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Pattern, Determinants and Dynamics of Austrian Service Exports – A Firmlevel Analysis

Yvonne Wolfmayr, Elisabeth Christen and Michael Pfaffermayr

Abstract

Most firm-level research on the characteristics and strategies of globalized firms focuses on manufacturing industries while firm-level evidence on trade in services is still rare and has just recently begun to emerge. This study uses an unique dataset of Austrian service exporting firms over a four-year period to add to this literature. We show that service export participation is very low and highly concentrated among a few firms and that service exporters are on average larger and more productive than non-exporters. We also find that firm productivity increases with the number of export markets served. The detailed analysis on the export premium suggests the self-selection of firms as well as learning effects from exporting for export starters. The dynamic analysis reveals that the rate of export exits is high for export starters in the first year of exporting, especially for firms of small size. Movements into and out of exporting are however less frequent than moving in and out of individual markets. Entry and exit of markets (extensive margin) is an important component of overall export flows, especially for less popular markets, overall, however the intensive margin of trade contributes most. Analysis based on a Heckman sample selection specification including firm characteristics as well as the standard gravity variables on geographical characteristics of destination markets confirm this finding. In particular, distance to the destination market, firm productivity as well as destination market characteristics (market size, policy environment) significantly influence the probability of exporting but even more so the volume of service trade flows. Results from the counterfactual analysis suggest that export market growth and policy reforms produce the relative strongest impact on the entry into new markets. Hence, this decomposition of overall export growth into contributions attributable to the extensive and intensive margin allow for new insights for economic policy.

Keywords: service trade, firm-level evidence, export productivity premium, intensive and extensive margin of trade, gravity model, firm heterogeneity, sample selection, market coverage

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Research assistance: Irene Langer

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1. Introduction[1]

The increased availability of micro-datasets has given rise to a very active research area on the characteristics and strategies of globalized firms. It started with the empirical research of Bernard and Jensen (1995; 1999) for the USA and has been expanded to analyses for other countries by numerous authors. Most of this research focused on manufacturing industries while firm-level evidence on trade in services is still rare and has just recently begun to emerge (for an overview see: Wagner, 2007; 2012a).[2] In general, these studies on trade in services suggest that many of the stylized facts on the characteristics of exporting firms, the number of markets served and the trade patterns derived for goods trade at the firm-level also hold for service trade.

Generally, this research has unveiled important new facts that were unobservable at the aggregate or sector level and deepened our understanding of the underlying forces that are driving the international involvement of firms. It uncovered large heterogeneity among firms even within the same industry. First, firms were found to differ substantially in their engagement in international trade. The majority of firms do not export at all, and of those that do export, the majority only exports to one country. Overall, exporting activities are concentrated on activities of a few firms ("superstars"). Similar observations are true for firms that import goods or materials for use in the production process (e.g. Castellani et al., 2010). Second, these studies provide substantial insights into the characteristics of exporting firms and into why some firms export and others do not. Exporting firms were shown to differ from non-exporting firms in a number of firm characteristics: they are larger, more productive, employ a larger skilled workforce and are more capital intensive. The literature has provided two hypotheses to explain this export performance premium. On the one hand, the performance differences associated with different internationalization patterns of firms may reflect the self-selection of high performing firms into exports, on the other hand they may be the result of learning effects from internationalization, or a combination of both. According to the empirical trade literature on productivity differences, self-selection of firms tends to dominate learning effects from internationalization. Thus, the performance premium explains why some firms export and others do not, while growth effects from leaning-by-exporting tend to be rather weak. Third, firm-level trade studies relate firm performance to the heterogeneity within exporters and show that larger and more productive firms serve a greater number of export markets (for an overview see: Wagner, 2012a). Firms with high market coverage in turn are also more likely to serve less popular markets, while firms selling to

[1] We are very grateful Patricia Walter and Rene Dell'mour from the Oesterreichische Nationalbank (OeNB) for providing an anonymized micro-dataset on service exports and their kind hospitality and help when running our stata-jobs at the OeNB.

[2] The service trade studies include: Breinlich and Criscuolo (2011) for the UK, Kelle and Kleinert (2010) for Germany, Kox and Rojas-Romagosa (2010) for the Netherlands, Dell'mour and Walter (2009) for Austria, Ariu (2012) for Belgium, Lööf (2010) for Sweden, Temouri et al. (2011) for Germany, the UK and France.

only a few markets usually choose the most popular ones (e.g. Lawless, 2009). To our knowledge there are not yet any empirical papers verifying this relationship for service exporters.

While a comparison between the studies on goods trade and those in service trade have led to the conclusion that both types of trade share many common features in terms of trade participation, heterogeneity of firms and trade concentration, there is only one paper (Ariu, 2012), that is able to directly compare the results for goods and service trade. Again, this paper finds widespread similarities in the key characteristics in qualitative terms, but is able to more clearly show some interesting quantitative differences between the two trade types. The most important are: First, the participation of firms in service exports is lower than for goods, which in turn could be an indication of higher fixed costs of exporting services (e.g. related to higher marketing costs due to the higher uncertainty about the "product" quality for services; higher bureaucratic restrictions and special authorizations and tougher regulations). This in turn should increase the productivity thresholds for service export starters and result a higher average productivity of firms trading services. Second, while concentration of exports among a few firms is high, it is lower than among goods traders. Third, service exporters are more sluggish than goods exporters to expand in the country dimension (increase the number of destination markets) as well as in the product dimension (number of "products").

