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WHAT ARE THE DETERMINANTS OF INTERNATIONAL TRADE IN SERVICES? EVIDENCE FROM FIRM-LEVEL DATA FOR POLAND

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Abstract: In this paper, we investigate the determinants of firm-level services export performance. Our focus is on three main aspects affecting services export: international capital linkages (FDI relationships), the existence of trade barriers, the demand and supply factors. The estimated models of the export performance include product and firm-level controls, such as foreign demand, firm-level imports, merchandise exporter status and foreign ownership, as well as destination fixed effects, product fixed effects, firm-level fixed effects. We used the Services Trade Restrictiveness Index (STRI) as a proxy to control for institutional trading barriers. The results suggest export-augmenting effects in services caused by both foreign ownership and involvement in activity in merchandise trade. Restrictions on international services market turned out to be significant as well. As far as the heterogeneity of firms is concerned, size of firms, industry and gravity variables such as GDP of trade-partner, distance and the common border have a significant impact on export. The study uses a unique firm-level dataset providing detailed information on services exports for the period of 2010-2015. In contrast to modern studies based on a random sample of firms, we used the entire population of services exporters in Poland.

Keywords: firm heterogeneity, services trade, FDI in services, trade barriers, determinants of export

JEL codes: F10, F14, F23

1. Introduction

International trade in services has become the most dynamic category of the world trade over the past ten years, growing faster than the trade in goods and the World GDP (WTO, 2018). This trend is also reflected in changes across the global economy. According to World Bank data, the share of services value added in global GDP has grown from 61,5% to roughly 65,0% between 1997 and 2016. For example, in the case of Poland services accounted for 56,4% in 2016, up from 52,2% in 1997.

The above tendencies show the increasing importance of services in modern economies. Nevertheless, little is known about the characteristics of firms operating in services and their decision-making process. This state of knowledge is in stark contrast to empirical analyses on trade in goods where a broad set of stylized facts on exporting and, more recently, importing firms is available. Exporting firms tend to be larger and more productive than their non-exporting counterparts. They use capital more intensively and employ a more highly skilled workforce (see Bernard and Jensen, 1995; Bernard and Jensen, 1999a; Bernard and Jensen, 1999b; Bernard et al., 2007; Wagner, 2007; Aw, 2000). This vast empirical literature also shows that the majority of firms are present only in the domestic market. On top of that, only a small percentage of firms is engaged in both domestic sales and export sales oriented towards just a few foreign markets. (Bernard and Jensen, 1999a; Eaton et al., 2004; Bernard et al., 2009). These initial empirical findings were followed by a development of rigorous theoretical frameworks supporting the stylized facts (e.g. Melitz, 2003; Bernard et al., 2003, Bernard et al., 2011; Eaton et al., 2011; Head and Mayer, 2014).

The main aim of this paper is to identify the main determinants of services exports in the case of Poland. This paper contributes to the empirical literature by providing firm-level evidence on the determinants of exports of services. Our approach builds on earlier studies that

focus on aggregate services data using gravity models of trade (e. g. Walsh, 2006; Kimura, 2003; Francois et al., 2007) but is applied to firm-level data. In our model, the firm exports respond to gravity variables that proxy for the evolution of demand and supply as well as various firm and industry level variables. In our study, we used a unique database on services exporters.

Our first two hypotheses concern the relationship between foreign direct investment (FDI) and services exports of firms. On the one hand, being an FDI recipient (inward FDI) is expected to be export-enhancing when foreign investors use the firm as a vehicle to access nearby markets (H1a), while on the other, outward FDI can be a substitute to exports and therefore negatively related to the volume of exports (H1b).

We test a set of several other hypotheses. In particular, on the demand side, we investigate the influence of destination-specific (H2a) and sector-specific (H2b) demand factors, expecting a positive correlation with the value of exports. Following the gravity approach, we also expect that the size of the trade partner will be positively correlated with the value of export (H2c).

On the supply side, we control for the range and type of products to account for possible economies of scope. We are expecting that firms by offering a wider range of products would exports more services (H3a). We control for the intensity of firms-imports to account for possible effects of participation in global value chains (GVC). Participation in GVC should be reflected in higher intensity of imports and exports. Imports of services are measured by the range (types of products) and the value of imports. We hypothesize that both should be positively correlated with the value of exports (H3b and H3c respectively). We also verify that both imports (H3d) and exports (H3e) of goods have an export-augmenting effect.

This study also provides firm-level evidence on service trade barriers. We exploit cross-country variation of barriers to trade in services to quantify the link between barriers and export

performance. In addition to the explicit institutional trade barriers, we also check the role of distance as a measure of physical (proximity) barriers to trade. We expect that both institutional (H4a) and proximity barriers (H4b) are negatively correlated with the value of services exports.

The remainder of the paper is organised as follows. Section 2 surveys the relevant literature. Section 3 presents the datasets and method used in the study. In section 4 we present the discussion on the results obtained from estimating the empirical model. Section 5 concludes the paper.

2. Literature review

Over the past two decades, one can observe a surge in the empirical literature of heterogeneous firms investigating the causes and consequences of international activities. Researchers focused on microeconomic studies that use large sets of firm-level data (for example Bernard and Jensen, 1999a; Aw, Chung and Roberts, 2000; Clerides, Lack and Tybout, 1998). The main focus of economic literature has been put on the merchandise export firms and the links between exports and productivity.

