Decomposing Services Exports Adjustments along the Intensive and Extensive Margin at the Firm-Level[*]

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Abstract

Using a comprehensive and unique data set of Austrian service exporting firms provided by the Austrian central bank (OeNB) this paper empirically examines the determinants of service exports at the firm/destination country level. Based on a Heckman sample selection gravity model, the paper introduces a new approach to decompose expected firm-level services exports into changes at the intensive and the extensive margins of adjustment as a response to counterfactual changes in exogenous variables. Specifically, we consider several counterfactual scenarios including the (hypothetical) reduction of trade costs, changes in destination market size and enhanced firm productivity. Our results suggest that export market growth and a reduction in distance related trade costs exert the relative strongest impact on the entry into new markets. Policies aiming at promoting firm productivity also have the potential to broaden the exporter base and play an important role for trade deepening.

Keywords: Service trade, Firm-level evidence, Firm heterogeneity, Gravity model, Sample selection, Intensive and extensive margin of trade.
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1 Introduction

The (new) new trade theory literature pioneered by Melitz (2003) and further developed by Chaney (2008), Helpman et al. (2008) and Crozet and Koenig (2010) emphasizes the self-selection of the more productive firms into export destination markets. As firms exhibit heterogeneity in their productivity, only the more productive and larger firms are able to earn sufficient operating profits in a destination market to cover the associated fixed costs and thus are able to serve this market by exports. At the firm level, adjustments in trade flows due to changes in exogenous determinants occur along two margins. On the one hand firms entering (exiting) a specific destination market contribute to an increase (decrease) in exports to that market (the extensive margin). On the other hand firms that already export to a destination may increase or decrease their export activities (the intensive margin). Both margins of adjustment, and especially their relative contributions to overall export growth, seem to be highly relevant to economic policy as different policy instruments are relevant to promote firms to enter new foreign markets and to deepen existing export relations.

Despite the prominent role gravity models have had in explaining aggregate trade flows, their adoption to firm level data has not yet gained widespread attention in the empirical literature, even less so for service trade. Greenaway et al. (2009) apply a Heckman sample selection gravity model to control for the possible self-selection into exporting using firm level data on the Swedish food and beverage sector. Their findings are consistent with the predictions from the theory and confirm that more productive and larger firms are more likely to serve large and relatively close foreign markets. In addition, the export volumes are positively influenced by the size of the destination market and negatively by the distance between the trading partners. In a related paper, Crozet and Koenig (2010) examine the impact of distance on the probability of exporting and the export levels using French manufacturing firm level data. Their results show that distance has a significant negative impact on both the propensity to export and the export volume in the majority of the industries.[1]

In contrast to the research on goods trade, the empirical literature on services trade is developing only recently and so far mainly relies on aggregate data.[2] Recent contributions on services trade using firm-level data include Breinlich and Criscuolo (2011) who are among the first to study firm-level services trade with a focus one trade participation and trade patterns of UK firms. In line with evidence for manufacturing firms they find important differences between service traders and non-traders with respect to firm size and productivity. A major conclusion of their study is that firm-heterogeneity is also a key feature of services trade, thereby pointing to the relevance of heterogenous firm models for modeling service activities. In related papers Kelle and Kleinert (2010), Ariu (2011, 2012) and Federico and Tosti (2012) report similar stylized facts and provide firm-level evidence on services trade for Germany, Belgium and Italy, respectively. All

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[1]A detailed survey on the export productivity nexus at the firm-level is provided by Wagner (2007), but the survey does not include gravity models.

[2]Francois and Hoekman (2010) provide a comprehensive survey on service trade.

these contributions analyze the adjustment at the intensive and extensive margin at the *aggregate level* of destinations or industries. Accordingly, variation in aggregated firm-level services trade is mainly explained by the intensive margin, while contributions of the extensive margin only account for 20 to 30% of the total variation. This dominance of the intensive margin can be partly explained by the large fraction of firms which trade with only one foreign destination market and in one service type.

In these contributions the preferred measure of the extensive margin is the number of destination countries and/or services types per firm within an industry, while the intensive margin refers to the average trade volume per destination country and/or services type, likewise within an industry.[3] However, these measures of the intensive margin leave out variation across destinations and/or service types because it is valued as the average exports of a firm across destination and service types. On the other hand, the number of firms as a measure of the extensive margin fails to account for the heterogeneity of firms. In contrast, a firm-level Heckman sample selection gravity model is able to account for both aspects defining the extensive margin as the probability to enter a specific destination market and the intensive margin as the expected volume of services exports conditional on entering that destination. Based on the predictions of the Heckman sample selection model it is possible to assess the expected reaction of trade flows for specific groups of firms in response to changes in key exogenous determinants. In particular, this approach enables us to elaborate on the composition of trade flows in counterfactual scenarios along the extensive and intensive margin.[4]

Using the formal results on the conditional expectation of log-normal random variables provided by Yen and Rosinski (2008) and Staub (2014) and the estimated parameters of the Heckman sample selection gravity model, we calculate the firm-specific probability of exporting to a specific destination and the expected trade volume conditional on exporting for each firm. Thereby, we decompose the expected change in exports into the contribution of continuing exporters holding the probability of serving a destination market constant (intensive margin) and changes in the probability of serving that market given predicted exports of all firms (extensive margin).

The main contribution of this paper is to apply this framework in an analysis of services exports using a unique firm-level data set covering services exports by Austrian firms from both the manufacturing and service sector, by destination over the period 2006 to 2009. The distinction between manufacturing and service sector traders seems to be important not only because manufacturing firms differ from service firms in a number of ways (e.g., in terms of average size, export participation and average destination specific export flows per firm, see Breinlich and Criscuolo, 2011 and Ariu, 2012), but most importantly because

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[3]Hummels and Klenow (2005), also provide a widely used decomposition based on aggregates of product groups. The extensive margin is measured as the (value weighted) share of all products that are imported by a country from a specific exporting country in all products imported from the world. The intensive margin is defined as the value share of imported products from this specific exporter country in the total amount of world imports within the very same product group.

[4]Crozet, Milet, Mirza (2013) estimate a two part model with French firm level data focusing on the impact of domestic regulation on the exports of professional services. Their set-up is similar to ours since they define the extensive margin as the probability of entry into a specific destination market.

the nature of service trade is likely to differ between service and manufacturing firms. Services exporting manufacturing firms are likely to be also goods exporters. Fixed and variable costs of services exports linked to goods exports can be expected to be lower since goods exporters tend to be more familiar with market conditions in destination markets.

The estimation results suggest that export market growth and a reduction in distance related costs produce the relatively strongest impact on the entry into new destination markets. However, the adjustment at the intensive margin dominates and contributes with more than 70 percent to the overall change in export flows. IMF projections suggesting an expected increase in market size of 20.3% on average across destinations between 2012 and 2017 result in a pronounced increase in Austrian services exports to Extra-EU destinations. Counterfactually increasing firm productivity broadens the exporter base and leads to the largest adjustment at the extensive margin in the most distant markets. Again, in this scenario the adjustment of exports mainly occurs by trade deepening. Comparing manufacturing firms to services firms all counterfactual scenarios reveal a greater importance of the extensive margin for the manufacturing sector. Moreover, it is interesting that the overall change in services exports is more pronounced for firms in the manufacturing sector. Only the impact of a reduction in distance related costs forms an exception to this pattern.