Another strand of the firm-level literature in international economics focuses on the dynamics of trade relations. Distinguishing between entry, exit and survival in foreign markets they study the persistence and survival patterns of exporting firms and how these affect the growth rate in the aggregate (Besedes and Prusa, 2006 and 2011; Eaton et al., 2007; Bricongne et al., 2012; Gleeson and Ruane, 2006; Buono et al., 2008; Wagner, 2012b and 2003; Lawless, 2009). All these studies analyze goods trade. With the exception of Ariu (2012), there is a clear lack of solid empirical evidence on the micro-structure of trade dynamics in services. However, Ariu uses a different definition of the extensive and intensive margins and sets a different focus, by studying growth strategies of individual firms. It is thus not directly comparable to the other literature cited for goods trade and our approach that is studying the contribution of exits, entries and survival from the viewpoint of the individual markets. Several facts emerge from this strand of literature on the micro-dynamics of goods trade. First, aggregate net flows hide the high volatility of export relations at the micro-level and miss much of the underlying dynamics. Second, the change in the total export volume is mostly accounted for by increases/decreases of exports in existing export relations (intensive margin) while increases/decreases in the number of export relations through entries and exits (extensive margin) play a minor role. Besedes and Prusa (2006) highlight the importance to study the micro-dynamics of exporting by showing that the duration of export relations has a profound impact on long term export dynamics and that it is especially important to account for the amount of entry and exit disclosed by aggregate trade flows. This is important as survival of

export relationships is a necessary requirement for trade deepening and export growth and poor survival prevents deepening from taking place.

Finally, despite the prominent role gravity models have in explaining aggregate trade flows their adoption to firm-level data has not yet gained considerable attention in the empirical literature and even less so for service trade. In general, empirical specifications incorporate the export decision of firms based on the heterogeneous firm literature which results in an extensive and intensive margin of trade. Various proxies for trade costs have been identified in recent papers to examine the adjustments along both margins of trade. Bernard et al. (2007) study whether distance affects firm participation, the number of products exported or the value of product exported by each firm by decomposing aggregate US exports into these three factors. Their results suggest that aggregate trade relations are influenced strongly by adjustments along the extensive margin of trade. In a similar study, Lawless (2010) examines the impact of various cost factors of exporting on the number of exporting firms and average export sales. She finds that the most of the proxies for trade costs, such as distance, common language, import cost barriers, effect both margins of trade, but the relative magnitude is substantially higher for the extensive margin. However, the problem of self-selection of firms into exporting is not addressed by these papers although the theoretical literature emphasizes the primacy of productivity differences. Using data on the Swedish food and beverage sector, Greenaway et al. (2009) are aware of the possible sample selection and apply a Heckman sample selection model. Their findings are consistent with the predictions from the theory and confirm that more productive and larger firms are more likely to serve foreign markets that are large and relatively close. Additionally, also 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 firm-level exports and the export levels using French manufacturing firm-level data. Their results show that distance has a significant negative impact on the export probability and a significant negative impact on export volume in the majority of the industries. However, to our knowledge there is no empirical study employing a firm-level gravity model accounting for sample selection as well as for changes at the extensive and the intensive margin of trade in a counterfactual analysis.

In this study we are able to use a detailed dataset from the Oesterreichische Nationalbank (OeNB) on Austrian firms for the period 2006 to 2009 providing information on exports and imports of services by destination and source country as well as details on important firm characteristics such as sector affiliation, FDI activity, ownership status, employment and total sales. It does not cover any information on goods trade, but also includes non-traders.

Dell'mour and Walter (2009; 2010) presented a detailed picture of the Austrian firms engaged in service trade for 2006, the first year for which the firm-level data on service trade was available, including the extent to which firms in the service industries engage in both, import and export markets as well as whether these firms are mostly domestic firms, domestic firms

with subsidiaries abroad or largely subsidiaries of foreign-owned multinationals or whether these firms are service exporters only or are engaged in both service and goods trade.

We will partly repeat their analysis to provide evidence for the more recent years but also extent their analysis in a number of ways and complement the descriptive evidence of existing micro-level studies on service trade. We will analyze service trade participation, the concentration of trade flows and the market coverage of service exporting firms (number of markets served by firms). The study will then put a focus on the exporter premium by comparing service exporters to non-exporters and investigate whether the self-selection hypothesis is also true for Austrian service exporters. It also investigates the productivity and market coverage relationship. Furthermore, the panel structure of the data covering the years 2006 to 2009 will allow us to also study dynamic processes underlying the internationalization of service supply. We will first present transition matrices to analyze the survival patterns of Austrian service exporters and then proceed to study export dynamics at the extensive and intensive margins. This will allow us to answer to which extent Austrian service export growth is related to an intensification of existing export relations of surviving and continuing exporters or to the entry/exit of exporters. The years covered by the dataset will allow us to especially elaborate on this in the year 2009 in which international trade (albeit more in goods than in services) was hit sharply by the economic crisis. Did the economic turmoil change the observed patterns of service trade, especially the rate of engagement in foreign trade, broken down by firm size, and other firm characteristics? Lastly, we estimate a firm-level gravity-sample selection model that accounts for both entry and exit of firms in export markets (the extensive margin) and the change of already established exports (the intensive margin). In addition, we illustrate the estimated impact of the main determinants by quantifying several counterfactual scenarios.