Numerous firm-level empirical studies documented the stylized facts about merchandise exporters. According to Bernard et al. (2012), firms participating in international trade are only a tiny fraction of all producers. Merchandise exporting firms tends to be more productive than those that supply products only to domestic markets (Buono, 2009; Bernard et al., 2009; Eaton et al., 2011; Boughanmi, 2007).

At the same time, studies focused on services trade have been relatively scarce. The few existing studies (Temouri et al., 2013; Breinlich, 2011 and Vogel, 2011) highlights that services exporters tend to be larger, more productive, more skill intensive and pay higher wages than the non-trading firms. Conti et al. (2010) - for Italy, Kox and Rojas-Romagosa (2010) - for Denmark, Lööf (2010) - for Sweden, shows empirical evidence supporting these observations.

Several studies analyse similarities between merchandise and services exporters. Damijan et al. (2015) investigated the differences in fixed costs incurred to start international operations. They demonstrate that these costs can be higher among services exporters than among merchandise exporters. The percentage of firms participated in international trade, and the trade intensity is lower among services firms than among manufacturing firms. Comparing merchandise exporters to services exporters, we can find that in case of services the concentrations of trade is equally if not more concentrated among a few large firms (Grublješić and Damijan, 2011; Kelle and Kleinert, 2010; Breinlich and Criscuolo, 2011). Furthermore, all exporters are facing more intense competition and must improve their efficiency faster than firms selling their products only on the domestic markets (Wagner, 2014).

Another strand in the trade literature analyses the substitution and complementarity between export and FDI. Helpman, Melitz, and Yeaple (2004) expand the theoretical model of trade (Melitz, 2003) by incorporating foreign direct investment. In merchandise trade, only the more productive firms choose to export, and only the most productive among them will choose to substitute export via FDI (see Wagner, 2012; Buch, 2009). In contrast, only a few studies analysing services tend to suggest that the most productive firm would prefer exports rather than FDI (Wagner, 2011b; Bhattacharya, Patnaik, and Shah, 2012). The difference could arise from the intangible nature of the services contributing to the uncertainty of the consumer, hence, physical proximity is needed to reduce asymmetry of information. In consequence, there are strong incentives for engaging in FDI rather than for exporting.

The firms will establish FDI when the gains from avoiding trade costs outweigh the costs of maintaining a presence in multiple markets. This is known as the “proximity-concentration trade-off” (Helpman et al., 2004). While FDI can be associated with higher fixed costs than exports, it usually involves lower variable costs such as transport etc. Profit-maximising firms can substitute export activity by FDI (Head, Rise, 2004). On the other hand, Lipsey and Weiss

(1984), Clausing (2000) and Graham (2000) found evidence for complementarity between exports and FDI. At the same time, Girma et al. (2005) provide evidence that complementarity and substitutions do not contradict each other.

According to Dunning's (1977, 1981, 1993) eclectic paradigm (OLI¹), the motivation for establishing FDI can arise from the possibility to simultaneously retain the control of its intangible assets (e.g. goodwill, R&D which of most is treated as services) and earn economic rent on these assets (Williams, 1997). In addition, according to Boddewyn et al. (1986) one of the crucial factors for firms to engage in FDI is the location-bound nature of services. Casson (1982) point out that in this context one of the key motivation for FDI in services could arise from quality-control of supplied services (e.g. by utilising brand names, integrate producer and consumer markets etc.). Ramasamy and Yeun (2010) checked what the determinants of FDI among manufacturing and services exporters are and concluded that there are some similarities between services and merchandise trade (the same conclusion had Boddewyn et al., 1986).

In this paper, we also analyse the role of barriers to trade in services. These barriers can affect not only FDI but also the use of production factors and the modes of supply of services to the foreign markets (Dee et al., 2003; Nordås, and Kox, 2009).

Barriers to trade in services differ from those present in trade in goods. The barriers in services are usually more restrictive than in the manufacturing sector (UNCTAD, 2004). It results from the heterogeneous nature of services which includes, e.g. intangibility, perishability, the simultaneity of production and consumption and customisation (Boddewyn, 1986; Ethier and Horn, 1991). Following Dee (2005), we can distinguish two types of trade barriers in services. The first type can explicitly discriminate against foreign suppliers (against entry or their scope of operations). The second type may protect already operating firms by discriminating

¹ Ownership, Location, and Internalization

against all new suppliers (without distinction whether it is domestic or foreign firm). Protecting against any new market entry is frequent a feature of services trade barriers (for more see Dee and Sidorenko, 2005).

The services trade barriers are not tariff-like. Kneller and Pisu (2007) show that the firm perception of the existing trade barriers is determined by their age and exporting experience. They provide the evidence that for over 42% of the UK services firms, the trade barriers are typically of regulatory nature (i.e. dealing with legal, taxes regulations etc.). At the same time, 51% of firms perceive marketing costs associated with doing business in an overseas market as a significant trade barrier.

Numerous studies analysed the influence of sectoral trade barriers: Fink, Mattoo and Rathindran (2002) - for telecommunications, Nguyen-Hong (2000) - for professions – engineering, Clark, Dollar and Micco (2001) - for maritime Kalirajan (2000) - for distribution, Francois and Hoekman (1999) - for business/finance, Dee (2004) - for banking, Gonenc and Nicoletti (2000) - for air passenger transport. In addition, there are economy-wide studies, eg. Eschenbach and Francois (2002) - for finance and Mattoo, Rathindran and Subramanian (2001) - for telecommunications. Unlike the above studies that analyse aggregate or sectoral data, our study explores the firm level response to services trade barriers.

