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Cutting Red Tape for Trade in Services

Milena Kern*, Jörg Paetzold†, Hannes Winner‡

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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) aimed at reducing 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 fixed effects. On average, the reform increased intra-EU trade in targeted services between a lower bound of 27% and an upper bound of 55%, translating into an overall welfare increase between 0.35% and 1.04%. This effect of the reform on service trade 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, European integration

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1 Introduction

International trade is hampered by a variety of administrative barriers (Carrère and de Melo, 2011a; Bratt, 2017). These hurdles seem to persist even when countries form regional trade agreements (RTA; Hornok and Koren, 2015). Several studies show that a reduction of administrative barriers increases trade volumes (Engman, 2005; Carrère and de Melo, 2011b), 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; Mustilli and Pelkmans, 2013). Administrative hurdles are especially problematic in the case of services, 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, Baccini and Elsig, 2014). Services are in many countries highly regulated, and 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 exist even in highly integrated markets, like the European Union (EU) (Felbermayr and Jung, 2011; Mustilli and Pelkmans, 2012). Kox and Lejour (2006) argue 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, Rutkowski and Lorenzani, 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). A liberalisation of service trade could enhance innovation (Coelli, Moxnes and Ulltveit-Moe, 2016), foster competition and productivity (Malchow-Møller, Munch and Skaksen, 2015; Griffith, Harrison and Simpson, 2010), leading to better opportunities for job creation, lower prices for consumers and increase welfare (Vogt,

2005; Francois and Hoekman, 2010; Heuser and Mattoo, 2017).[1]

To exploit the untapped potential and to reap the welfare enhancing powers of liberalisation and trade integration, the EU adapted directive 2006/123/EC on services in the internal market in 2006 (in the following SD for 'Service Directive'). To reduce the administrative burden for businesses when trading services across borders, the SD aimed to harmonise rules and regulations and to facilitate bureaucratic requirements.[2] Although the final directive was much less ambitious than originally proposed, the SD was designated to catalyse the free movement of services within the Single Market. The final deadline for implementation into national law was 2010.

The SD can be interpreted as a deepening of an existing RTA, since it aims at completing the EU internal market of services. In general, the previous literature is ambiguous on the impact of RTAs on service trade (Kimura and Lee, 2006; Ceglowski, 2006; Miroudot and Shepherd, 2014), and it also emphasises different channels through which these effects may operate. Ariu et al. (2019), for instance, argue that trade increasing effects may not result directly from the RTA but rather from the complementarity between goods and services trade. Egger, Larch and Staub (2012) find services to respond stronger to reductions of trade barriers than goods, arguing that the domestic service sectors are bigger and trade costs are larger. Felbermayr, Gröschl and Heiland (2018) find very large increases of more than 80% for trade in services by overall EU integration, but they do not examine single reforms like the SD, which targeted service trade specifically. Grünfeld and Moxnes (2003) find no significant impact of RTAs, but they expect trade increases of 50% once barriers for trade in services are removed. In line with this reasoning, Nordås (2018) hypothesises that an RTA alone is not boosting trade in services enough, but a strengthening of harmonisation and regulatory cooperation may have more substantial effects. An analysis of the SD is able to directly test this argument, since the SD aimed exactly for stronger harmonisation and deeper cooperation. Dettmer (2015) provides the only study aiming to assess the impact of the SD on service trade. She finds no positive effect on intra-EU service trade, but uses data only until 2010. In addition, information on how rigorously member states (MS) of the EU implemented the SD were not available. As acknowledged by the author, these limitations inhibit the direct estimation of the effect of this

[1] Cristea, Hummels and Roberson (2017) investigate a particular case of service trade liberalisation. Exploiting more than 100 *Open Sky Agreements* signed by the USA in 22 years, they find an increase of supply and substantially lower prices for consumers.

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

liberalisation on service trade (Dettmer, 2015, p. 450).

We aim to fill this gap by exploiting bilateral service trade data between 2001 and 2014 and utilising novel information on how rigorously the MS have implemented the SD. Thus, we follow Inklaar et al. (2008) and Nordås (2012), who argue that the SD provides a substantial policy change which can be used to analyse trade effects of service market liberalisation. We combine a difference-in-difference (DD) strategy with a gravity model, and use the implementation of the SD to identify the effects. Employing the World-Input-Output-Database (WIOD), we take intra-EU trade in services after the SD implementation as treated, and assign domestic trade, trade between non-EU countries and trade between EU and non-EU members to the control group. Accounting for domestic trade flows allows to consider a general increase in international trade. We also include a set of fixed effects to control for country-specific time-varying and country-pair time-invariant characteristics (Bergstrand, Larch and Yotov, 2015; Yotov et al., 2016). Furthermore, we control for EU membership and RTAs to isolate the SD reform effect from other influences stemming from the EU Single Market and bilateral trade agreements.