The dataset used in this study does not include any information on goods trade and thus will not allow confronting the findings for service trade with those on goods trade. However, throughout the study we separate the analyses between service traders from the service sector and service traders from the manufacturing sector. This seems important to us because production firms are different from service firms in a number of ways, but most importantly, because the nature of service trade is likely to differ between service sector and manufacturing sector firms. Service exports of manufacturing firms are most likely to be linked to the internationalization of production and the export of goods. Most of these are in the field of business services, mostly technical services (maintenance and repair, assembly, etc.) innovation related services (license fees, R&D), marketing and advertising and logistics, sometimes also in relation to FDI activities of manufacturing firms (see Table 1.1 taken from Dell'mour and Walter, 2010).

Table: 1.1 Export of service packages by manufacturing enterprises

Activity according to ÖNACE2003		Leading service category
15–16	Manufacture of food prod., beverages and tobacco prod.	Royalties and licence fees
17	Manufacture of textiles	Research and development
18	Manufacture of wearing apparel	Merchanting and other trade related services
19	Manufacture of leather and related products	Transportation
20	Manufacture of wood and wood products	Royalties and licence fees
21	Manufacture of pulp and paper	Merchanting and other trade related services
22	Publishing, printing and reproduction of recorded media	Advertising, marketResearch, and public opinion polling
23–24	Manufacture of coke, petroleum prod., nuclear fuel, chemicals et.al.	Research and development
25	Manufacture of rubber and plastic products	Architectural, engineering, and other technical services
26	Manufacture of other non-metall. min. prod.	Advertising, marketResearch, and public opinion polling
27	Manufacture of basic metals	Merchanting and other trade related services
28	Manufacture of metal products	Construction services
29	Manufacture of machinery and equipment n.e.c.	Architectural, engineering, and other technical services
30	Manufacture of office machinery a. computer	Research and development
31	Manufacture of elec. equipment	Architectural, engineering, and other technical services
32	Manufacture of radio, television, comm. equip.	Research and development
33	Manufacture of medical, precision. a. opt. instr.	Architectural, engineering, and other technical services
34	Manufacture of motor vehicles and trailers	Research and development
35	Manufacture of other transport equipment	Architectural, engineering, and other technical services
36–37	Manufacturing n.e.c.	Research and development

Source: Dell'mour and Walter (2010).

Most of the analyses on Austrian service trade is of a descriptive and explorative nature and is intended to complement findings for other countries and to add new aspects that have so far not been covered by firm-level studies in service trade. An important contribution of the study is the estimation of a firm-level gravity model accounting for sample selection as well as for changes at the extensive (exit and entry of firms in foreign markets) and the intensive margin (export volume changes in already established export relations) of trade. This is a very novel approach and for the first time applied to service trade. In particular, the econometric approach is extended by a counterfactual analysis to assess the role of key determinants and quantify the impact of a substantial change in exogenous variables. This enables us to examine the expected aggregate response of trade flows and the new pattern of Austrian service trade. Moreover, it allows us to elaborate on the composition of trade flows between the extensive and intensive margin which gives new insights to the existing empirical literature and highlights relevant conclusions for economic policy.

The remainder of the study will be structured as follows: Chapter 2 presents the theoretical background and discusses the main predictions. Chapter 3 explains the database in more detail. Chapter 4 summarizes the main structure and patterns of Austrian service trade, analyzes trade participation, the composition and the concentration of trade flows and the heterogeneity in the pattern of market coverage. Chapter 5 presents the analysis on the exporter premium in service trade and the market coverage premium. Chapter 6 investigates

the dynamic processes by analyzing entry, exit and survival patterns of service exporters and by providing a decomposition of net export growth to account for the contribution of entering/exiting and surviving exporters. Chapter 7 presents the estimation results of the firm-level gravity model and highlights the impact of the main determinants of Austrian service exports in a counterfactual analysis.

2. Theoretical model and predictions

The heterogeneous firm model of Melitz (2003) that has been further developed by Chaney (2008), Helpman at al. (2008) and Crozet and Koenig (2010) is the usual reference point for the empirical trade analyses at the micro-level. Heterogeneity in productivity and two types of trade costs associated with exporting (fixed and variable costs) are at the heart of this class of models and determine productivity thresholds that allow only the most productive firms to start exporting. The early model has been extended to include an explanation of exports to different countries and different cut-off levels of productivity depending on the destination country. The predictions of the theoretical models are in line with the stylized facts for goods trade as well as the available evidence for service trade (see Lawless, 2009):

- There is a positive relationship between exporting and productivity. Exporters are more productive than non-exporters.
- With varying productivity thresholds across destination markets, firms of higher productivity will be present in more markets, among them less popular ones (e.g. in terms of distance or market size) for which the productivity threshold is higher.
- Entering and exiting firms are more likely to be the firms close to the productivity cut-off point, i.e. firms that are just below or just above the size or productivity threshold. As they are then the more marginal firms, and are less productive and sell less than continuing firms they are likely to contribute less to the overall export growth than continuing firms.
- Firm entry into new destination markets should come from changes in firm characteristics, as well as market-specific changes related to GDP growth or trade costs.