The remainder of the paper is organized as follows: Section 2 discusses the theoretical model and motivates the application of the Heckman sample selection model. Based on the model with heterogeneous firms we present the empirical specification and derive the functional composition of the comparative static analysis. In section 3 we present the data, descriptive statistics and the regression and robustness analysis. section 4 contains the counterfactual analysis and section 5 concludes.

2   A Simple Firm-Level Gravity Model

To motivate the empirical specification of the firm level gravity model estimated below, we envisage a standard monopolistic competition model of bilateral service trade with CES-preferences and heterogeneous firms as introduced by Melitz (2003). As our sample of firms refers to a single country, we consider one exporter country and skip the corresponding index. Each firm i produces a variety of a service and may export it to $j = 1, ..., J$ destination countries. Firms are assumed to differ in their (labour) productivity so that the more productive firms exhibit lower marginal costs.

In this monopolistic competition framework profit maximization implies that in each market firms price a mark-up over its firm and destination market specific marginal costs,

$$p_{ij} = \frac{\sigma c_i \tau_j}{\sigma - 1}, \tag{1}$$

where p_{ij} denotes the price of variety i in destination market j and $\sigma > 1$ is the elasticity of substitution. c_i refers to firm specific marginal costs that are inversely related to its productivity. $\tau_j \geq 1$ stands for destination specific trade costs for service trade flows to country j. Following the literature (see e.g. Helpman et al., 2008; Crozet and Koenig,

2010), profits of firms are assumed to be separable across markets and are given by

$$\pi_{ij} = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\frac{c_i\tau_j}{P_j}\right)^{1-\sigma}E_j - f_j. \qquad (2)$$

f_j captures destination specific fixed costs of serving market j. $P_j = \left(\sum_k^{N_k} p_{kj}^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$ denotes the CES-price index in importer country j and E_j the income in country j that is spent on services, which is interpreted as destination market size. Exports of firm i to country j will be observed if market specific profits are positive, or, when taking logs, a latent variable z_{ij}^* describing the propensity of firm i to export to destination market j that is defined as

$$z_{ij}^* = -\ln\sigma + (1-\sigma)\ln(\frac{\sigma}{\sigma-1}) + (1-\sigma)\ln c_i + (1-\sigma)\ln\tau_j + \ln\frac{E_j}{P_j^{1-\sigma}} - \ln f_j \qquad (3)$$

is positive. We assume that $\pi_{ii}(c_i) > 0$, i.e., that the home market is always served. The value of firm i's exports to country j, if positive, can be shown to amount to

$$X_{ij} = \left(\frac{p_{ij}}{P_j}\right)^{1-\sigma}E_j = \left(\frac{\sigma}{\sigma-1}\frac{c_i\tau_j}{P_j}\right)^{1-\sigma}E_j \text{ if } z_{ij}^* \geq 0 \qquad (4)$$

or rewriting it in logs

$$x_{ij} = (1-\sigma)\ln\frac{\sigma}{\sigma-1} + (1-\sigma)\ln c_i + (1-\sigma)\ln\tau_j + \ln\left(\frac{E_j}{P_j^{1-\sigma}}\right) \text{ if } z_{ij}^* \geq 0. \qquad (5)$$

Firm i only exports its services to destination market j if it is profitable to do so. Hence, firms select themselves systematically into the group of service traders to destination j based on the potential operating profits they are able to achieve in these markets relative to the corresponding fixed costs of serving that market (see Helpman et al., 2008). Specifically, the model implies that the decision of firm i to serve the foreign market j depends on its marginal costs and thus its productivity, the associated variable and fixed trade costs of exporting services to the respective destination market and, lastly, on the size of the destination markets. Given the distribution of the firms' productivity, only a fraction of firms – the most productive ones – will be able to achieve high enough operating profits and decide to export to a specific destination market (extensive margin). Firms with a productivity level below the threshold only serve the domestic market, where trade barriers are assumed to be absent or low. Services exports of firm i to destination market j are more likely to be observed the lower are the bilateral trade barriers, τ_j, and the lower are the fixed costs, f_j, of exporting to the respective market. Foreign market size exerts a positive impact on the propensity to export as one would expect. With the exception of fixed trading costs the model suggests that essentially the same set of variables determine the value of a firm's service export to a specific destination market (intensive margin). The observed trade flows will be higher the more efficient firms are able to produce, the lower the variable trade costs and the larger the destination markets are.

2.1 Empirical Specification and Comparative Static Analysis

Under normality of the unobserved stochastic disturbances, one can use a standard Heckman sample selection model based on the latent propensity to export, z_{ij}^*, for the selection equation and the nominal export volume, x_{ij}, for the outcome equation. While the Heckman sample selection model seems restrictive for estimation, it has also important advantages. Under the assumption of a bivariate normal distribution, it is possible to derive theory consistent comparative statics and to disentangle the reactions of firms at the intensive and extensive margins as a response to changes in exogenous determinants. A non-parametric estimation framework would not allow such a decomposition.[5]

To set up the econometric specification we subsume the set of explanatory variables of the outcome equation into the vector w_{ij} with corresponding parameter vector β. The right hand side variables of the selection equation are collected in v_{ij} with parameter vector γ and include those of the outcome equation, w_{ij}, plus additional proxies of destination-specific and firm-specific fixed costs. Hence, identification not only relies on the functional form of the likelihood, but also on exclusion restrictions. Cameron and Trivedi (2006) show that the sample selection model, since it is non-linear, is formally identified without any exclusion restriction and precise estimation will be possible if the variation of $v_{ij}\gamma$ is large enough. However, adding an exclusion restriction is recommended, if the Mills' ratio turns out highly collinear to the explanatory variables in the outcome equation, especially when two-step estimators are used.

Denoting the iid disturbances by $(\varepsilon_{ij}, \eta_{ij})$, for each service firm the empirical specification of the sample selection model may be written as:

$$z_{ij}^* = v_{ij}\gamma + \eta_{ij} \tag{6}$$

$$x_{ij} = \begin{cases} w_{ij}\beta + \varepsilon_{ij}, & \text{if } z_{ij}^* \geq 0 \\ \text{unobserved}, & \text{if } z_{ij}^* < 0 \end{cases} \tag{7}$$

$$\eta_{ij}, \varepsilon_{ij} \sim N(0, (1, \sigma_\varepsilon^2, \rho\sigma_\varepsilon)). \tag{8}$$

The comparative static analysis has to refer to both the extensive margin (selection into exporting to a specific destination market) and the intensive margin (change in services exports to a specific destination given they are positive). For firms, which decided to export, the conditional expectation of their services exports can be derived as:

$$E[x_{ij}|z_{ij}^* \geq 0] = w_{ij}\beta + \rho\sigma_\varepsilon\lambda(v_{ij}\gamma), \ \lambda(v_{ij}\gamma) = \frac{\phi(v_{ij}\gamma)}{\Phi(v_{ij}\gamma)}. \tag{9}$$

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[5]So far, as outlined in the introduction, the common practice in estimating gravity models distinguishing between the intensive and extensive margins seem to be mainly based on aggregate figures at the industry and/or destination country level and the number of firms in an industry and/or destination is considered to reflect reactions at the extensive margin.