We build our empirical model on the gravity framework to account for crucial country-level demand and supply factors. While both the theoretical and empirical gravity literature is vast (see Armstrong, 2007 for an extensive review), we focus here on a more constrained set of literature that is related to services trade.

The bilateral determinants of trade with the use of a gravity model were also investigated by Freund and Weinhold (2002), Kimura and Lee (2006); Walsh (2006), Head et al. (2009). They demonstrate the positive impact of the size of a trade partner's GDP on the services trade

volume. Moreover Mirza and Nicoletti (2004) used the gravity framework to show that the exporters of services have to combine the use of the domestic inputs with inputs from destination countries. One of the most important outcomes of the gravity studies is that in the case of services trade, the distance is more important than in the case of goods trade. According to Kimura and Lee (2006), this arises from more significant transaction costs in services (i.e. because of intangible nature, quality problem, heterogeneity).

The existence of high transaction costs could imply that most exporters trade only in several adjacent markets (Matuszczak, 2019) using stepping stones tactic and reducing the uncertainty of their foreign market performance (Lejour, 2015). However, the conclusions derived from the gravity equation for distance in services trade are inconsistent. On the one hand, the results of some studies confirmed a negative correlation between geographical distance and trade flow (Kimura and Lee, 2006; Head et al., 2009; Frankel, 1991). On the other hand, some studies like Walsh 2006 underline insignificance of distance.

3. Data and methods description

In this paper we investigate the determinants of services exports with the use of a created firm-level dataset. In our study, we measure the services exports responses to change in both demand and supply factors as well as in firm characteristics. We also analyze the role of foreign ownership and estimate the influence of trade barriers.

Our dependent variable is the firm-level (k) value of exports towards a single country (j) in a given year (t). Our explanatory variables include firm-level controls for inward and outward FDI status which is treated as a proxy of foreign ownership. Variables FDI and FDI_2 take a value of 1 if a firm is an FDI investor or FDI recipient respectively and zero otherwise.

Variables responsible for supply factors include $N_s_exp_p$ - the number of exported types of services as well as EXP_G – a dummy variable reflecting the merchandise export status

and *IMP_G* – a dummy variable reflecting the merchandise import status. Moreover, we include the log of firm's services imports per source country (*L_imp*) as well as the number of imported types of services (*N_s_imp_p*) per source country. The demand controls include aggregate exports value towards a given destination country (*L_exp_country*), the aggregate exports in a particular sector (*L_exp_NACE*), as well as the trade partner GDP (*L_gdp*).

We control for trade barriers using the Services Trade Restrictiveness Index (*STRI*). *STRI* is reflected as an annual score for each export destinations (country breakdown). We control the effect of trade barriers for EU member states separately by interacting the *STRI* with a EU dummy variable taking a value of 1 when the trade partner is a member of the EU. We control for the distance between trade partners (*l_dist*), common border (*border*), as well as EU membership of trade partner (*UE*). The geographical distance *l_dist* was calculated by using the Haversine formula and is reflected as a log of the distance between the capital city of Poland and the capital city of trade partner.

To investigate the determinants of exports, we also control for available firm characteristics. We control for size (*Size*) of a firm which is available as a discrete variable grouping firm into small (<49 employees), medium (between 50 and 249 employees) and large (>249 employees) entities as well as the sector of operation.

Several variables used are time-invariant or have very little variation over time (such as *STRI*). To explore both the within and between variation in the data, we take a two-step approach. First, we estimate a fixed-effects² model to obtain unobservable individual effects ($u_{i,t}$). We used separate models with firm-country fixed effects and sectoral effects. Using the above empirical approximations, the log-linear version of services export can be expressed by³:

² To overview results of the Hausman and the Mundlak tests (Mundlak 1978) see table 7 and 8.

³ All variable description is reported in Table 5

$$\begin{aligned} \ln(\text{Serv_exp}_{kjt}) = & \beta_1 N_s_exp_{kjt} + \beta_2 N_s_imp_p_{kjt} + \beta_3 \ln(\text{exp_country}_{jt}) + \beta_4 \ln(\text{imp}_{jt}) \\ & + \beta_5 \ln(\text{GDP}_{jt}) + \beta_6 \ln(\text{exp_NACE}_{jt}) + \beta_7 \text{STRI}_{jt} + \beta_8 \text{STRI_UE}_{jt} + \beta_9 \text{FDI}_{jt} \\ & + \beta_{10} \text{FDI_2}_{jt} + \beta_{11} \text{EXP_G}_{kjt} + \beta_{12} \text{IMP_G}_{kjt} + u_{kjt} + \varepsilon_{kjt} \end{aligned} \quad (1)$$

In the second stage, we estimate OLS equations on the obtained fixed effect to investigate how much of the individual effect variance can be explained by the time-invariant variables. The equation of second step model can be expressed as follows:

$$\hat{u}_{kjt} = \beta_0 + \beta_1 \text{NACE}_{kj} + \beta_2 \text{Sieze}_{kj} + \beta_3 \text{Border}_{kj} + \beta_4 \text{Distance}_{kj} + \beta_5 \text{EU}_{kj} + \epsilon_{kjt} \quad (2)$$

Due to the existence of heteroskedasticity, we used robust variance-covariance matrix. In all specifications, we used clustered standard errors.