In more formal terms as in the standard model we envisage a standard monopolistic competition model of bilateral service trade with CES-preferences and heterogeneous firms. Firms are assumed to differ in their productivity so that the more productive firms exhibit lower marginal costs which in turn is reflected in bigger firm size.

We consider a single exporter country, where each firm i produces a variety of a service and may export it to j=1,...,J destination countries. In the monopolistic competition framework profit maximization of firms implies that each firm prices a mark-up over marginal costs:

(2.1) $$p_{ij} = \frac{\sigma}{\sigma-1}(a_i \tau_j)$$

where p_{ij} is the price of variety i in destination market j, $\sigma > 1$ denotes the elasticity of substitution of varieties, a_i refers to firm specific marginal costs that are inversely related to its productivity. $\tau_j > 1$ captures bilateral trade costs for service trade flows to country j. Follwing the literature, profits of firms are assumed to be separable across markets and are given by

(2.2) $$\pi_{ij} = \left(\frac{\sigma}{\sigma-1} \frac{a_i \tau_j}{P_j} \right)^{1-\sigma} E_j - f_j$$

f_j captures destination specific fixed costs of serving that market. P_j denotes the CES-price index in importer country j and E_j income in country j that is spent on services, which is interpreted as destination market size. Exports will be positive and observed if profits from exporting to this market are postive, which is the case if

(2.3) $$\left(\frac{\sigma}{\sigma-1}\frac{a_i\tau_j}{P_j}\right)^{1-\sigma}\frac{E_j}{f_j} > 1 \text{ or}$$

(2.4) $$z_{ij}^* = (1-\sigma)\ln(\tfrac{\sigma}{\sigma-1}) + (1-\sigma)\ln a_i + (1-\sigma)\ln\tau_j + \ln\frac{E_j}{P_j^{1-\sigma}} - \ln f_j > 0$$

We assume that $\pi_{ii}(a_i) > 0,$ i.e. that the home market is always served. z_{ij}^* is interpreted as latent variable describing the propensity of firm i to export to destination market j. One can infer the threshold level of marginal costs $\bar{a}_i$ that allows a firm to break even in serving a specific export market j. This threshold level can be derived as

(2.5) $$\pi_{ij}(\bar{a}_{ij}) = 0 \Rightarrow \bar{a}_{ij} = \underbrace{\left(\frac{\sigma-1}{\sigma}P_j E_j^{\frac{1}{\sigma-1}}\right)}_{\hat{\lambda}_j} f_j^{\frac{1}{1-\sigma}}\frac{1}{\tau_j}$$

and all firms with $a_i \le \bar{a}_{ij}$ will export to country j. Following Crozet and Koenig (2010) the inverse of marginal costs $(1/a_i)$ may be assumed to be Pareto distributed so that the density of marginal costs a_i is given by $f(z) = \gamma z^{\gamma-1},\ 0 \le z \le 1$ so that the expected number of firms exporting to market j can be derived as

(2.6) $$N_j = N\int_0^{\bar{a}_{ij}} f(a)da = \frac{\gamma}{\gamma-1}\lambda_j^{\gamma} f_j^{\frac{\gamma}{1-\sigma}}\tau_j^{-\gamma}$$

while the overall volume in service exports is given as

(2.7) $$X_j = N\int_0^{\bar{a}_{ij}} x_{ij}(a)f(a)da = N\frac{E_j}{P_j^{1-\sigma}}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}\left(\frac{\gamma}{\gamma-(\sigma-1)}\right)\lambda_j^{\gamma-(\sigma-1)} f_j^{-\frac{\gamma-(\sigma-1)}{1-\sigma}}\tau_j^{-\gamma}$$

Based on the iso-elastic CES-demand function exports to country j, if postive, can be shown to amount to

(2.8) $$X_{ij} = \left(\frac{p_{ij}}{P_j}\right)^{1-\sigma}E_j = \left(\frac{\sigma}{\sigma-1}\frac{a_i\tau_j}{P_j}\right)^{1-\sigma}E_j \ if\ z_{ij}^* \ge 0$$

or in logs

(2.9) $$x_{ij} = (1-\sigma)\ln\tfrac{\sigma}{\sigma-1} + (1-\sigma)\ln a_i + (1-\sigma)\ln\tau_j + \ln\left(\frac{E_j}{P_j^{1-\sigma}}\right)E_j \ if\ z_{ij}^* \ge 0$$

Service exports of firm i to the destination market j only take place if it is profitable to do so, in which case $z_{ij}^{*} > 0$. Following Helpman et al. (2008), firms select themselves systematically into the group of service traders for destination j based on their potential operating profits they are able to achieve in these markets and the corresponding fixed costs of serving that market. Specifically, the model implies that the decision of firm i to serve the foreign market j depends on its productivity, the associated variable and fixed trade costs of exporting to the respective destination market and the size of the destination markets. Profit margins have to be large enough to cover the fixed costs of exporting and the possible additional variable trade costs. Given the productivity distribution of the firms' productivity only a fraction of firms – namely the most productive ones – are able to achieve high enough operating profits and decide to export to a specific destination market. Firms with a productivity level below the threshold only serve the domestic market where trade barriers are assumed to be absent or low.