Overall, we find that the SD increased intra-EU service exports substantially. The size of this impact is in order of the estimated effect of the Single Market in the case of goods trade (see, e.g., Egger and Pfaffermayr, 2013; Felbermayr, Gröschl and Steinwachs, 2018). Specifically, we find that the reform increased intra-EU trade in targeted services between a lower bound of 27% and an upper bound of 55%. Our estimation results survive a series of robustness and plausibility checks. First, we provide some placebo tests exploiting the fact that a number of service sectors were explicitly excluded (i.e., non-treated) from the SD. As expected, we find no effects of the SD on these excluded 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 SD. 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. This pattern is in line with previous evidence (Kelle et al., 2013). Further, we show that the SD also has affected goods trade, but this effect is much lower than the one for service trade. Finally, we conduct a welfare analysis, estimating general equilibrium effects of the SD based on the Armington trade model (Baier, Yotov and Zylkin, 2019). Using the upper and lower bounds of our estimated effect, we find that the SD increased overall welfare between 0.35% and 1.04%. This effect size is in the range

of what ex-ante studies predicted (De Bruijn, Kox and Lejour, 2008; Badinger et al., 2008).

The remainder of the paper is organised as follows. Section 2 provides further details on the SD and gives a short overview over the related literature. Section 3 presents the data and the empirical strategy to identify the effects of the SD on international service trade. Section 4 discusses the empirical results, Section 5 elaborates the trade associated welfare effects, and Section 6 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 MS and the freedom of establishment of service providers within the EU. The publication of the proposal induced unprecedented protests throughout Europe, in particular in the old EU15 (Bertola and Mola, 2010; Menz, 2010; Lindstrom, 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 (Hay, 2007). 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 water. 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 (Badinger and Maydell, 2009).[3] 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).[4] The SD is a horizontal directive, therefore it covers all included sectors alike (Mustilli and Pelkmans, 2013) and the implementation period was universal, so that no time variation within the included sectors exists.

Following the publication of the SD, a period of fundamental revision and verification of na-

[3] In the subsequent empirical analysis, we use these excluded sectors as placebos to check the plausibility of our findings.

[4] 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.3 in the Appendix).

tional laws and bureaucratic structures started. The national implementation processes were accompanied by the EC and multi-laterally observed, which is highly unusual and a signal for the complexity and importance of the SD (Mustilli and Pelkmans, 2013). 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 (Corugedo and Ruiz, 2014). The MS were allowed to only keep restrictions that passed the audit, and to abolish or to amend the remaining ones (compare Table 6 in Mustilli and Pelkmans, 2013, for an overview of outlawed barriers). 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

A number of studies predicted the *ex-ante* impact of the SD (see Monteagudo, Rutkowski and Lorenzani 2012, for a comprehensive overview). Accordingly, the estimates ranged widely from intra-EU service trade increases of about 5% (Sejerøe et al., 2005) up to 60% (Kox, Lejour and Montizaan, 2004). Further, due to increased trade and competition, it was predicted that GDP growth increases by about 0.3 to 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) up to 2.2% (Breuss and Badinger, 2006). These differences can be explained by alternative coverages 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 to 9% (Sejerøe et al., 2005) and one third (Kox, Lejour and Montizaan, 2004).

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.[5] However, Monteagudo, Rutkowski and Lorenzani (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, Rutkowski and Lorenzani (2012) investigate for the European Commission (EC) the gains from the SD. They estimate in their "central scenario" an increase of trade by about 7% and of GDP between 0.8% and 1.6% in the very short-run.

Olbrecht (2018) investigates the effect of the SD on firm productivity in the wholesale and retail sector and finds significant positive effects. Regarding effects on trade in services, there is only one *ex-post* study quantifying the impact of the SD. 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.[6] 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. Apart from several methodological differences between her and 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, Rutkowski and Lorenzani, 2012). To explicitly account for the differences in SD implementation, we extract detailed information from Eurochambres (2010) on the implementation progress of each MS.