Marginal effects conditional on positive services exports can thus be calculated as (see Cameron and Trivedi, 2006; Greene, 2008):

$$\frac{\partial E[x_{ij}|z_{ij}^* \geq 0]}{\partial x_{ij,k}} = \beta_k - \rho\sigma_\varepsilon\gamma_k(\lambda_{ij}^2 + v_{ij}\gamma\lambda_{ij}). \tag{10}$$

To quantify the impact of a change in exogenous determinants on the extensive and intensive margin of service trade, we compare the expected export flows in the counterfactual and the baseline scenario. Thereby we aggregate the implied percentage changes of each firm to weighted averages of groups of firms and report aggregate group specific figures. Hence, changes at the extensive margin can be analyzed in terms of the probabilities of the firms' export status in a particular destination. It is not necessary to derive predicted individual changes in the firm's actual export status. Actually, this latter approach involves the prediction of a dummy variable based on estimated probabilities and risks erroneously classifying exporters as non-exporters and viz versa. Here, we follow Yen and Rosinski (2008, p. 5) and Staub (2014) and first calculate the estimated expectation of the positive trade flows in levels as

$$E[e^{x_{ij}}|z_{ij}^* \geq 0] = e^{w_{ij}\beta + \sigma_\epsilon^2/2}\frac{\Phi(v_{ij}\gamma + \rho\sigma_\epsilon)}{\Phi(v_{ij}\gamma)}. \tag{11}$$

The corresponding unconditional expectation is therefore given by:

$$E[e^{x_{ij}}] = E[e^{x_{ij}}|z_{ij}^* \geq 0]P(z_{ij}^* \geq 0) = e^{w_{ij}\beta + \sigma_\epsilon^2/2}\Phi(v_{ij}\gamma + \rho\sigma_\epsilon). \tag{12}$$

Aggregating over a set of N exporting firms yields $\sum_{i=1}^{N} E[e^{x_{ij}}]$ as a measure of the expected aggregate nominal service trade flow of this firm group to country j. Note, this measure considers both exporting and non-exporting firms, but sets exports in case of non-exporter status to zero, which occurs with probability $1 - P(z_{ij}^* \geq 0)$.

Moreover, one can decompose the expected aggregate export volume into two components in order to analyze the reaction of the intensive and the extensive margin of adjustment as response to changes in exogenous variables. The first component refers to continuing exporters holding the probability of exporting constant (intensive margin). Second, the probability of exporting to a specific destination may change at given conditional expectations of positive exports (extensive margin). In particular, the expected percent change (G_{ij}) for firm i exporting to destination country j can be decomposed as:

$$
\begin{aligned}
G_{ij} &= \frac{E[e^{x_{ij}^C}] - E[e^{x_{ij}}]}{E[e^{x_{ij}}]} \\
&= \frac{E[e^{x_{ij}^C}|z_{ij}^{*C} \geq 0]P(z_{ij}^{*C} \geq 0) - E[e^{x_{ij}}|z_{ij}^{*C} \geq 0]P(z_{ij}^{*C} \geq 0)}{E[e^{x_{ij}}|z_{ij}^* \geq 0]P(z_{ij}^* \geq 0)}
\end{aligned}
\tag{13}
$$

(intensive margin at constant probability to export)

$$+ \frac{E[e^{x_{ij}}|z_{ij}^{*C} \geq 0]P(z_{ij}^{*C} \geq 0) - E[e^{x_{ij}}|z_{ij}^* \geq 0]P(z_{ij}^* \geq 0)}{E[e^{x_{ij}}|z_{ij}^* \geq 0]P(z_{ij}^* \geq 0)}$$

(extensive margin at constant positive export flows).

Thereby, superscript C refers to the counterfactually changed situation. Inserting the conditional expectations and the probabilities to export from above yields the decomposition:

$$
\begin{aligned}
G_{ij} &= \frac{\Phi(v_{ij}^C\gamma + \rho\sigma_\epsilon)\left[e^{x_{ij}^C\beta + \sigma_\epsilon^2/2} - e^{w_{ij}\beta + \sigma_\epsilon^2/2}\right]}{e^{w_{ij}\beta + \sigma_\epsilon^2/2}\Phi(v_{ij}\gamma + \rho\sigma_\epsilon)} \\
&+ \frac{\left(\Phi(v_{ij}^C\gamma + \rho\sigma_\epsilon) - \Phi(v_{ij}\gamma + \rho\sigma_\epsilon)\right)\left[e^{w_{ij}\beta + \sigma_\epsilon^2/2}\right]}{e^{w_{ij}\beta + \sigma_\epsilon^2/2}\Phi(v_{ij}\gamma + \rho\sigma_\epsilon)} \\
&= \frac{\Phi(v_{ij}^C\gamma + \rho\sigma_\epsilon)}{\Phi(v_{ij}\gamma + \rho\sigma_\epsilon)}\left[e^{(x_{ij}^C - x_{ij})\beta} - 1\right] + \left(\frac{\Phi(v_{ij}^C\gamma + \rho\sigma_\epsilon)}{\Phi(v_{ij}\gamma + \rho\sigma_\epsilon)} - 1\right).
\end{aligned} \tag{14}
$$

The contribution to the intensive margin of firm i is therefore given as:

$$
int_{ij} = \frac{\Phi(v_{ij}^C\gamma + \rho\sigma_\epsilon)}{\Phi(v_{ij}\gamma + \rho\sigma_\epsilon)}\left[e^{(x_{ij}^C - x_{ij})\beta} - 1\right], \tag{15}
$$

while contribution of the extensive margin reads:

$$
ext_{ij} = \left(\frac{\Phi(v_{ij}^C\gamma + \rho\sigma_\epsilon)}{\Phi(v_{ij}\gamma + \rho\sigma_\epsilon)} - 1\right). \tag{16}
$$

Adding these two components yields the corresponding overall change:

$$
tot_{ij} = int_{ij} + ext_{ij}. \tag{17}
$$

In order to obtain the aggregate percentage change for a group of firms of size N, we use the following weighting scheme:

$$
\frac{\sum_{i=1}^N E[x_{ij}^C] - E[x_{ij}]}{\sum_{i=1}^N E[x_{ij}]} = \sum_{i=1}^N tot_i \frac{E[e^{x_{ij}}]}{\sum_{k=1}^N E[e^{x_{kj}}]} \tag{18}
$$

and similarly for the extensive an intensive margin. In our empirical exercise, these weights will be based on the predictions of the baseline model. The counterfactual experiments first focus on the overall response in trade flows comparing the predictions from the baseline and counterfactual scenario using (17) and (18). In a second step, we decompose the overall percentage change in exports into its contribution at the extensive (16) and intensive margin (15) applying the same aggregation as in (18). Thereby, we first consider continuing exporters (intensive margin) holding the probability of exporting constant, and second, we calculate changes in the probability of exporting at given conditional expectations of positive exports (extensive margin).