We base our estimations on an unique firm-level dataset. The data in this paper comes mainly from the International Trade in Services Survey (ITSS)⁴ conducted jointly by Narodowy Bank Polski and Statistics Poland (GUS). The main area of interest of the survey is the value of international trade in services between the residents (the reporter in the survey) and nonresidents. According to Polish statistical law whole population of Polish residents is obliged to report their international transactions in services⁵. The ITSS is conducted in two editions. The first survey is a quarterly survey and covers only firms with the value of international trade in services above the threshold of 800 000 PLN (approximately equal to EUR 185 895) in the case of exports and 1 000 000 PLN (approximately equal to EUR 232 369) in the case of imports. The second one is an annual survey and contains the rest of Polish residents who report any international services transactions (the rest of the population below the threshold). To overcome some of the problems such as seasonality we decided to aggregate the data into annual frequency. Because of missing a significant subset of small firms for 2009 we dropped the initial year of 2009. The information on services export was available in the full

⁴DNU-K/R survey. The form is provided on the website of CSO: <http://form.stat.gov.pl/formularze/formularze.htm>

⁵ Therefore in this paper we are using population term – the survey should contain every single firm involved in export of services. It is no the random sample survey.

destination/source country breakdown and in the type of services breakdown (the classification of the services flow type follows the EBOPS⁶ classification used in National Accounts and Balance of Payments statistics see IMF 2009).

We augment the dataset by merging additional data. We use the census of firms from Statistics Poland which contains firm identification data as well as some of firms characteristics. We also use firm-level data on international trade in goods obtained from the Ministry of Finance. The gravity variables come from CEPII Gravity Database⁷. Information on trade barriers (STRI) comes from OECD. We merged the information on FDI from another firm-level database available at Narodowy Bank Polski. The constructed database covers period from 2010 till 2015.

The resulting dataset contains information on 18 296 of firms with the average value of services export equal to EUR 1,8 million. The majority of firms export only one type of services in only one direction. Most of them were simultaneously services importers and exporters. At the same time, most of the services exporters were not merchandise trade exporters and/or importers. The population of services exporters consists mostly of large and medium-sized firms.

Table 1. Trade engagement

Year	Services			Goods			Total
	Export only	Export and Import	Non trade	Export	Import	Both	
2010	2 949	7 733	7 791	522	917	1 452	10 682
2011	3 368	8 704	8 836	621	852	1 763	12 072
2012	3 802	9 567	9 869	712	906	1 882	13 369
2013	4 468	10 730	11 584	687	922	2 005	15 198
2014	5 066	11 769	13 150	648	951	2 086	16 835
2015	5 474	12 822	14 484	685	910	2 217	18 296
Total	25 127	61,325	65714	3 875	5 458	11 405	86 452

Source: Author own calculations

⁶ Extended Balance of Payments Services classification on <http://www.oecd.org/std/its/EBOPS-2010.pdf>

⁷ http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=8

Most of the services exporters and/or importers are domestic firms with no inward and/or outward FDI. Inward FDI is much more common than outward FDI. However, firms that do have outward FDI are also likely to be FDI recipients. Firms with inward and/or outward FDI are predominantly large.

Table 2. Size and international capital linkage status

Year	Size				International capital linkage				Total
	Large	Medium	Small	Unknown	No investment	Outward FDI	Inward FDI	Both outward and inward FDI	
2010	4 081	3 282	3 319	0	9 608	32	1 335	1 388	12 363
2011	4 455	3 831	3 786	0	10 716	34	1 401	1 455	13 606
2012	4 764	4 474	4 131	0	11 591	31	1 511	1 533	14 666
2013	5 135	5 380	4 683	0	13 201	22	1 609	1 514	16 346
2014	5 475	6 167	5 193	0	14 653	26	1 687	1 548	17 914
2015	5 708	7 018	5 498	72	16 048	35	1 723	1 663	19 469
Total	29 618	30 152	26 610	72	75 817	180	9 266	9 101	94 364

Source: Author own calculations

To summarize the total number of observations in our panel is 539 907. In average we can observe the single flow for 2,5 year (this is due to the high rotation is small firms subset). The full table of the descriptive statistics can be found in Table 5 in Annex.

4. Results

The results of the first stage estimations are reported in table 3. In the first column, we present the results from the pooled model. In column (2) we show the results for a random-effect model. Columns from (3) to (8) report the results for several specifications of the fixed-effect models. The major differences between specifications are the structure of fixed effects. In (3) – (6) we provide the results for fixed-effect models with the sectoral fixed effects where some of the between variation is not explained by individual effects. Following the general to specific approach models from (3) – (6) differ in the sets of explanatory variables. In (4) – (6) we omit the range of imported types of services as it turned out to be statistically insignificant. In (4) we

omit the variables responsible for inward and outward FDI. In column (7) – (8) we report the results for firm-country fixed-effect models.

In the case of specification (6) and (8), we focus on *STRI* by omitting it in the first stage estimations. Instead, we include *m_STRI*, the destination-specific mean of *STRI* over time in the second step regression to focus on between variation of trade barriers. Our sample was restricted to 197 562 observations mainly due to availability of *STRI*.