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

[6]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 differs between service sectors (see also footnote 4). 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. The WIOD includes all 28 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" (ROW). Compared to other publicly available sources such as the OECD trade in services or Comtrade database, the main advantage of the WIOD is its inclusion of domestic trade. This allows to account for general trade increases and trade diversion effects with the domestic market (Larch, Wanner and Yotov, 2018).[7]

To construct our main variable that is included service exports (i.e., treated by the SD), we exclude gross exports and final consumption and only include the bilateral sector specific inputs. Thereby, double counting resulting from intermediates crossing borders several times, can be reduced to a minimum (Dhingra, Freeman and Mavroeidi, 2018). Thus, we implicitly focus on business-to-business (B2B) and exclude possibly distortive business-to-consumer (B2C) transactions, which accounts only for a minor share of total trade (Christen and Francois, 2017). We then sum the inputs produced in country i and received by country j by the producer's sector level. This yields a measure of sectoral exports by country i to country j.

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.3 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

[7] It should be noticed that the WIOD does not contain missing values, which naturally demands a number of assumptions. For instance, if the value of exports does not fit the value of imports, the imports are adjusted proportionally (Timmer et al., 2016).

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.3 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. 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.[8] Focusing on Mode 1 is reasonable 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, only very few firms are able to participate in Mode 3, because installing a permanent establishment often comes with non-negligible costs (Sejerøe et al., 2005).[9] Finally, an explicit goal of the SD was to enable small and medium enterprises (SME) to participate in the EU service trade. Since most SMEs trade via Mode 1, focusing on this mode seems natural when estimating the effects of the SD.

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 structural gravity equation, formulated by Anderson and van Wincoop (2003),

[8] **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 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.

[9] For instance, Kelle et al. (2013) record that in 2005 only 85 out of 2,212 German service exporting firms chose Mode 3 as their export channel.

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; Francois, Hoekman and Woerz, 2007; Head, Mayer and Ries, 2009; Egger, Larch and Staub, 2012; Anderson et al., 2015; 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 (Francois and Hoekman, 2010; Borchsenius, Munch and Skaksen, 2010; Anderson et al., 2015). Since we are not interested in 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, Yotov and Zylkin, 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 incon-

sistent if standard errors are heteroskedastic, and, second, zero trade flows are lost by taking the logarithm of x_{ij}. To overcome these problems, Santos Silva 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:[10] 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, Vicard and Zignago (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 estimation equation.[11]

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 MS in P_4, and zero otherwise. Thereby, we define the SD effect exclusively to the intra-EU

[10] 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.

[11] In contrast to Mayer, Vicard and Zignago (2018), we define RTA and EU as *inclusive*, i.e., RTA remains at value 1 if EU membership replaced an RTA. Compared to an *exclusive* treatment of RTAs and EU membership (i.e., RTA changes to zero in case of EU membership), the parameter estimate of the SD does not change, but now the EU membership dummy informs about the differently impact relative to the RTA. See also Table A.4 in the Appendix.

effect in order to get estimates for each level of EU integration separately.[12] R indicates the time after the reform deadline (i.e., P_4 and P_5) and, thus, the years between 2010 and 2014. By changing the reform dummy R to previous periods, we also check for anticipatory effects (compare column (4) in table 1). 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. Note that $RTA_{ij,t}$ and $EU_{ij,t}$ equal zero for domestic trade, because any kind of RTA is by definition not affecting the domestic market but reducing international border effects (Oberhofer and Pfaffermayr, 2018). Country-pairs with ROW are always assigned to the control group and RTA is zero. $INTL_{ij}$ takes a value of zero if trade is intranational ($j = i$), and one for international trade ($j \neq i$). In interaction with the dummies for the different time periods P_t, the terms $INTL_{ij}P_t$ capture a general trade increase over time (Bergstrand, Larch and Yotov, 2015). 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 β_1, which 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, domestic trade 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.

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), 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 a substantial effect of the SD, falling within the 95% confidence interval from 26.62% to 54.81%. This effect is significant not only in statistical but also in economic terms when compared to the parameter estimates of EU-membership and RTAs. Moreover, it corresponds to

[12] We also vary this definition, where we define EU membership as a time-variant dummy. It turns out that our results are nearly unchanged when taking $EU_{ij,t}R_t$ instead of $EU_{ij}R_t$ (see Table A.5 in the Appendix).

the ex-ante predictions of Kox, Lejour and Montizaan (2004), who estimate increases between 30% and 60%. Table 1 further shows that an RTA is associated with a significantly positive service trade effect of around 20%, which is generally in line with recent contributions (e.g., Felbermayr, Gröschl and Steinwachs, 2018). 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. This finding fits well to the results of Felbermayr, Gröschl and Heiland (2018), who find an increase of 83% for total service trade due to EU membership.