3 Data and Estimation Results

3.1 Data Description

The empirical analysis makes use of the Austrian Trade in Services Survey of non-financial corporations, which is conducted by Statistics Austria on behalf of the Austrian National-albank (OeNB) since 2006. The survey is mandatory and based on a stratified sample with the following threshold levels: export values above $50,000 \mathbin{\text{€}}$ or $200,000 \mathbin{\text{€}}$ depending on the industry affiliation of the firm. Overall, the survey covers at least 90 percent of all services exports in every industry.[6] The service exporting firms may belong to either the service or the manufacturing sector. In total our sample covers 5,554 service traders and excludes financial and insurance companies as well as the tourism sector. Moreover, the sample includes only firms that exported services during the period 2006 to 2009 and that reported exports of services for at least one destination country. Additional information on the industry affiliation of the company, employment and sales revenues is drawn from matched Structural Business Survey data from Statistics Austria. We aggregated this information to a cross-section by averaging over these years so that the data vary by firm and destination country.[7]

Furthermore, the matched OeNB's company database provides us with information on outward FDI (yes or no) as well as foreign ownership of the firms (yes or no). The country dimension of services exports is restricted to 37 individual destination countries and we merged diverse country information from different sources, including CEPII sources[8] for variables on geographical, cultural and historical ties. The sample of 37 destination covers 87 percent of Austrian exports of services and thus includes the most important trading partners. This set of explanatory variables includes information on bilateral distance between the trading partners, contiguity, common language, historical ties and whether the destination country is landlocked. The size of the destination market is captured by real GDP (measured in billions of constant 2000 US Dollars) which in addition to real GDP per capita is drawn from the World Bank's World Development Indicators (WDI) database. In addition, we make use of the starting a business indicators provided by the World Bank. These indicators collect information on the number of days and procedures as well as the costs to start a business in the respective host country. We use the information on the number of days as a proxy for the fixed costs exporting firms face when they decide to start exporting to a particular host country. For an overview of the data sources see Table A1 in the Appendix. Table A2 in the Appendix reports the list of 37 destination countries. While 6 out of the 37 destination countries are landlocked, 7 share a common border, 5 countries share a common language and 5 countries share past historical links with Austria (Czech Republic, Croatia, Hungary, Slovenia and Slovakia).

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[6]The survey data used in this paper do not include imputed values for missing data or estimates for trade values below the reporting thresholds.

[7]As the focus of this paper is on the application of the new decomposition method, we refrain from applying a sample selection panel model which would complicate the empirical setting and estimation considerably and is thus beyond the scope of the current contribution.

[8]http://www.cepii.fr/CEPII/en/welcome.asp

Summary statistics for both the dependent variable as well as the set of explanatory variables are reported in Table 1. In specific, we compare service exporting firms that export to a specific destination to those that do not serve this specific market. It offers first glimpse on the relevance of firm characteristics as well as the influence of destination market characteristics in the choice of destination markets for services exports. Interestingly, in our data set the percentage of positive service export flows across all 37 individual destination countries is higher in the sub-sample of service firms (23 percent) than for manufacturing firms (17 percent). On average, service sector firms are active in 8 export destinations, while manufacturing service exporters serve an average of 6 destinations. In line with the findings in the literature, firms serving a specific destination market are

Table 1: Descriptive statistics on firm and destination specific services export flows

| | Service Sector | | | | Manufacturing Sector | | | |
| | Zero Export flows | | Positive Exports: 23% | | Zero Export flows | | Positive Exports: 17% | |
Variables	Obs	Mean	Obs	Mean	Obs	Mean	Obs	Mean
Exports	123463	0	36007	2268.77	38100	0	7928	3193.97
Foreign control	123463	0.37	36007	0.36	38100	0.34	7928	0.41
Outward FDI	123463	0.07	36007	0.09	38100	0.17	7928	0.34
Sales	123463	37688.80	36007	88856.97	38100	113506.50	7928	243417.00
Employees	119408	84.44	35474	176.96	37457	258.93	7868	517.47
Sales/Employee	119408	1934.74	35474	3241.40	37457	637.33	7868	537.59
real GDP	123463	735.30	36007	911.80	38100	730.49	7928	989.79
real GDP p.c.	123463	19148.08	36007	19894.98	38100	19273.23	7928	19525.73
real GDP 2017	123463	884.74	46235	1061.40	38100	877.41	7928	1133.25
Distance	123463	2813.04	36007	1459.62	38100	2701.77	7928	1573.60
Contiguity	123463	0.17	36007	0.38	38100	0.18	7928	0.40
Historical Ties	123463	0.07	36007	0.11	38100	0.07	7928	0.11
Com. language	123463	0.11	36007	0.21	38100	0.12	7928	0.21
Landlocked	123463	0.14	36007	0.23	38100	0.15	7928	0.22
Time zone diff.	123463	1.66	36007	0.77	38100	1.59	7928	0.83
Start Business	115755	21.79	35095	19.13	35730	21.47	7810	19.82

Notes: Source: OeNB, Statistics Austria, WIFO calculations. Firms without any services exports are excluded. For an overview of the data sources see Table A1 in the Appendix.

on average characterized by larger size (higher sales and more employees), and they are more often foreign direct investors as compared to services exporters not serving this particular market. Higher productivity of exporters is observed for service firms but not for manufacturing firms. However, as compared to service firms the manufacturing firms are considerable larger on average in terms of their sales and employees and especially so the service exporters. Also the services exports of manufacturing firms are higher on average and more of them run foreign affiliates. Markets not served are most often the more distant markets both, in terms of geographical distance in kilometers as well as in terms of time zone differences. Additionally, all other trade barrier variables (contiguity, historical ties, language, landlocked) indicate higher impacts of such barriers for firms serving less destination markets. In particular, less than 20 percent of zero trade flows refer to neighboring countries, less than 10 percent to markets with historical ties, etc.. This marks the clear geographical concentration of Austrian services exports to close

markets in terms of geography, culture and language, a fact that can also be read from the results for firms serving a particular market (column 4 and 8 in Table 1).

3.2 Econometric Analysis

Table 2 reports the estimation results of the Heckman sample selection model based on the specification discussed in Section 2.1, thereby distinguishing between service exporters in services sectors and manufacturing sectors. The Heckman sample selection model is estimated by maximum likelihood.

In both equations, we use overall firm size (log(total sales)) and labor productivity (log(total sales per employee)) as proxies of marginal costs. The former controls the dependence of marginal costs on output in the absence of constant returns to scale, while the latter is used as a proxy of productivity that would ideally be measured by total factor productivity. However, this figure remains unobserved in the present sample of firms. In the comparative static analysis below, we consider the impact of counterfactual changes in labor productivity interpreted as a shifter of the marginal cost curve. In addition, the set of explanatory variables includes real GDP per capita in the host country as additional control. This variable captures the stylized fact that the domestic supply of services tends to be larger in more advanced countries (see Grünfeld and Moxnes, 2003). Lastly, both the selection and the outcome equation include industry dummies.

In order to avoid relying on the normality assumption for identification only, we also use exclusion restrictions in the outcome equation. The theoretical model displayed in Section 2.1 suggests that trade frictions that affect the fixed trade cost of exporting but not the variable trade costs form a valid exclusion restriction. In line with Helpman et al. (2008), we make use of the country-level data on regulation costs of firm-entry provided by the World Bank. These "starting a business" indicators measure the regulation costs by the number of days, the number of legal procedures as well as the costs (as percentage of GDP per capita) firms face when they legally start operating a business in the particular host country. Although exporters may not need a business operation in the respective host country, we surmise that these costs are a good proxy variable for the fixed costs exporting firms face.

Additionally, we also include the foreign control indicator variable as an exclusion variable as firms may have better access to foreign markets if they are part of a multinational network of firms. On the other hand, these affiliates may concentrate on local markets. As the results in column 2 and 4 of Table 2 confirm, the additional cost measures have substantial explanatory power in the Probit equation. The number of days to start a business is economically and statistically significant in explaining the selection into export markets. Also, the foreign control dummy variable as a measure of fixed costs significantly affects the formation of service trading relationships, although the impact differs between firms in the service and manufacturing sector. The negative correlation of foreign control and the formation of new export relations in the service sector seems plausible, as affiliates of multinational firms in the service sector mainly provide services to the domestic (Austrian) market rather than export services to other third countries.