The firm-country fixed-effect models (column (7)-(8)) explain the largest share of the overall variation of the dependent variable. Comparing these results to columns (3)-(6), one can infer that the firm-level heterogeneity explains over 50% of the overall variation.

Table 3. The first step estimation results

Variables	(1) Pooled	(2) RE Base	(3) Sector fixed base	(4) Sector fixed 2	(5) Sector fixed 3	(6) Sector fixed 4	(7) Firm-country fixed base	(8) Firm-country fixed
N_s_exp_p	0,692***	0.616***	0.752***	0.764***	0.750***	0.750***	0.552***	0.553***
N_s_imp_p	-0,032***	0.002	-0.005				0.004	
L_imp	0,337***	0.195***	0.308***	0.316***	0.308***	0.307***	0.108***	0.109***
L_exp_country	0,265***	0.248***	0.294***	0.284***	0.315***	0.258***	0.115***	0.114***
L_exp_NACE	0,301***	0.255**	0.019	0.019			0.266***	0.266***
L_gdp	0,041***	0.069***	0.038	0.037	0.038*	0.065*	0.403***	0.401***
STRI	0,011***	0.007*	0.011**	0.012**	0.015***		-0.003	
STRI_UE	-0,004***	-.004	-0.003	-0.003	-0.003***		0.003	
FDI	0,070***	0.192***	0.340***		0.339***	0.349***	0.142***	0.151***
FDI_2	-0,037***	-0.005	-0.087***		-0.087***	-0.121**	0.014	
IMP_G	-0,018	-0.076*	0.137*	0.194**	0.143**	0.137*	0.034*	0.034*
EXP_G	-0,336***	-0.113***	-0.052*	-0.046	-0.053*	-0.048	0.040*	0.040*
Constant	-6,818***							
N	197562	197562	197562	197562	197562	197562	197562	197562
r2	0,253		0.328	0.325	0.327	0.327	0.8906	0.8906
r2_a	0,253		0.327	0.326	0.328	0.328	0.8158	0.8158
Rmse	2,417	1.211	2.294	2.298	2.295	2.295	0.925	0.925

*p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Source: Author own calculations

Our results support the hypotheses that FDI recipients export more services. We show that on one hand, having a foreign direct investor increases the value of exports (introduction

of a foreign investor increases exports by 15,1%). On the other hand, being a foreign direct investor turned out to be insignificant. While inward FDI is robustly positively related to firm-level exports, we find a significant negative effect of outward FDI investor on services exports only when we control for sectoral fixed-effects. Hence, while multinationals invest in Polish firms in order to reach other markets (i.e. the EU markets) or in order to take advantage of Polish comparative advantages in their supply chains, there is little evidence that Polish firms treat outward FDI as a substitute to their exports. Based on our results, we positively verify our hypothesis H1a. At the same time, we reject hypothesis H1b.

The results also suggest that trade barriers are statistically insignificant for Polish services exporters as far as within variation is concerned. The same holds for variable controlling for institutional trade barriers among EU member states. The coefficient on *STRI* is statistically significant only when we control for the sectoral fixed effects. We explore this issue further in the second step estimation.

All estimated models suggest that partner-specific demand measured by *L_exp_country* turned out to be positive and statistically significant. According to specification (8), an increase of the Polish aggregate exports with a given partner by 1% is associated with the increase of firm-level services exports by 0.114%. This allows for positive verification of H2a. Our study also suggests that sector-specific aggregate demand is statistically significant. According to the last presented specification (8), increasing foreign sectoral demand by 1% is associated with the increase of firm-level services exports by 0,27%. Based on that fact, H2b was also positively verified. Models estimated in column (6)-(8) suggest that the size of the trade partner economy is positively associated with the volume of exports. The last specification shows that increasing trade partner GDP by 1% can be associated with the increase in exports by about 0.4%. This results are in line with our prior expectations (positive verification of hypotheses H2c) and are supported by the previous literature on the gravity model of trade.

As far as supply factors are concerned the number of exported services types was statistically significant and positively correlated with the value of exports. These results meet our prior expectations and convincingly support our hypotheses (H3a) that improvements in the variety (whether horizontal or vertical) of exports may be considered as an important determinant of export flows (Hummels and Klenow, 2005). Bernard et al. (2010), Funke and Ruhwedel (2001), Iacovone and Javorcik (2010) provide a similar conclusion.

Our results suggest a positive correlation between the value of imports and exports of services. Increase in services import by 1% is associated with 0,109% increase in export of services. These results are in line with the literature suggesting that firms can increase their export performance through import-related technology transfer (Blaloc and Veloso, 2007; Vogel and Wagner, 2008). At the same time, firms are more export-oriented when they are involved in GVC and are using imported inputs. On the other hand, the range of imported types of services ($N_s_imp_p$) was statistically insignificant. Based on our results we can positively verify hypothesis H3c. At the same time, the range of traded services was statistically significant only in the case of exports, which leads to rejection of hypothesis H3b.

Our results suggest that both the imports and exports of goods are positively correlated with the value of exports. Being a goods importer is linked with exports higher by 3,4%. In addition, the results for goods exports suggest that having a status of merchandise exporter would be associated with 4,0% increase in services export. This support our views expressed in H3d and H3e. According to Hoekman et al. (2017), involvement in goods trade is positively associated with the services exports because of the large amount of services inputs embodied in goods trade. These results suggest that services and merchandise exports could complement each other and provide some reduction in exporting costs.