Column (2) of Table 1 accounts for the ambiguous treatment status of educational and health services through the SD (see Section 2), excluding both sectors from our estimation. Our results remain virtually unchanged, suggesting that our estimated effect presented in column (1) is robust against the inclusion of these sensitive sectors. Further, column (3) of Table 1 shows the estimation results of a placebo test which uses only service sectors that are *excluded* from the SD (a detailed list of these sectors is reported in the lower block of Table A.3). As expected, we do not find any significant effect of the SD on these sectors. The intra-EU dummy is significant and large, which is in line with the sectoral findings from Felbermayr, Gröschl and Heiland (2018). Hence, the excluded sectors were affected by the EU integration, but not so by the SD, indicating that the exclusion was effective.

To test the identifying assumption underlying the DD-approach, we check for common trends prior to the SD reform, shown in column (4) of Table 1. The first (second) lag artificially shifts the reform back in time by one (two) period(s), i.e., SD_{t-1} (SD_{t-2}). The insignificant parameter estimates of both coefficients 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 coefficient is insignificant which goes against the notion of anticipatory effects. This finding is also consistent with Monteagudo, Rutkowski and Lorenzani (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 lead 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 statements by the European Commission (2012) that several MS implemented the SD belatedly. 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

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 the sum 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.

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.

4.2 Old versus new member states

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 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

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.

MS more strongly than in the opposite direction. Nevertheless, exports from and within the old MS also show substantial effects and these effects do not differ significantly.

4.3 Heterogeneity in the Implementation Progress

Monteagudo, Rutkowski and Lorenzani (2012) emphasised that an evaluation of the SD should consider different qualities of SD-implementation, which was very heterogeneous at the country level. Specifically, the reduction of entry barriers was no uniform process, but country-specific. This was often due to differences in effort by the responsible authorities (Matei and Doleys, 2011). In order to construct a measure for SD implementation stringency, we turn to a policy survey conducted by Eurochambres – the Association of European Chambers of Commerce and Industry.

In 2009, Eurochambres executed a survey among its national chambers to review the MS' implementation progress regarding the SD from a business perspective (Eurochambres, 2010). The survey 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. Since the main goal of the SD was a reduction of the entry barriers for service providers, we assign the importer (host) MS 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.[13]

[13]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)

	(1) C1	(2) C2	(3) C3
SD	0.265**	0.367***	0.335***
	(0.115)	(0.078)	(0.078)
intra-EU	0.419***	0.244***	0.214**
	(0.108)	(0.090)	(0.092)
RTA	0.217***	0.192**	0.200***
	(0.077)	(0.076)	(0.072)
$INTL_2$	0.050*	0.045*	0.072***
	(0.027)	(0.026)	(0.022)
$INTL_3$	0.091**	0.094**	0.112***
	(0.044)	(0.042)	(0.035)
$INTL_4$	0.091	0.096*	0.103**
	(0.055)	(0.052)	(0.044)
$INTL_5$	0.044	0.076	0.089
	(0.064)	(0.064)	(0.055)
Exporter-time FE	yes	yes	yes
Importer-time FE	yes	yes	yes
Country-pair FE	yes	yes	yes
Observations	5,720	5,940	5,940

Notes: The table is based on the sum of included services only. Columns (1) to (3) show separate regressions for each implementation category. C1 refers to poor, C2 to sufficient and C3 to good implementation. Clustered standard errors on country-pair level in parentheses. *,** ,*** indicate significance at the 10%-, 5%- and 1%-level.

Columns (1) to (3) in Table 3 present the results for three separate regressions, one for each of the implementation categories. For instance, in column (1) we only use imports to countries with poor implementation, and drop countries with better implementation from the analysis. Column (2) and (3) focus on countries with sufficient or good implementation, respectively. Turning towards our results, the SD parameter in column (1) shows that for Category 1 countries with poor implementation, the SD had a smaller and less significant impact on service trade than we estimated on average. Countries in Category 2 and 3, in contrast, experience a larger and more significant positive impact of the SD on service imports. These results illustrate that the quality of SD-implementation matters, and that MS which reduced the entry barriers for service providers more effectively also record stronger increases for imports. Thus, the benefits of the reform are heterogeneous due to varying transpositions into national law.