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Table 2: Heckman estimates

Variable	Service Sector		Manufacturing Sector	
	Selection	Outcome	Selection	Outcome
Ln Size	0.185***	0.600***	0.207***	0.596***
	(0.002)	(0.014)	(0.005)	(0.048)
Ln Productivity	0.147***	0.625***	0.086***	0.687***
	(0.003)	(0.014)	(0.010)	(0.047)
Ln Distance	−0.245***	−0.561***	−0.202***	−0.305***
	(0.009)	(0.039)	(0.018)	(0.085)
Time zone diff.	−0.040***	−0.026*	−0.033***	−0.048*
	(0.003)	(0.014)	(0.007)	(0.028)
Ln GDP	0.193***	0.646***	0.207***	0.627***
	(0.003)	(0.018)	(0.006)	(0.053)
Ln GDP pc.	−0.072***	−0.347***	−0.085***	−0.441***
	(0.006)	(0.023)	(0.011)	(0.049)
Contiguity	0.381***	0.970***	0.432***	0.928***
	(0.014)	(0.054)	(0.027)	(0.132)
Historical ties	0.141***	0.329***	0.133***	0.235**
	(0.016)	(0.056)	(0.030)	(0.118)
Com. language	0.431***	1.435***	0.347***	1.082***
	(0.014)	(0.053)	(0.027)	(0.116)
Landlocked	−0.161***	−0.475***	−0.183***	−0.268**
	(0.016)	(0.055)	(0.031)	(0.116)
Foreign control	−0.025***		0.059***	
	(0.009)		(0.017)	
Ln Start Business	−0.084***		−0.043***	
	(0.006)		(0.012)	
Constant	−0.878***	−0.548*	−1.159***	−1.615**
	(0.076)	(0.306)	(0.165)	(0.821)
Mills' ratio		0.803***		0.510*
		(0.087)		(0.279)
Industry dummies ($\chi^2(3)$)	5394.783***		307.579***	
Observations		146510		42875
Log-Likelihood		-150289.5		-35997.83

Notes: Dependent variables are (i) service export participation (selection equation); (ii) non-zero export flows (output equation). Standard errors are reported in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent level. Source: OeNB, Statistics Austria, WIFO calculations.

The significant coefficients in the selection equation as well as the significant Mills' ratio highlight that the selection of firms into exporting is systematic and needs to be considered in the econometric specification to consistently estimate the export flows. Regarding the trade friction variables in Table 2 all estimated coefficients exhibit the expected sign and are significant in explaining the probability of exporting services as well as the magnitude of export flows. Both firm characteristics - size (in terms of the number of employees) and productivity (defined as sales per employee) - have a significant impact on the selection into specific export destinations and the volume of flows. Distinguishing between the service and the manufacturing sector highlights that the productivity level seems to be more important for firms in the service sector exporting genuine services with respect to entering the market.

Indeed a Wald test for the hypothesis that one should estimate a pooled model for service and manufacturing firms is rejected. Specifically, the Wald test statistic referring to the equality of all parameters with exception of the constant and the industry dummies takes the value of 190.19 and is significant at a 1%-level. The test is also significant when applied separately to the selection and the outcome equation.[9]

The estimation results also indicate significant effects of trade frictions both for the extensive and intensive margin of services trade as indicated by the significant impact of log distance, the timezone difference, contiguity, common language and landlockedness of the export destination.

In order to interpret the coefficients also in quantitative terms, we compute marginal effects for the most important explanatory variables following Greene (2008) and report them in Table 3. The calculated marginal effects give the full effect (combining the intensive and extensive margin) of a change in one regressor on services exports and can be interpreted as elasticities. The corresponding figures are calculated at firm level and Table 3 reports the averages across firms. Comparing the marginal effects for a change in distance by 1 percent across firms, we can conclude that the impact of distance is almost twice as large for service firms than for manufacturing firms (service export flows are reduced by 0.410 percent for service firms compared to 0.223 percent for manufacturing firms all other factors equal). In contrast, the marginal effects from changes in market size (proxied by real GDP) on services exports are relatively balanced across service and manufacturing firms. A 1 percent increase in market size raises services exports by 0.5 percent in service and manufacturing sectors all other factors held constant. The corresponding marginal effect for an increase in productivity (all other factors, especially employment, held constant) is slightly higher for manufacturing (0.652) than service sector firms (0.535), as is the marginal impact of firms size (0.486 vs. 0.512).

The empirical results point to the relevance of trade frictions, firm characteristics and destination market conditions for Austrian services exports. To assess the impact of substantial changes in trade related costs, firm productivity and market conditions,

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[9]Since the estimated models for service and manufacturing firms do not have any parameter in common, the Hessian (and thus the variance-covariance matrix of the parameters) of the pooled model is block diagonal. Thus, the Wald test can easily be calculated based on the two separately estimated models reported in Table 2.

Table 3: Marginal effects on export flows

	Mean	Std. dev.	Minimum	Maximum
	Service Sector			
Ln Distance	−0.410	0.019	−0.540	−0.372
Ln Size	0.486	0.014	0.457	0.584
Ln Productivity	0.535	0.011	0.512	0.613
Ln GDP	0.527	0.015	0.497	0.629
	Manufacturing Sector			
Ln Distance	−0.223	0.008	−0.278	−0.208
Ln Size	0.512	0.008	0.496	0.568
Ln Productivity	0.652	0.003	0.645	0.675
Ln GDP	0.543	0.008	0.528	0.600

Source: OeNB, Statistics Austria, WIFO calculations.

we perform a counterfactual analysis in the Section 4. This allows us to examine how different scenarios influence the observed pattern of trade and the composition of services exports between extensive and intensive margins by destination country groups.

3.3 Robustness Analysis

We assess the robustness of the estimation results along several dimensions (see Table A3 in the Appendix). First, we re-estimate the first stage Probit model using the semiparametric SNP estimator discussed by De Luca (2008), which allows for deviations from the normal in terms of skewness and kurtosis. In general, the estimated parameters of the SNP-models all have the same sign and almost all of them exhibit similar size as that of the corresponding Probit models, although the SNP-model indicates some deviations from the normal distribution, especially for the sample of the service firms. However, plotting estimates of the densities of the disturbances against the normal shows only slight deviations, despite the rejection of a Likelihood ratio test of the Probit model in favour of the SNP-model. Overall, we conclude that the normality assumption provides a reasonable approximation of the data generating process and that the pursued maximum likelihood approach seems to be justified.

Second, we re-estimated the outcome equation model using alternative two-step (parametric and semiparametric series) estimators (not reported in Table A3, but are available upon request). It turns out that the available alternative estimators bear their own problems, again confirming the use of the maximum likelihood estimator.[10] Overall, however the predictions of all estimated ML and two-step outcome models turned out nearly iden-

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[10]The estimation of the standard two-step Heckman sample selection model yields differences in some of the estimated parameters (i.e., that of log firm size) despite significant parameter estimates referring to the exclusion restriction (see Table 2). This indicates that the Heckman two-step estimator is prone to collinearity of the estimated Mills' ratio and the explanatory variables in the outcome equation. The same problems arise even more severely if one uses the two-step series estimators proposed by Newey

tical and highly correlated (correlation >0.95). Given that the counterfactual analysis relies on these predictions, we are confident to obtain reliable comparative static results.

Third, we introduced destination country dummies and re-estimated all specifications to account for the impact of trade resistance terms. This implies that country specific variables (like log GDP of the destinations) cannot be included. The estimation results for the remaining parameters of the firm specific variables turn out very similar to the baseline model (Table A3).