From this condition we can infer that service exports of firm i to destination market j are more likely 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, essentially, the same variables determine the volume of a firm's service export to a destination market it has decided to serve. Observed trade flows will be higher the more productive firms are, the lower the variable trade cost and the larger the destination markets are. To summarize, trade barriers and market size both impact the magnitude of trade flows (the intensive margin) as well as the decision of firms to serve the foreign market at all (extensive margin).

As argued by Buono et al. (2008), this theoretical framework based on Melitz (2003) type models is less suitable to explain the dynamics of firms' export status (surviving, entry, exit). Dynamic analyses need to be based on the theoretical literature that is able to link persistence of exports to sunk fixed costs (Bernard and Jensen, 2004), incorporate uncertainty about the success or failure of exporting (e.g. Segura-Cayuela and Vilarrubia, 2008) and incomplete information (e.g. Rauch and Watson, 2003). These models offer the following predictions:

- Uncertainty about the export outcome restricts knowledge about true costs and increases the volatility of trade-relations.
- Incomplete information about the buyer (especially in less developed countries) will induce exporters to start with small transactions, which will increase over time as information increases. The extensive margin will involve small quantities, even more so for more difficult markets.

3. The database

We use two different sets of data in the study. Both are based on the Austrian Trade in Services Survey of non-financial corporations conducted by Statistics Austria on the behalf of the Oesterreichische Nationalbank (OeNB) since 2006. The survey forms the basis for the Balance-of-Payments Statistics of the Bank. It is statutory and is based on a stratified sample within the scope of the Austrian Structural Business Survey (SBS) with the following threshold levels: export/import values above € 50,000 or € 200,000 depending on the industry affiliation of the firm to cover at least 90 percent of all service imports and exports in every industry. It covers about 5,000 service traders excluding financial and insurance companies as well as the tourism sector. The survey reports exports and imports of services by destination country and type of services exported. The survey data used in this study do not include imputed values for missing data or estimates for trade values below the reporting thresholds.

In a first step, the Austrian Trade in Services Survey data for all years covered (2006 to 2009) was merged with the Austrian Structural Business Survey data of all active enterprises (i.e. registered in the central Austrian company register) covering more than 160,000 active enterprises, including non-traders. The SBS data provided information on the industry affiliation of the company, employment and sales revenues. Missing information for companies covered by the Austrian Trade in Services Survey, but not the SBS data was extracted from the central Austrian company register and additionally merged to the dataset. Moreover, data from the OeNB's company database, on the year of incorporation and mainly on FDI were additionally merged providing us with variables on outward FDI (yes or no) as well as foreign ownership of the firms (yes or no). Leaving aside observations with missing data on employment or sales this provided us with a dataset of 639,296 observations over 4 years or 159,824 each year. This dataset we used to provide a detailed picture of the characteristics of service exporters in contrast to non-exporting firms, the export participation rates and the general patterns and structure of trade patterns, as well as the dynamic analyses in the study, exporter survival and the changes in market coverage.

The second set of data used in the study is a subset of the first sample covering only enterprises that exported or imported services (or both) in the period 2006 to 2009. It includes 5,554 firms. It covers the same variables as the big sample but additionally includes information on the destination country (source country) of exports (imports). However, the country dimension is restricted to 37 individual destination/source countries and one "rest" category. We merged diverse country information to the data from different sources including CEPII, for variables on geographical and cultural as well as historical ties. Information on GDP, GDP per capita and the quality of economic institutions are taken from the World Bank's World Development Indicators (WDI) database. To account for market regulation in the service sector we include the product market regulation indices provided by the OECD to our main dataset. This second database forms the basis for the gravity analysis and a comprehensive overview of the dataset and the variables is provided in Chapter 7.3.1.

4. Main patterns and structure of Austrian trade in services

This section presents the main patterns of Austrian trade in services. While the panel structure of the data allows for an analysis of important dynamic aspects of service trade this chapter explores the cross-section dimension by averaging over the years 2006-2009 as has been done in the comparable literature. We start by presenting data on the distribution of Austrian firms by sector and trade status (Table 4.1). Note that the trade status of the firms in our study had to be defined exclusively with respect to service trade as our dataset does not allow us to observe whether firms are also engaged in goods trade. Thus, non-traders are firms that never exported or imported services over the period considered. Traders are defined as firms that exported, imported or did both at least once during the period. This is in line with most of the available literature on service trade. First, and in concordance with the findings of firm-level studies on trade patterns, we find only a very small fraction of firms (3.5 percent) that engage in international service trade. Dell'mour and Walter (2010) found the same participation rate in service trade of Austrian companies in the year 2006. The Austrian participation rate in goods trade according to their analysis in 2006 amounts to 17.4 percent and is thus much larger than the service participation rate. The Austrian rate for services also compares well with the findings of Ariu (2012) for Belgian firms (2 percent). The engagement of Belgian firms in goods trade however – while still higher than in services – is a lot lower than in Austria (7 percent versus 17.4 percent). For the UK Breinlich and Criscuolo (2011) find a comparably higher rate of service participation of 8.1 percent, signalling the higher importance of the service sector in that country.[3]