Finally, we conduct a placebo test applying the Eurochambres classification on *excluded* (i.e.,

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

	(1) C1	(2) C2	(3) C3
SD	−0.175	0.041	−0.058
	(0.109)	(0.094)	(0.073)
Controls and FEs[1)]	yes	yes	yes
Observations	5,720	5,940	5,940

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 (intra-EU, RTA, $INTL_2$-$INTL_5$), country-pair and exporter/importer-time FE from Table 1 are included but not reported.

non-treated) service sectors only. For these sectors, we would expect insignificant results of the SD variable, since the quality of implementation should not matter for these sectors. Table 4 summarises the corresponding findings.[14] We find insignificant parameter estimates across the Eurochambres classification throughout. Thus, the results of the placebo test 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 SD.

4.4 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, Yotov and Zylkin, 2019). 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 MS within the time period after 2009.

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

[14]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.

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

		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 the sum of sectors that are included in the SD. Control variables from Table 1 are included but not reported.

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 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% [$= (e^{1.113} - 1) \times 100$].[15]

[15]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, Vicard and Zignago (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 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. Given our empirical specification based on exporter, importer and bilateral fixed effects, this finding can only be explained by changes in time-variant bilateral conditions between the two countries and the rest of the EU (e.g., increased labour migration in the aftermath of the financial crisis).

Finally, Table 5 reveals that old and new MS are distributed evenly within the range of coefficients. 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.

4.5 Sector-specific Effects

To consider heterogeneities at the sector 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).

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.

First, we find significantly negative impacts 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, 2009, 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.

"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.3 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 (2018), 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. Note, that even before the SD, teachers were one of the most mobile professions within the EU, accounting for 27% of all mobile professionals between 1997 until 2008. Hence, the positive and significant coefficient for education signals a further increase of teacher's mobility, however mainly in the private edu-

cation sector (Mustilli and Pelkmans, 2013). 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.

4.6 Effects on Goods Trade

Service trade liberlisation might as well have a positive impact on trade in manufacturing (see, e.g., Francois, Manchin and Tomberger, 2015; Crozet and Milet, 2017; Dhingra, Freeman and Mavroeidi, 2018; Ariu et al., 2019). Following Dhingra, Freeman and Mavroeidi (2018), we replace trade in services in our estimation equation (2) with the sum of trade in manufacturing and with trade in the single manufacturing sectors, respectively. Table 7 presents the results from this excercise. In line with previous studies, we find a significant and positive but substantially smaller impact of the SD on the sum of trade in manufacturing (see first row of Table 7). Accordingly, we observe an overall trade increase in manufacturing of about 6.4% due to the SD, which is much smaller than the impact for trade in services, but still not negligible. Focusing on single sectors, very large and significant effects appear for manufacturing of computer, electronic and optical products (C26), electrical equipment (C27) and machinery and equipment (C28). These sectors often require specialised services for installing and maintaining the manufactured products, which makes the estimated effects of the SD on those sectors plausible (Francois and Woerz, 2008; Francois, Manchin and Tomberger, 2015; Blanchard, Fuss and Mathieu, 2017).

Table 7: Spillover SD-effects to manufacturing trade

Manufacturing sector		SD-effect	SE
Sum of all Manufacturing	C	0.064***	(0.022)
Computer, electronic and optical products	C26	0.239*	(0.117)
Electrical equipment	C27	0.214***	(0.049)
Textiles, wearing apparel and leather products	C13-C15	0.182	(0.102)
Machinery and equipment n.e.c.	C28	0.154***	(0.039)
Chemicals and chemical products	C20	0.149**	(0.056)
Eood, cork and straw and plaiting materials	C16	0.098*	(0.047)
Coke and refined petroleum products	C19	0.078	(0.065)
Food and tobacco products, beverages	C10-C12	0.077*	(0.035)
Other non-metallic mineral products	C23	0.046	(0.035)
Motor vehicles, trailers and semi-trailers	C29	0.026	(0.058)
Basic metals	C24	0.012	(0.062)
Printing and reproduction of recorded media	C18	0.009	(0.097)
Rubber and plastic products	C22	0.008	(0.032)
Pharmaceutical products and preparations	C21	−0.010	(0.083)
Paper and paper products	C17	−0.017	(0.051)
Furniture	C31_C32	−0.061	(0.070)
Fabricated metal products, except machinery	C25	−0.064*	(0.033)
Repair and installation of machinery and equipment	C33	−0.122	(0.206)
Other transport equipment	C30	−0.221*	(0.110)

Notes: The table reports the point estimate and standard errors of the SD-parameter of separate regressions for each manufacturing sector. Control variables from Table 1 are included but not reported. See Section 4.6 for details.