To sum up, the robustness analysis suggests that maximum likelihood estimates are preferable and reasonably robust. The deviations in terms of the third and fourth moment seem to be moderate justifing to proceed with the normality assumption as a reasonable approximation of the data generating process and the maximum likelihood estimates reported in Table 2. As mentioned above, the main advantage of this approach lies in the possibility to derive counterfactual predictions based on the estimated probabilities of exporter status and conditional expectations given positive export flows as demonstrated in Section 2.1. With a semiparametric estimation procedure the prediction of counterfactuals along these lines is not possible.

4 Counterfactual Analysis

4.1 Design of Experiments

The subsequent counterfactual analysis is based on the estimation results from the Heckman sample selection model reported in Table 2. The empirical results point at the relevance of firm heterogeneity, trade barriers and characteristics of the destination market (market size). In order to assess the importance of these factors for Austrian services exports we consider four counterfactual scenarios for all countries and country groups in our sample. In particular, we can use the predictions from the model to examine how a change in one of these variables affects the pattern of trade along both the extensive and intensive margin as introduced in Section 2.1. This decomposition is new and extends the existing evidence on trade margins.

Regarding the firm's decision to serve foreign markets and the respective productivity threshold, we expect important differences across countries, especially with respect to contributions from the extensive and intensive margin. Markets that can be served with services exports more easily (less costly) will experience an increase in services trade mainly due to an increase in volume of existing trade relationships (intensive margin). In contrast, new markets in which uncertainty or other cost factors still hamper bilateral trade flows will experience an increase in trade attributable to the formation of new trade relationships besides also increasing trade flows from existing trading partners.

In particular, the four experiments designed are the following: (i) a reduction in bilateral distance by 10 percent which mirrors a proportional reduction in distance related

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(2009). The reason is that these series estimators include a linear term in the approximation of the Mills' ratio that is highly correlated with the explanatory variables of the outcome model.

costs for all countries, (ii) an increase in productivity for all firms in the lowest quantile of the productivity distribution by 5 percent, (iii) an increase in productivity for all firms in the highest quantile of the productivity distribution by 5 percent and (iv) a change in market size based on projections of the IMF World Economic Outlook for the GDP in 2017 which predict an increase in market size in 34 out of our sample of 37 countries (only for Ireland, Portugal and Greece a decrease is projected) countries. In particular, these projections suggest an average increase in real GDP of 20.3% over the period $2012 - 2017$.

4.2   Counterfactual Results

Based on the different counterfactual experiments considered in the analysis we can identify the heterogeneous trade responses due to changes in trade related costs, firm characteristics and market size. In order to highlight how these elasticities vary along specific country dimensions, we report the results according to the popularity of the respective export destination. Specifically, we group destination markets into the following 5 groups: (1) neighbouring countries including the Czech Republic, Germany, Hungary, Italy, Liechtenstein, Slovakia, Slovenia and Switzerland, (2) traditional export markets in the EU comprising Belgium, Croatia, Finland, France, Great Britain, the Netherlands, Poland, Romania, Spain and Sweden, (3) traditional export markets in the Extra-EU including Japan, Russia, Turkey, Ukraine and the USA, (4) less traditional, new export markets in the EU which are defined by Bulgaria, Cyprus, Denmark, Estonia, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta and Portugal as well as (5) new export markets Extra-EU which include Australia, Brazil and New Zealand.

Table 4 summarizes the counterfactual results along these dimensions revealing patterns that are valid across the four scenarios. First, increases in export flows are more pronounced in the more "distant" (culturally as well as geographically), less traditional export destinations. Thus, gains in exports from lowering trade barriers by 10 percent vary between 6.51 percent for countries sharing a common border and 8.31 percent for new export markets in the Extra-EU area in the upper panel for service firms, and between 4.10 percent and 5.84 percent for manufacturing firms (lower panel). At the same time, market growth projections up to the year 2017 by the IMF are most favorable outside the most traditional Austrian export markets. Specifically, five countries out of these two country groups (USA, Japan, Brazil, Turkey and Australia) are ranked top regarding their future market size expansions which induces potential trade gains for Austrian service exporters. Overall the counterfactual analysis predicts an increase in services exports between 5.84 percent for neighboring countries and between 19.07 percent and 28.49 percent for service firms (upper panel) and 20.60 percent to 31.83 percent for manufacturing firms (lower panel) in the Extra-EU countries. Service export responses are quite low in the group of least productive firms. While the promotion of less productive firms yields an overall increase in exports of 0.32 percent (0.38 percent) for services firms (manufacturing firms), trade responses from stimulating high productive firms are about 4 times larger. However, the overall impact again increases with the difficulty to serve distant. less traditional export markets.

Table 4: Change in overall services exports in four counterfactual scenarios by sector and destination country group

	Reduction in distance by 10 %	Market growth projections by IMF	Promotion of least productive firms	Promotion of most productive firms
	Services sector Changes in percent			
Neighbours	6.51	5.84	0.32	1.27
Traditional EU	7.17	7.60	0.32	1.35
Traditional Extra-EU	7.49	19.07	0.33	1.38
New EU	7.78	4.53	0.33	1.41
New Extra-EU	8.31	28.49	0.34	1.47
Total	6.73	7.14	0.32	1.30
	Manufacturing sector Changes in percent			
Neighbours	4.10	5.84	0.39	1.41
Traditional EU	4.99	8.42	0.37	1.52
Traditional Extra-EU	5.20	20.60	0.36	1.55
New EU	5.68	4.60	0.35	1.61
New Extra-EU	5.84	31.83	0.35	1.63
Total	4.42	7.98	0.38	1.45

Notes: Neighbouring countries: Czech Republic, Germany, Hungary, Italy, Liechtenstein, Slovakia, Slovenia and Switzerland; Traditional export markets in the EU: Belgium, Croatia, Finland, France, Great Britain, Netherlands, Poland, Romania, Spain and Sweden; Traditional export markets Extra-EU: Japan, Russia, Turkey, Ukraine and USA; New export markets in the EU: Bulgaria, Cyprus, Denmark, Estonia, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta and Portugal; New export markets Extra-EU: Australia, Brazil and New Zealand. - Source: OeNB, Statistics Austria, WIFO calculations.