Table 4.1: Trade participation by sector

	Non-traders	Traders	Exporters only	Importers only	Exporters and importers	Total
	Percentage shares					
Agriculture, forestry and mining	98.2	1.8	0.2	0.5	1.1	100.0
Manufacturing	93.4	6.6	0.5	1.9	4.3	100.0
Electricity, gas, water	97.0	3.0	0.3	1.1	1.6	100.0
Construction	98.4	1.6	0.3	0.3	1.0	100.0
Wholesale and retail trade	96.9	3.1	0.7	0.5	1.9	100.0
Transportation and storage	89.6	10.4	1.3	0.4	8.8	100.0
Information and communication	92.7	7.3	1.1	0.6	5.7	100.0
Real estate activities	98.7	1.3	0.3	0.1	0.9	100.0
Professional, scientific and technical activ.	98.9	1.1	0.2	0.4	0.5	100.0
Other	98.3	1.7	0.2	0.4	1.0	100.0
Total	98.3	1.7	0.2	0.5	1.0	100.0

Source: OeNB, Statistics Austria, WIFO calculations.

[3] Comparability between studies however is restricted because of a different coverage of service types in the datasets. Our dataset excludes tourism, finance and insurance.

Among Austrian service traders, most firms export and import services (2.4 percent) while it is less likely that a firm is an exporter only (0.5 percent) or an importer of services only (0.6 percent).[4] There are some differences across industries. "Transportation services", "information and communication services", "professional, scientific and technical activities" reveal the highest share of internationalized firms. Within the former two, firms are more likely to be an exporter without importing than to be an importer without exporting. Note also, the relatively high participation rate of firms in the manufacturing sector (6.6 percent). Most of these manufacturing firms export and import services (4.3 percent). In contrast to the service sector industries it is more common in the manufacturing sector to import services without exporting than to export without importing services.

Table 4.2 reports the value of trade in services by sector. It confirms the main patterns from the frequency distribution by sector. Manufacturing firms account for 15.9 percent of total Austrian service exports and a quarter of imports. This is comparable to the shares found for Belgium – 15 percent for both flows (Ariu and Mion, 2010). Kelle and Kleinert (2010) find a share of the manufacturing sector in service trade of 25 percent for exports and 30 percent of imports for Germany. The major shares within the service sector stem from "transportation and storage", "wholesale and retail trade" and "professional, scientific and technical activities". The latter include service exports and imports of holding companies.

Table 4.2: Value of service trade by sector of the trading firms

	Exports		Imports	
	mn €	Percentage shares	mn €	Percentage shares
Agriculture, forestry and mining	22.3	0.1	99.9	0.6
Manufacturing	3,478.6	15.9	3,944.1	24.6
Electricity, gas, water	813.9	3.7	92.4	0.6
Construction	785.7	3.6	402.7	2.5
Wholesale and retail trade	3,113.3	14.3	2,052.2	12.8
Transportation and storage	8,112.8	37.1	5,612.7	35.0
Information and communication	1,458.3	6.7	1,246.5	7.8
Real estate activities	175.2	0.8	106.4	0.7
Professional, scientific and technical activ.	3,008.2	13.8	1,493.4	9.3
Professional, scientific and technical activ. (excl. Holdings)	*1,951.4*	*8.9*	*843.6*	*5.3*
Others	866.4	4.0	995.6	6.2
Top-1% of exporters and importers	10,329.1	47.3	7,260.5	45.2
Top-5% of exporters and importers	15,786.4	72.3	11,148.7	69.5
Total	21,834.8	100.0	16,045.9	100.0

Source: OeNB, Statistics Austria, WIFO calculations.

The lower panel of Table 4.2 reveals that trade in services is highly concentrated among firms. A small number of firms account for the bulk of total exports. Again, this confirms earlier results

[4] Breinlich and Criscuolo (2011) find a different pattern in the UK. In their sample of firms exporters only account for the largest share among service traders.

for Austria (Dell'mour and Walter, 2009 and 2010) and is in line with the findings of the related literature. We find that the Top-1% of exporters (47 firms) accounts for a share of 47.3 percent of total exports and the Top-5% (230) for a share of 72.3 percent. These findings are very much in line with the results for Austrian exports of manufactured goods by Pöschl et al. (2009): the largest 1 percent of exporters account for 42 percent of goods exports, the Top-5% account for 74 percent. We find an equally strong concentration of services imports.