5 Elaborating the welfare effects of the SD

To obtain an impression on the welfare effects of the service trade liberalisation through the SD, we follow Baier, Yotov and Zylkin (2019) and provide some back-of-the-envelope calculations based on our preferred specification of column (1) in Table 1. The corresponding parameter estimate of the SD informs about the direct impact of the SD on treated country-pairs, holding all endogenous variables constant. It is well known that changes in trade between one country pair can also have additional effects for the liberalising countries, effects on other countries and possible feedback effects. These effects are captured in the multilateral resistance terms (MRT), as they can be interpreted as general equilibrium trade cost terms, which transmit the trade change into the economic system. More precisely, the outward (inward) MRT are a weighted average of all bilateral trade costs for the exporter (importer) in each country and decrease for the treated countries of the policy change and increase for all non-members. The decrease in outward MRT translates into higher prices for the producers, leading to higher output Y_i

and expenditure E_i, in turn leading to even more trade. Via this channel also trade with non-members can increase and this trade creation can outweigh trade diversion effects with non-members if it is strong enough (Head and Mayer, 2015; Yotov et al., 2016).

The MRTs can be derived from the exporter- and importer-time fixed effects according to

$$exp(\hat{\pi}_{i,t}) = \frac{Y_{i,t}}{\hat{\Pi}_{i,t}^{1-\sigma}} \times E_{R,t} \tag{3}$$

$$exp(\hat{\chi}_{j,t}) = \frac{E_{j,t}}{\hat{P}_{j,t}^{1-\sigma}} \times \frac{1}{E_{R,t}}, \tag{4}$$

where $\hat{\pi}_{i,t}$ ($\hat{\chi}_{j,t}$) are the exporter- (importer-) time fixed effects estimated with PPML. $Y_{i,t}$ is output and $E_{j,t}$ is expenditure. $\hat{\Pi}_{i,t}^{1-\sigma}$ and $\hat{P}_{i,t}^{1-\sigma}$ are the outward and inward MRT with σ representing the elasticity of substitution between products from different countries. $E_{R,t}$ is the expenditure of the reference country.

The estimates of the exporter- and importer-time fixed effects are combined with the measures on output $Y_{i,t}$ and expenditure $E_{j,t}$, which are constructed as $Y_{i,t} = \sum_j X_{ij,t}$ and $E_{j,t} = \sum_i X_{ij,t}$.[16] To calculate the transposition of the trade policy shock, a baseline and a counterfactual (absence the policy change) model are constructed. Based on these two models, the full endowment general equilibrium effects are obtained using a four stage iterative procedure. The fixed point algorithm implemented by Baier, Yotov and Zylkin (2019) calculates wage changes in the first stage, normalises all wages in the second stage, updates the price level changes in the third stage and updates expenditure in the fourth stage. The four steps are repeated until the price change is close to zero, signalling that the structural gravity model has reached its new equilibrium (compare Figure 5 in chapter 2 in Yotov et al. 2016). The difference between the baseline and the new equilibrium indices is calculated to measure the general equilibrium effects of the trade policy. This technique results in welfare changes in percentages, not in levels.

Choosing phase 3 as reference phase[17] and a substitution elasticity of $\sigma = 4$, following Baier, Yotov and Zylkin (2019), we obtain an average welfare effect for the MS of 0.57%, with the 95% bootstrap confidence interval ranging from 0.35% to 1.04%. These ex-post estimates lie well within the range of ex-ante predictions. De Bruijn, Kox and Lejour (2008) predicted GDP increases between 0.3 and 0.7% and Badinger et al. (2008) estimated effects up to 1.5%. Non-

[16] Note that this property allows an estimation of the equilibrium effects using only data on intra- and international trade flows.

[17] Choosing other periods before the reform, e.g., phase 1 as reference, makes not much difference for the general equilibrium welfare effects.

EU countries experience a welfare decrease on average by about -0.004% with a lower bound of -0.007% and an upper bound of -0.002%. Note that this calculation is performed with the trade flows of Mode 1 of included sectors only, thus parts of the economy and trade flows are ignored.[18]

6 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, such trade-impeding measures were observed 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 to estimate the impact of trade liberalisation on trade in services. Using a large database of bilateral and domestic service trade, we employ a difference-in-difference design to identify the effects of the SD on international service trade. 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 within a lower bound of 26.6% and an upper bound of 54.8%, resulting in an average welfare increase between 0.35% and 1.04%. 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, Gröschl and Steinwachs 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 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

[18]Previous studies, like Baier, Yotov and Zylkin (2019), base their analysis on only manufacturing trade data.