Table 4 shows the results of estimation of the second step regressions where column numbers refer to first-step regressions. Second step regression corresponding to models (4)-(6)

explain 60% of between variation and at the same time models correspond to firm-country fixed-effects explain slightly above 9% of between variation.

In every specifications sectoral variables were individually and jointly statistically significant. That includes the sector fixed effects (sectoral variables alone explains almost all between variation in case of specifications (4)-(6) and almost half of the variation in specifications (7) and (8)). Their estimates show that firm-level export value in transportation as well as information, computer and professional services are higher than elsewhere.

Table 4. Results of the second step estimation

	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	Pooled	RE Base	Sector fixed base	Sector fixed 2	Sector fixed 3	Firm-country fixed base	Firm-country fixed best
Agriculture, fishing	0.956***	0.551***	0.426***	0.483***	0.468***	1.004***	1.008***
Manufacturing	-0.268***	-0.279***	-0.264***	-0.229***	-0.232***	-0.423***	-0.414***
Construction	1.467***	1.616***	1.576***	1.667***	1.667***	1.682***	1.694***
Wholesale and retail trade	-0.621***	-0.460***	-0.414***	-0.323***	-0.327***	-0.829***	-0.825***
Transporting and storage	0.598***	1.173***	1.184***	1.339***	1.342***	0.601***	0.607***
Accommodation and food	0.732***	0.610***	0.556***	0.576***	0.564***	0.738***	0.734***
Real estate	0.517***	0.231***	0.217***	0.212***	0.210***	0.584***	0.585***
Information, computer and professional	0.439***	0.634***	0.618***	0.719***	0.718***	0.404***	0.404***
Administrative services	0.724***	0.735***	0.670***	0.751***	0.749***	0.785***	0.788***
Education	-0.830***	-0.980***	-1.190***	-1.023***	-1.019***	-1.170***	-1.165***
Arts, entertainment	-0.393***	-1.110***	-1.330***	-1.272***	-1.271***	-0.602***	-0.598***
Size							
Large	0.600***	-0.071***	-0.071***	-0.079***	-0.079***	0.799***	0.802***
Medium	0.249***	0.015***	0.021***	0.020***	0.020***	0.288***	0.290***
border=1	-0.107***	-0.019***	-0.023***	-0.022***	-0.021***	-0.428***	-0.451***
l_dist	-0.170***	-0.037***	-0.038***	-0.039***	-0.039***	-0.648***	-0.654***
UE	-.103***	0.002	0.003		-0.031*	-0.497***	-0.472***
m_STRI					-0.001*		-0.007***
m_STRI_UE					0.001*		
Constant	1.000***	-0.158***	-0.107***	-0.195***	-0.146***	4.153***	4.631***
N	188384	188 384	188 384	188 387	188 387	188384	188384
r2	0.069	0.620	0.613	0.627	0.627	0.091	0.091
r2_a	0.069	0.620	0.613	0.627	0.627	0.091	0.091
Rmse	1.935	0.575	0.569	0.578	0.578	2.235	2.235

* p<0.05, ** p<0.01, *** p<0.001; Source: Author own calculations

Our results suggest that the size of the firm also has a significant influence on services export performance. We can observe that the value of export of both large and medium firms would be bigger in comparison with small firms. Comparing to small firms, the increase in the value of big firms export would be greater by 80,2% and for the medium firms would be greater by 29,0%. These results are in line with our prior expectation and are consistent with the literature (Verwaal, 2002; Francois, 1992, Majocchi, 2005; Patibandla, 1995, Wagner, 1995).

As far as trade barriers are concerned, our results (model (6) and (8)) suggest that increasing the level of market protection would be associated with the decrease in services export. This observation is entirely in line with our expectations supporting H4a and with the conclusions of the earlier literature (Benz et al., 2017; Nordås, 2016; Hokeman et al., 2017). However, we show that institutional barriers are only important in the case of extra-EU trade. This suggests that the differences between the levels of intra- and extra-EU barriers are rather large. We also found that distance is statistically significant and negatively related to exports value, but with a rather small effect. This particular result supports our opinion described by H4b. This result shows that even though the nature of services differs from goods, the role of distance is similar. Unlike in merchandise trade, the estimated effects of common-border are small, and at the same time negative, which may be a result of a very specific location of Poland, i.e. its major EU trade partners are geographically close, but services trade with nearest neighbouring non-EU countries (Belarus, Ukraine) is very low. Moreover, the trading cost of exporting to neighbouring EU countries could be relatively small which enables big numbers of small firms to exports services of low value.

Finally, our results suggest that EU membership is negatively related to services exports. This particular result may arise from the fact that our data contain mainly small firms in majority exporting to EU countries. At the same time, only a small fraction of big exporters tend to

export toward extra-EU markets. These results may in fact suggest that the fixed costs of exporting to adjacent and EU countries are smaller than elsewhere and smaller firms are able to export than it is the case of distant markets and non-members of the EU. While on aggregate the trade with the EU and adjacent countries is unambiguously larger, at the firm level these numbers may be due to a large extensive margin (many small firms exporting to EU).