Table 4.3: Trade participation by firm size, FDI and ownership status

	Percentage shares					
	Non-traders	Traders	Exporters only	Importers only	Exporters and importers	Total
	Service sector					
1-24	97.5	2.5	0.5	0.3	1.6	100.0
25-49	86.6	13.4	1.7	1.8	9.9	100.0
50-99	82.7	17.3	1.9	2.0	13.5	100.0
100-249	73.5	26.5	2.0	4.7	19.8	100.0
>250	63.7	36.3	1.5	6.2	28.7	100.0
No active foreign direct investor	96.8	3.2	0.6	0.5	2.2	100.0
Active direct investor	70.0	30.0	2.9	3.6	23.5	100.0
Not foreign-controlled	97.6	2.4	0.5	0.3	1.6	100.0
Foreign-controlled	86.4	13.7	1.6	2.2	9.8	100.0
	Manufacturing sector					
1-24	99.2	0.8	0.2	0.2	0.4	100.0
25-49	93.8	6.2	1.1	1.8	3.3	100.0
50-99	84.3	15.8	1.2	3.6	10.9	100.0
100-249	68.3	31.7	1.6	10.2	19.9	100.0
>250	33.5	66.5	2.5	13.8	50.2	100.0
No active foreign direct investor	96.9	3.1	0.4	0.9	1.8	100.0
Active direct investor	41.5	58.6	2.6	7.4	48.5	100.0
Not foreign-controlled	97.4	2.6	0.4	0.7	1.6	100.0
Foreign-controlled	76.7	23.3	1.1	5.4	16.8	100.0

Source: OeNB, Statistics Austria, WIFO calculations.

Table 4.3 presents the trade participation by different firm characteristics and major sector affiliation. It first reveals that firm size is a critical feature of international service traders. This is true for service sector firms with the share of traders increasing from 2.5 percent in the smallest size group to 36 percent in the largest size group. Firm size correlates with a number of firm characteristics that foster the internationalization decisions of companies as well as their likelihood of entry and exit and the survival of export relationships (e.g. managerial capabilities, organizational structures and financial capacities). Firm size is also a proxy for the scale of production with larger firms achieving lower costs and thus higher export potential. Furthermore, foreign direct investors are more likely to be international traders as well as firms in foreign control. Again we find that exporting and importing services is the most likely

pattern throughout. Importing without exporting is more likely than exporting only especially among larger firms as well as for foreign direct investors and firms under foreign control. These patterns are even more pronounced for international service traders from the manufacturing sector. As services are not part of the primary activity of production firms, the share of international service trading firms is very small among firms in the smallest size groups. From the largest size group, however two thirds of the manufacturing firms are trading services across international borders.

Generally, these observations are a first hint for consistent differences in the characteristics between non-traders and international service traders, exporters as well as importers. The results in this chapter have also highlighted the number of different trade options among which firms choose and this choice is also likely to be related to the characteristics of firms. We will now turn to the choices Austrian firms make with respect to the number of export destination markets.

Figure 4.1 shows the distribution of the number of export markets in more detail and summarizes the evidence for service exporters from the manufacturing and the service sectors. It reveals the skewed nature of the distribution, with almost a quarter (22.8 percent) of service exporting firms serving only one market, and a share of 6.4 percent exporting services to more than 25 markets. Of those serving only one market, about two thirds trade with Germany (Dell'mour and Walter, 2009). Overall the tendency to serve more than just one market is higher in the Austrian data on service trade, than in earlier studies for goods trade in other countries. The average number of export markets served over the period 2006 to 2009 was 8 the median number was 4. Lawless (2009) finds over a third of firms serving only one export market in Irish goods trade and an average market coverage of 5.9 and a median of 2.8 for Ireland. Bernard et al. (2005) find an average market coverage of goods exports of 3.3 for the USA. To our knowledge there are no comparable analyses for service exports. There is no comparable analysis for Austrian goods trade.

Table 4.4: Market coverage of service exporters by firm size

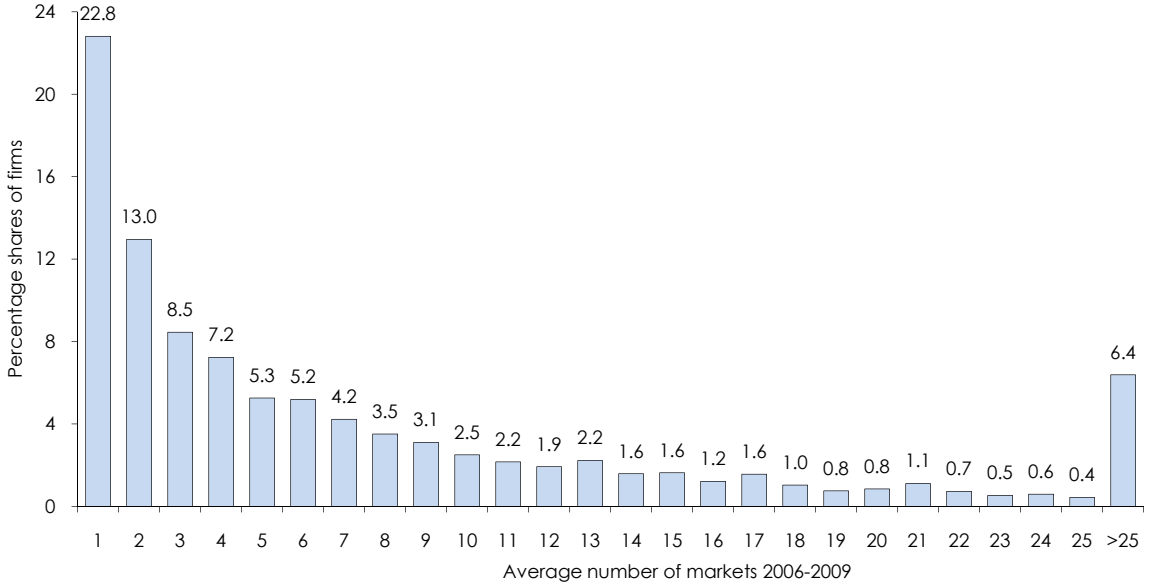
	Service sector					Manufacturing sector				
	1-24	25-49	50-99	100-249	>250	1-24	25-49	50-99	100-249	>250
Average number of markets	5	10	11	12	20	2	4	5	8	12
Percentage										
1 market	26.7	13.8	13.0	12.4	9.6	54.0	29.8	29.8	22.5	13.9
2-5 markets	38.0	29.5	29.5	25.1	21.2	35.5	44.2	43.0	29.2	27.9
6-10 markets	18.3	24.2	17.7	15.7	22.7	7.3	17.3	12.6	24.2	17.4
11-25 markets	14.3	24.2	28.3	33.0	20.7	3.2	7.7	12.6	16.3	28.6
26 or more markets	2.6	8.1	11.5	13.9	25.8	0.0	1.0	2.0	7.9	12.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: OeNB, Statistics Austria, WIFO calculations.