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 give us a more complete picture of the differential impact of the SD on international service trade.

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A Appendix

In the Appendix, we check the sensitivity of our main results relying on two exercises. In subsection A.1, we extent our analysis to the sectoral level to test whether the trade effect is driven by different compositions within the service industry (Felbermayr, Gröschl and Heiland, 2018). In subsection A.2, we apply a strategy proposed by Larch, Wanner and Yotov (2018), who apply different control groups in order to identify trade effects not only from international trade flows but also in the presence of intra-national trade flows. This, in turn, allows to isolate the effects of the SD on domestic as well as on service trade between EU members and non-member countries.

A.1 EU-Average on sectoral level

According to Felbermayr, Gröschl and Heiland (2018), the use of exporter-importer-sector level data limits the risk of reversed causality when policy variables are uniform across sectors. To take this into account and to consider differences in sectoral composition, we re-estimate our main results on the exporter-importer-sector level instead of the sum of included sectors. Note that the fixed effects in our specfication become country-pair-sector and exporter-/importer-time-sector fixed effects. Results in Table A.1 show slightly smaller effects for the SD, intra-EU and RTA for included sectors, whereas the globalisation effects are larger compared to the effects for the sum of included sectors from Table 1. This suggests that summing over the sectors masks to some extent general trade increases. However, the variable of interest, the SD effect, is still highly significant and positive, indicating a trade increasing effect of 35.9%. The SD effect for the excluded sectors is slightly negative and only significant on the 10% level. It might indicate that the explicit exclusion of some sectors led to a decrease in trade or a substitution for another mode for some of the excluded sectors. Overall, the sector-level analysis supports our previous findings.

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

	(1) included	(2) excluded
SD	0.307***	−0.093*
	(0.054)	(0.053)
intra-EU	0.298***	0.659***
	(0.048)	(0.065)
RTA	0.111**	−0.058
	(0.056)	(0.097)
$INTL_2$	0.075***	0.026
	(0.013)	(0.019)
$INTL_3$	0.168***	0.066**
	(0.020)	(0.034)
$INTL_4$	0.209***	0.050
	(0.027)	(0.048)
$INTL_5$	0.244***	0.024
	(0.033)	(0.048)
FEs	yes	yes
Observations	159,615	112,290

Notes: Column (1) shows results for all sectors included in the SD. Column (2) is based only on sectors excluded from the SD. Clustered standard errors on country-pair-sector level in parentheses. *,** ,*** indicate significance at the 10%-, 5%- and 1%-level.

A.2 Impact on domestic and unilateral trade

Larch, Wanner and Yotov (2018) investigate the trade impact of the European Monetary Union (EMU) using the WIOD data. They demonstrate that constructing a control group which also includes *domestic* trade flows is essential. Specifically, they find no significant effect of the EMU as long as domestic trade flows are not considered. However, once domestic trade is included in the control group, the coefficient for EMU becomes positive and significant. The authors interprete this finding to the effect that the EMU increased intra-EMU trade on the expense of domestic trade. In addition, they construct an unilateral EMU dummy which turns one if either the exporter or the importer joined the euro. Thereby, the respective trade flows are taken out of the control group and the impact on the unilateral EMU trade can be estimated separately. Because it seems plausible that the SD induced similar diversions, we replicate their estimation strategy here. Results are shown in Table A.2. First, we find that the SD effect is still positive and significant even if domestic trade is ignored (see column (1)). According to this, intra-EU trade increased by about 14.7% through the SD when compared to a control group

which consists only of non-EU and unilateral trade flows. This effect is about 60% smaller than the effect in our baseline specification reported in column (2). This suggests that a large share of the SD-induced increase of intra-EU trade is at the expense of domestic trade, as it is the case for the EMU shown by Larch, Wanner and Yotov (2018).[19]