Figure 1: The impact on the external and internal margin of exports in four counterfactual scenarios by sector and destination country - changes in percent
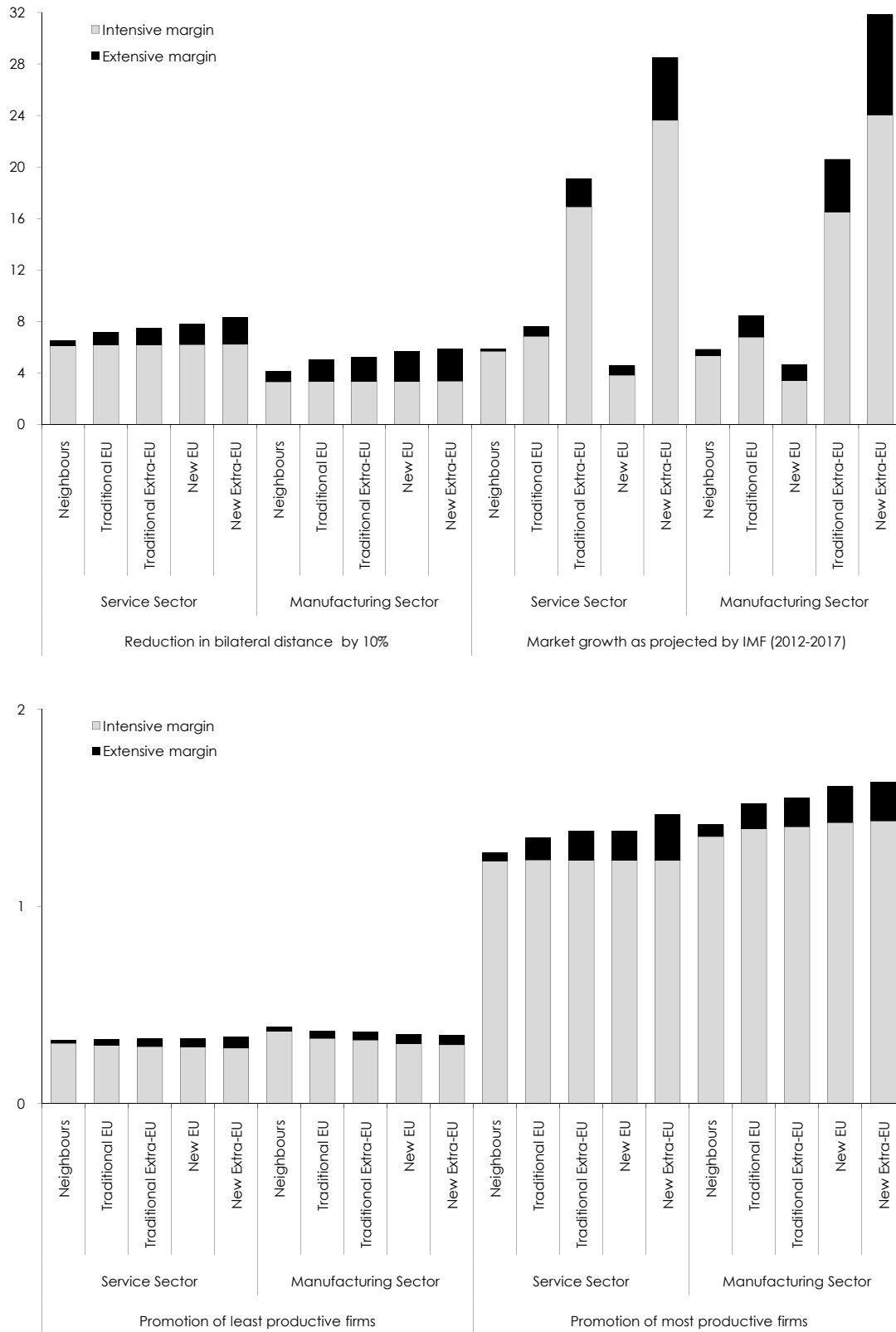
Second, concentrating on the differences of the results between the the service sector (upper panel) and the manufacturing sector (lower panel) reveals slightly higher overall impacts on services exports of manufacturing firms in all scenarios except for the scenario of lowering bilateral distance. Lowering trade barriers has a significantly smaller impact on service export flows for manufacturing firms than for service firms. Distance costs in services are mostly linked to coordination costs and the need for proximity in exchange due to the non-storable nature of many services ("proximity burden") rather than to physical transportation costs and the physical shipment of goods. Due to this "proximity burden", distance places a higher burden to the delivery of some services than goods trade as shown in earlier empirical studies (Francois and Hoekman, 2010; Francois and Christen, 2010). At the same time the nature of services trade is likely to differ between service sector and manufacturing sector firms, as services exports of manufacturing firms are most likely linked to the international production and export of goods (maintenance and repair, installations and assembly, marketing, innovation related services ect.).

Third, when we further decompose the overall change in exports into contributions from the intensive and extensive margin following the procedure given in Section 2.1 we find that increases in services exports in all experiments are predominantly driven by changes in the intensive margin of trade rather than the extensive margin (Figure 1). Indeed, given uncertainty and incomplete information which even weight more heavily in services trade, exporters are likely to start with low probability and with small transactions in new markets (e.g. Segura-Cayuela and Vilarrubia, 2008; Rauch and Watson, 2003). It is also for this reason, that the extensive margin involves small quantities, especially in more distant and difficult markets. However, the elasticities again vary by country groups and imply an unambiguous shift in the pattern of trade. While the intensive margin contributes most in neighboring countries, the adjustment of the extensive margin gains increased importance the more distant and the less relevant export market are. This holds in both sub-samples of service exporters - the service and the manufacturing sector - and across all experiments.

Fourth, comparing again the impacts between service sector and manufacturing sector services exports, we find the contribution of the extensive margin to be higher for manufacturing firms. Again this is valid across all four experiments but it is most pronounced with respect to lowering distance and the market growth experiment. In these two experiments, the effects at the extensive margin are 2 to 3 times higher than in the services sector. The share of the extensive margin spans from 9 percent in neighboring countries) to a share of 25 percent in new markets outside the EU in reaction to market growth as projected by the IMF (Figure 1; detailed results Table A4). In the experiment of reducing bilateral distance, the contribution of the extensive margin in service exporting manufacturing firms amounts to 43 percent of the overall change in services exports to new export markets and to about 20 percent in neighboring countries. This might be taken as an indication that new export relations that are more closely linked to goods exports involves larger volume transactions from the beginning and are likely to be linked to the lower burden of distance, uncertainty and incomplete information in such instances.

Overall, our findings are in line with earlier studies based on aggregated firm level studies in services trade (Breinlich and Criscuolo, 2011; Kelle and Kleinert, 2010; Ariu, 2011, 2012; Federico and Tosti, 2012) which reveal a more important role of the intensive margin than the extensive margin. They are also in line with Crozet et al. (2013) who approach the question in a similar way and estimate a two part model at the disaggregated firm level. Overall, the results for export of services are in contrast to those found in manufacturing, revealing a larger role of the extensive margin (Bernard et al, 2009; Lawless, 2010).

5 Conclusions

As more productive firms are more likely to select themselves into exporter status, the econometric analysis of firm-level export activities has to account for sample selection. Estimating a Heckman sample selection gravity model for a large sample of Austrian service exporting firms with potential trade relations to 37 destination countries reveals an important role of (physical) trade barriers in restricting services trade. Furthermore, destination market size is an important determinant of services exports of Austrian companies. In line with previous findings the estimation results confirm significant self-selection of firms into service exporting. Hence, the large and productive firms both exhibit a higher probability of exporting to a specific destination and a higher volume of exports if they indeed serve these markets.

Moreover, this paper applies a new approach to decompose changes in exports into one component referring to the extensive margin and one referring to the intensive margin. The decomposition allows to quantify counterfactual scenarios for aggregates of firm groups that might be relevant for economic policy. The scenarios considered are related to changes in trade costs, productivity and destination market size. Distinguishing between services exports of manufacturing and service firms, all counterfactual scenarios reveal larger overall changes in exports (except of a reduction in distance related costs) and more pronounced contributions at the extensive margin of service trade for manufacturing firms as compared the services firms.

In particular, the results suggest that export market growth and a reduction in distance related costs produce the relatively strongest impact on the entry into new destination markets. However, their impact on the intensive margin dominates and contributes with more than 70 percent to the overall change in export flows. IMF projections of the expected increase in market size of 20.3% on average between 2012 and 2017 suggest a pronounced increase in Austrian services exports to Extra-EU destinations. Specifically, five countries in the group of traditional and new Extra-EU markets (USA, Japan, Brazil, Turkey and Australia) are ranked top regarding their future market size expansions which may induce substantial trade gains. Policies aiming at promoting firm productivity play an important role for trade deepening in services. In this respect, the largest effects on the intensive margin have been found for the group of firms with already high productivity levels.