Conclusions

In this paper, we investigate the factors that have a direct impact on firms' service export performance: the role of inward and outward FDI, the existence of trade barriers and the influence of supply and demand factors. To find the determinants of services export we used a firm-level gravity framework. We explore a unique and novel firm-level dataset compiled from a variety of sources. In contrast to random sample-based studies, our dataset covers the entire population of services exporters in Poland.

Our results show an important role of firm characteristics on the size of firm-level services exports. Considering the association between foreign ownership and services exports, we analysed two relationships. We show that inward FDI matters for firms' export activity. At the same time, we find no significant effect of outward FDI investor. We show that the sector and the size of the firm are also important characteristics correlated with services exports. These results were robust across all estimated specifications.

We also show the importance of aggregate and individual demand and supply factors in driving the firm-level exports. As far as demand factors are concerned, both country and sector demand turned out to be a significant driver of exports. Among the supply factors, the number of types of services exported is associated with higher exports suggesting possible economies of scope leading to cost savings. The same conclusion about the economies of scope, in line to expectations, apply to the firms' concurrent involvement in merchandise trade. Moreover,

services importers are likely to be exporters as well, which may be related to their involvements in more complex production networks, that also can contribute to better access to foreign markets (Baldwin and Venables, 2013).

Other important determinants of services exports include trade barriers. As a result, we observe a negative relationship between institutional trade barriers and the value of export. Similar findings were presented by numerous researchers like Nordås and Rouzet, 2015; Borchert et al., 2012; Dihel and Shepherd, 2007; Deardorff et al., 2008 etc. Some of the other trade barriers (e.g. such as transport costs, physical barriers, differences in consumer tastes) are captured by a negative relationship between the size of exports and distance, a results consistent with similar results for merchandise trade, common in the literature, although of a relatively small magnitude. Moreover, we show that exports per firm tend to be smaller if the trading partner is geographically adjacent to Poland and whenever the trading partner is in the EU.

One can note that our approach has some shortcomings. We have concentrated on a limited set of firm characteristics (FDI activity, sectoral variable, size of firm). There is no information available on firms financial condition (such as the value of an investment, financial constraints, level of wages offered, the level of acquired costs etc.) or on usage of physical or human capital. The most significant drawback is a lack of direct information on productivity as well as the unavailability of data of non-exporting firms in the service sectors. Therefore, we are not able to account for possible selection effects. Moreover, the dataset is limited in the time dimension, which does not help us to exploit the within variation of exports fully. We hope to look into these issues as part of further research.

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Annex**Table 5. Variable explanation.**

Variable	Description
L_exp	Log of services exports
N_s_exp_p	The number of exported services products
N_s_imp_p	The number of imported services products
L_imp	Log of imported services
L_exp_country	Log of country demand
L_exp_NACE	Log of sectoral demand
L_gdp	Log of GDP of trade partner
STRI	Services Trade Restrictiveness Index
STRI_UE	Services Trade Restrictiveness Index among EU member states
m_STRI	Over-time mean of STRI
m_STRI_UE	Over-time mean of STRI for EU countries
FDI	Having foreign direct investor
FDI_2	Being investor abroad
IMP_G	Information on goods imports (dummies)
EXP_G	Information on goods exports (dummies)
Sectoral variables	
Agriculture, fishing	NACE code A and B
Manufacturing	NACE code C
Construction	NACE code F
Wholesale and retail trade	NACE code G
Transporting and storage	NACE code H
Accommodation and food	NACE code I
Real estate	NACE code L
Information, computer and professional	NACE code J and M
Administrative services	NACE code N
Education	NACE code P
Arts, entertainment	NACE code R
Size	
Large	Large firm
Medium	Medium firm
UE	UE membership (dummies)
border=1	Information on common border of trade partner (dummies)
I_dist	Log of distance from trade partner

