6.9
M74_M75	Other professional, scientific, technical	4.0	35.3	37.8	25.0
N	Administrative and support service activities	17.0	41.5	22.9	13.8
P85	Education	0.4	2.6	−9.8	27.0
Q	Human health and social work activities	0.3	15.7	34.1	37.2
Mean (weighted)			15.5	55.9	29.7
Excluded sectors					
D35	Electricity, gas, steam	7.0	26.1	−48.3	11.2
E36	Water collection, treatment and supply	0.7	35.4	16.4	31.6
E37-E39	Sewerage; waste management	15.3	54.6	−0.3	48.2
H49	Land transport and transport via pipelines	13.8	10.1	36.7	20.0
H50	Water transport	5.3	45.8	83.3	−16.9
H51	Air transport	8.8	−3.1	−5.7	10.3
H52	Warehousing and support activities	16.2	13.0	2.9	5.0
K64	Financial	14.9	40.4	−10.8	−0.6
K65	Insurance and pension funding	3.2	−15.7	−22.4	−10.4
K66	Auxiliary to financial and insurance	7.0	100.9	−21.6	33.4
O84	Public administration, defence, social security	4.9	2.9	10.3	136.9
R_S	Other service activities	2.8	−47.2	32.6	18.8
T	Activities of households as employers	0.0	71.4	134.4	−10.9
Mean (weighted)			28.0	4.6	21.2

Notes: Data source: WIOD. Intra-EU exports summarise all exports from EU member states to other EU member states. Trade volumes are converted with yearly exchange rates and deflated by the OECD CPI with reference year 2015.

Table A.2: Exclusive definition of intra-EU and RTA (Mayer et al., 2018)

	intraEU exports included services
SD	0.336***
	(0.051)
intra-EU (exclusive)	0.485***
	(0.088)
RTA	0.181**
	(0.071)
INTL_2	0.045***
	(0.015)
INTL_3	0.092***
	(0.024)
INTL_4	0.095***
	(0.037)
INTL_5	0.120***
	(0.046)
N	9,680

Notes: Results are based on the sum of included sectors. Following Mayer et al. (2018), we define RTA and EU in this alternative specification *exclusive* ($RTA = 0$ if $EU = 1$). Exporter/importer-time and country-pair FE included. Clustered standard errors in parentheses.$^{*}p < 0.1; {}^{**}p < 0.05; {}^{***}p < 0.01$.