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7 Appendix

Table A1: Description and sources of additional variables

Variable	Definition	Source
Distance	km	CEPII: Mayer and Zignago (2011)
Time zone difference	Hours	WIFO calculations
Common border	0=No, 1=Yes	CEPII: Mayer and Zignago (2011)
Historical ties	0=No, 1=Yes	CEPII: Mayer and Zignago (2011)
Common language	0=No, 1=Yes	CEPII: Mayer and Zignago (2011)
Landlocked	0=No, 1=Yes	CEPII: Mayer and Zignago (2011)
real GDP	bn constant 2000 $	The World Bank (2012)
real GDP per capita	bn constant 2000 $	The World Bank (2012)
real GDP 2017	bn constant 2000 $	IMF (2012), WIFO calculations
Start Business	Days	The World Bank (2012)
Productivity	Sales/Employees	OeNB
Size	Employees	OeNB
Foreign control	0=No, 1=Yes	OeNB
Outward FDI	0=No, 1=Yes	OeNB
Exports	in 1000 $	OeNB, WIFO calculations
Sales	in 1000 $	OeNB, WIFO calculations

Table A2: Country list

ISO code	Name	Common border	Historical ties	Common language	Landlocked
AU	Australia				
BE	Belgium			•	
BG	Bulgaria				
BR	Brazil				
CH	Switzerland	•		•	•
CY	Cyprus				
CZ	Czech Republic	•	•		•
DE	Germany	•		•	
DK	Denmark				
EE	Estonia				
ES	Spain				
FI	Finland				
FR	France				
GB	Great Britain				
GR	Greece				
HR	Croatia		•		
HU	Hungary	•	•		•
IE	Ireland				
IT	Italy	•			
JP	Japan				
LI	Liechtenstein			•	•
LT	Lithuania				
LU	Luxembourg			•	•
LV	Latvia				
MT	Malta				
NL	Netherlands				
NZ	New Zealand				
PL	Poland				
PT	Portugal				
RO	Romania				
RU	Russia				
SE	Sweden				
SI	Slovenia	•	•		
SK	Slovakia	•	•		•
TR	Turkey				
UA	Ukraine				
US	USA				
Rest					

Table A3: Robustness analysis

| | SNP Binary Choice Model | | FE Estimation | | | |
| | Service | Manufacturing Probit | Service | | Manufacturing | |
			Selection	Outcome	Selection	Outcome
Ln Size	0.222***	0.340***	0.188***	0.614***	0.209***	0.594***
	(0.013)	(0.034)	(0.002)	(0.014)	(0.005)	(0.047)
Ln Productivity	0.187***	0.140***	0.150***	0.636***	0.087***	0.685***
	(0.011)	(0.020)	(0.003)	(0.014)	(0.011)	(0.046)
Ln Distance	−0.287***	−0.308***				
	(0.019)	(0.041)				
Time zone diff.	−0.069***	−0.068***				
	(0.006)	(0.013)				
Ln GDP	0.247***	0.336***				
	(0.015)	(0.034)				
Ln GDP pc.	−0.085***	−0.135***				
	(0.008)	(0.022)				
Contiguity	0.362***	0.717***				
	(0.027)	(0.091)				
Historical ties	0.202***	0.199***				
	(0.021)	(0.053)				
Com. Language	0.463***	0.533***				
	(0.029)	(0.066)				
Landlocked	−0.122***	−0.294***				
	(0.019)	(0.060)				
Foreign control	−0.021*	0.088***		−0.025***		0.060***
	(0.011)	(0.029)		(0.009)		(0.017)
Ln Start Business	−0.085***	−0.059***				
	(0.009)	(0.021)				
Constant	−0.832	−1.151	−3.537***	−5.556***	−3.163***	−5.099***
	fixed	fixed	(0.054)	(0.297)	(0.129)	(0.919)
Mills' ratio				0.844***		0.461*
				(0.083)		(0.278)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	Yes	Yes	Yes	Yes
Observations	146510	42875				
Skewness	0.586	0.352				
Kurtosis	4.039	2.935				

Notes: Dependent variables are (i) service export participation (selection equation); (ii) non-zero export flows (output equation). Standard errors are reported in parentheses. *, ** and *** indicate statistical significance at the 10-percent level, 5-percent level, and 1-percent level. Source: OeNB, Statistics Austria, WIFO calculations

Table A4: Counterfactual results (changes in percent)

		Neighbour marktes	Trad. markets EU	Trad. markets Extra-EU	New markets EU	New markets Extra-EU	Total
		Service sector					
Reduction in bilateral distance by 10%	Total change	6.51	7.17	7.49	7.78	8.31	6.73
	Int. margin	6.11	6.15	6.17	6.18	6.21	6.12
	Ext. margin	0.40	1.02	1.32	1.60	2.09	0.61
Promotion of less productive firms	Total change	0.32	0.32	0.33	0.33	0.34	0.32
	Int. margin	0.31	0.29	0.29	0.29	0.28	0.30
	Ext. margin	0.01	0.03	0.04	0.04	0.06	0.02
Promotion of highly productive firms	Total change	1.27	1.35	1.38	1.41	1.47	1.30
	Int. margin	1.23	1.24	1.24	1.24	1.23	1.23
	Ext. margin	0.04	0.11	0.15	0.15	0.23	0.07
Market growth as projected by IMF	Total change	5.84	7.60	19.07	4.53	28.49	7.14
	Int. margin	5.65	6.83	16.89	3.82	23.62	6.67
	Ext. margin	0.19	0.77	2.18	0.71	4.88	0.47
		Manufacturing sector					
Reduction in bilateral distance by 10%	Total change	4.10	4.99	5.20	5.68	5.84	4.42
	Int. margin	3.29	3.32	3.32	3.34	3.34	3.30
	Ext. margin	0.81	1.67	1.87	2.34	2.50	1.12
Promotion of less productive firms	Total change	0.39	0.37	0.36	0.35	0.35	0.38
	Int. margin	0.37	0.33	0.32	0.30	0.30	0.36
	Ext. margin	0.02	0.04	0.04	0.05	0.05	0.03
Promotion of highly productive firms	Total change	1.41	1.52	1.55	1.61	1.63	1.45
	Int. margin	1.35	1.39	1.40	1.43	1.43	1.37
	Ext. margin	0.06	0.13	0.14	0.18	0.20	0.08
Market growth as projected by IMF	Total change	5.84	8.42	20.60	4.60	31.83	7.98
	Int. margin	5.31	6.77	16.49	3.38	24.02	6.82
	Ext. margin	0.53	1.65	4.11	1.22	7.81	1.17

Notes: Neighbouring countries: Czech Republic, Germany, Hungary, Italy, Liechtenstein, Slovakia, Slovenia and Switzerland; Traditional export markets in the EU: Belgium, Croatia, Finland, France, Great Britain, Netherlands, Poland, Romania, Spain and Sweden; Traditional export markets Extra-EU: Japan, Russia, Turkey, Ukraine and USA; New export markets in the EU: Bulgaria, Cyprus, Denmark, Estonia, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta and Portugal; New export markets Extra-EU: Australia, Brazil and New Zealand. - Source: OeNB, Statistics Austria, WIFO calculations.