Source: Author own work

Table 6. Descriptive statistics of the single flow data

Variable		Mean	Std. Dev.	Min	Max	Observations
Log of services Exports (L_exp)	overall	9.035045	2.731065	-1.434489	20.6054	N = 538 364
	between		2.500449	-1.434489	20.40349	n = 218137
	within		.9565331	-3.159969	17.20533	T bar = 2.46801
Log of imported services (L_imp)	overall	9.35623	2.777216	-1.434489	20.59829	N = 211605
	between		2.539924	-1.434489	19.87804	n = 86574
	within		1.01812	-.639728	18.95701	T bar = 2.44421
The number of exported services products (N_s_exp_p)	overall	1.185513	.6180748	1	19	N = 539907
	between		.4104728	1	14.16667	n = 218403
	within		.3181686	-5.481153	9.518847	T bar = 2.47207
The number of imported services products (N_s_imp_p)	overall	.7348877	1.381166	0	28	N = 539907
	between		1.055454	0	21.16667	n = 218403
	within		.5223348	-8.665112	9.734888	T bar = 2.47207
Log of GDP of trade partner (L_gdp)	overall	26.64509	1.732341	16.99474	30.42456	N = 533688
	between		1.791395	16.99474	30.42456	n = 215160
	within		.0657106	26.16022	27.22497	T bar = 2.48042
Log of distance from trade partner (L_dist)	overall	6.63817	.885412	5.499019	9.328068	N = 534904
	between		.9164375	5.499019	9.328068	n = 215698
	within		0	6.63817	6.63817	T bar = 2.47987
Log of country Demand (L_countr)	overall	19.72506	2.234009	-1.431507	22.77482	N = 539905
	between		2.370095	-1.431507	22.77482	n = 218402
	within		.1965094	13.41747	25.11014	T bar = 2.47207
Log of sectoral demand (L_sect)	overall	20.4668	1.576341	6.948715	22.58714	N = 539902
	between		1.617056	6.948715	22.58714	n = 218402
	within		.1894797	16.55198	23.86902	T bar = 2.47206
Information on goods imports (IMP_G)	overall	.2313269	.4216813	0	1	N = 539907
	between		.387816	0	1	n = 218403
	within		.1411787	-.6020065	1.06466	T bar = 2.47207
Information on goods exports (EXP_G)	overall	.2002956	.4002219	0	1	N = 539907
	between		.3649368	0	1	n = 218403
	within		.1533122	-.6330377	1.033629	T bar = 2.47207
Size (Size)	overall	1.824419	.85918	1	4	N = 510636
	between		.8362074	1	4	n = 202081
	within		0	1.824419	1.824419	T bar = 2.52689
Services Trade Restrictiveness Index (STRI)	overall	22.64918	7.737038	43137	88.2	N = 485503
	between		8.023786	43137	88.2	n = 192816
	within		1.329096	2833493	33.33266	T bar = 2.51796
Services Trade Restrictiveness Index among EU (STRI_UE)	overall	15.17691	367314	0	28.6135	N = 485503
	between		9.496457	0	28.6135	n = 192816
	within		1.124901	9.442886	20.91093	T bar = 2.51796
Information on common border of trade partner (border)	overall	.2467869	.4311421	0	1	N = 539907
	between		.4206403	0	1	n = 218403
	within		0	.2467869	.2467869	T bar = 2.47207
UE membership (UE)	overall	.732152	.4428383	0	1	N = 539907

	between	.4558586	0	1	n = 218403
	within	0	.732152	.732152	T bar = 2.47207
Inward FDI (FDI)	overall	.1431747	.5669275	0	22 N = 539907
	between	.4841616	0	22	n = 218403
	within	.2533555	-10.85683	18.14317	T bar = 2.47207
Outward FDI (FDI_2)	overall	.2422139	.4284235	0	1 N = 539907
	between	.3964147	0	1	n = 218403
	within	.0824174	-.5911194	1.075547	T bar = 2.47207

Source: Author own calculations

Table 7. Hausman test result

	Coefficients ----			
	(b) Fe estimator	(B) RE estimator	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
N_s_exp_p	.5521532	.6161801	-.0640269	.0024656
N_s_imp_p	.0043249	.0015516	.0027734	.0019181
L_countr	.1148272	.2501423	-.1353151	.0207454
L_imp	.1077863	.1949054	-.0871191	.0016678
L_gdp	.4031778	.0658536	.3373242	.0562561
L_sect	.2658822	.2549322	.01095	.0169491
STRI	-.0028387	.0054274	-.0082662	.0036646
STRI_UE	.0034259	-.0009557	.0043816	.0040228
FDI	.1376886	.1851123	-.0474238	.0249066
FDI_2	.029434	.0079949	.0214391	.012773
IMP_G	.0341596	-.0762159	.1103755	.0114228
EXP_G	.0396219	-.113162	.152784	.0086875

Source: Author own calculations

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(12) = (b-B)'[(V_b-V_B)^(-1)](b-B)
 = 3738.72
 Prob>chi2 = 0.0000

Source: Author own calculations

Table 8. Results of Mundlak test

Variable	re	fe	nomdlk
N_s_exp_p	.61618015	.55215322	.55208089
N_s_imp_p	.00155159	.00432495	.02468209
L_countr	.25014235	.11482722	.11335557
L_imp	.19490545	.10778633	.1034746
L_gdp	.0658536	.40317777	.40356439
L_sect	.25493221	.26588222	.2631317
STRI	.0054274	-.00283875	-.00219735
STRI_UE	-.00095574	.00342586	.00248353
FDI	.18511233	.13768857	.1427922
FDI_2	.00799492	.02943405	.03048295
IMP_G	-.0762159	.03415955	.03455392
EXP_G	-.11316202	.03962194	.04077097
UE	-.10098972	(omitted)	-.31851579
m_N_s_exp_p			.39624254
m_N_s_imp_p			-.16093797
m_L_exp_country			.1351572
m_L_imp			.25032994
m_L_gdp			-.3666118
m_L_exp_NACE			-.00277407
m_STRI			-.03330432
m_STRI_UE			-.53977671
m_FDI			.00847957
m_FDI_2			.00654429
m_IMP_G			-.09000442
m_EXP_G			-.06879848
m_UE			(omitted)
Cons	-5.1245298	-10.563969	-5.9369503

Source: Author own calculations

```

( 1)  m_n_prod_e = 0
( 2)  m_n_prod_i = 0
( 3)  m_l_exp_kraj = 0
( 4)  m_l_imp = 0
( 5)  m_l_gdp = 0
( 6)  m_l_exp_pkd = 0
( 7)  m_imp_good = 0
( 8)  m_exp_good = 0
( 9)  m_stri = 0
(10)  m_stri_ue = 0
(11)  m_f_z_k_zagr = 0
(12)  m_pl_f_inwes_z_g = 0
(13)  o.m_ue = 0
      Constraint 13 dropped

```

```

      chi2( 12) = 5625.43
      Prob > chi2 = 0.0000

```

Source: Author own calculations



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