Table A.2: Domestic and unilateral impact of the SD

	(1) w/o domestic	(2) standard	(3) unilateral
bil. EU × SD	0.137**	0.336***	0.410***
	(0.069)	(0.051)	(0.054)
intra-EU	0.419***	0.305***	0.304***
	(0.093)	(0.047)	(0.047)
RTA	0.038	0.181**	0.206***
	(0.065)	(0.071)	(0.066)
$INTL_2$		0.045***	0.045***
		(0.015)	(0.014)
$INTL_3$		0.092***	0.091***
		(0.024)	(0.024)
$INTL_4$		0.095***	0.025
		(0.037)	(0.039)
$INTL_5$		0.120***	0.051
		(0.046)	(0.048)
unil. EU × SD			0.148***
			(0.048)
FEs	yes	yes	yes
Observations	9,460	9,680	9,680

Notes: In column (1), the control group consists of non-EU and unilateral trade (EU with non-EU). Column (2) is from our baseline specification shown in column (1) of Table 1 including domestic, unilateral and non-EU trade in the control group. Column (3) includes a SD effect for unilateral trade, wherefore the control group consists of domestic trade and non-EU trade. Clustered standard errors on country-pair level in parentheses. *,** ,*** indicate significance at the 10%-, 5%- and 1%-level.

Column (3) demonstrates that the inclusion of the unilateral SD effect yields similar dynamics to Larch, Wanner and Yotov (2018).[20] The unilateral effect is significant and positive, suggesting an increase of a general trade openness by the MS. In addition, the bilateral effect increases in this specification by about 22% due to the removal of unilateral trade from the control group.

[19]Please note that without domestic trade, the control for the globalisation effects is impossible, since they are constructed with a dummy being 1 if trade is international.

[20]They find a positive and significant effect for the unilateral trade, showing that the EMU also led to more openness to non-EMU members. In addition, the bilateral EMU effect almost doubles once the unilateral trade flows are taken out of the control group.

Table A.3: 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.4: Impact of the SD on intra-EU service exports – exclusive definition of intra-EU and RTA according to Mayer, Vicard and Zignago (2018) (included sectors only)

	Inclusive $RTA = 1$ if $EU = 1$	**Exclusive** $RTA = 0$ if $EU = 1$
SD	0.336^{***}	0.336^{***}
	(0.051)	(0.051)
intra-EU	0.305^{***}	0.485^{***}
	(0.047)	(0.088)
RTA	0.181^{**}	0.181^{**}
	(0.071)	(0.071)
INTL_2	0.045^{***}	0.045^{***}
	(0.015)	(0.015)
INTL_3	0.092^{***}	0.092^{***}
	(0.024)	(0.024)
INTL_4	0.095^{***}	0.095^{***}
	(0.037)	(0.037)
INTL_5	0.120^{***}	0.120^{***}
	(0.046)	(0.046)
Exporter-time FE	yes	yes
Importer-time FE	yes	yes
Country-pair FE	yes	yes
Observations	9,680	9,680

Notes: Column (1) reports our baseline results from column (1) of Table 1, where we define RTA and EU membership as *inclusive* (i.e., $RTA = 1$ if $EU = 1$). In column (2), we follow Mayer, Vicard and Zignago (2018) and define RTA and EU membership as *exclusive* (i.e., $RTA = 0$ if $EU = 1$). Clustered standard errors in parentheses.$^{*}p < 0.1; {}^{**}p < 0.05; {}^{***}p < 0.01$.

Table A.5: Impact of the SD on intra-EU service exports – using a time-variant definition of EU membership (included sectors only)

	$EU_{ij}R_t$	$EU_{ijt}R_t$	
		with intra-EU	w/o intra-EU
SD	0.336***	0.336***	0.348***
	(0.051)	(0.052)	(0.051)
intra-EU	0.305***	0.293***	
	(0.047)	(0.049)	
RTA	0.181**	0.182***	0.185***
	(0.071)	(0.071)	(0.071)
$INTL_2$	0.045***	0.045***	0.053***
	(0.015)	(0.015)	(0.015)
$INTL_3$	0.092***	0.092***	0.101***
	(0.024)	(0.024)	(0.024)
$INTL_4$	0.095***	0.096***	0.103***
	(0.037)	(0.037)	(0.037)
$INTL_5$	0.120***	0.121***	0.127***
	(0.046)	(0.046)	(0.046)
Exporter-time FE	yes	yes	yes
Importer-time FE	yes	yes	yes
Country-pair FE	yes	yes	yes
Observations	9,680	9,680	9,680

Notes: Column (1) reports our baseline results from column (1) of Table 1, where we define EU membership as time-invariant (equation (2)). In columns (2) and (3), we use a time-variant definition of EU membership, using $EU_{ijt}R_t$ instead of $EU_{ij}R_t$. Clustered standard errors in parentheses.$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.