Table 4.4 summarizes the number of export markets, both for all Austrian service exporters and by different size groups. From the distinction by employment size classes we see that firms serving a higher number of markets tend to be larger. In the service sector, almost two thirds of small firms serves up to 5 markets while 25.8 percent of largest firms in the sample serve more than 26 markets.

Although the relationship is not strictly increasing, there is a clear difference between small and medium sized firms (SMEs) and large firms (more than 250 employees). The average number of markets of service sector exporters increases from 5 to 10 for SMEs to 20 in the largest size group. The relevance of firm size for market coverage in exports is even more pronounced for service exporters from the manufacturing sector. In the smallest size group of firms from this sector, 54 percent and in the following two size classes, 30 percent serve only one market. As we have seen earlier exporting services by manufacturing firms is mostly confined to large firms. If small manufacturing firms export services, most of them serve only one market.

Figure 4.1: Distribution of service exporters by market coverage – services and manufacturing



Source: OeNB, Statistics Austria, WIFO calculations.

4.1 Major findings

The main findings in this chapter can be summarized as follows:

- Only a very small fraction of firms (3.5 percent) engages in international trade of services. This is comparable to other small countries, but a lot lower than for goods trade (17.4 percent). This could suggest that manufactured goods are more tradable across borders than services. A related explanation could be that other modes of international

supply, such as foreign direct investments are more important than cross-border exports of services. A final interpretation is that the sunk costs of exporting (e.g. entry costs related to the higher uncertainty about the "product" quality for services due to their intangible nature; higher bureaucratic restrictions, special authorizations or tougher regulations) are higher for services requiring a higher productivity premium than in manufacturing to cover these additional costs.

- The participation rate is highest in "transportation services", "information and communication services", "professional, scientific and technical activities". The participation rate in service trade is relatively high in manufacturing. The manufacturing sector exports 15.7 percent of total service exports and imports 24.6 percent of total service imports.
- Trade participation correlates positively with firm size, active foreign direct investments of the firms and the foreign ownership status of the firms. The relationship is more pronounced for the manufacturing sector service traders.
- The most common pattern for Austrian service traders is the simultaneous export and import of services. Exporting only is more common than importing only among traders from the services sector. Traders from the manufacturing sector prefer importing only to exporting only.
- Service trade is highly concentrated among a few firms. The degree of concentration is similar to that found for goods trade in earlier studies. The Top-1% of exporters accounts for a share of 47.3 percent of total exports and the Top-5% for a share of 72.3 percent.
- Almost a quarter of firms exports to only one market. Most of them choose Germany as their first destination market. The average number of markets served is 8 the median is 4, which is higher than is found for goods trade in other countries, but there is no comparable analysis for Austrian goods trade.
- The findings further suggest a clear positive correlation between firm size and the number of export markets served.

5. Firm heterogeneity and the export-productivity relationship in services

The findings in the previous chapter suggest that there are consistent differences in the characteristics not only between service exporters and non-exporters, but also within the group of service exporters that influence their choices with respect to internationalization and the number of export markets to serve. This chapter first takes a closer look at the characteristics of different types of exporting firms and non-exporters and in a second step investigates the within exporter heterogeneity with respect to market coverage.

We compare firm characteristics between non-(service) exporters and service exporters by distinguishing between four groups of firms in each year: continuing exporters (or established exporters), new exporters (or entering exporters), exiting exporters, and non-exporters and split the analysis by the main sector affiliation of the exporting firm (services vs. manufacturing). This will allow us to descriptively approach the question whether there is a "self-selection" of firms into the export of services or "learning-by-exporting", or both. In analyzing the productivity premium of service exporters we apply the most common approach introduced by Bernard and Jensen (1999) and summarized in Wagner (2007) by regressing productivity on dummy variables indicating the export status of the firm.

5.1 A comparison of service exporters to non-exporters

Table 5.1 provides a first snapshot and presents summary statistics on the characteristics of different types of exporting firms and non-exporters. Firm size is measured by employment and sales, productivity is measured as sales per employee.[5] We find that all types of exporters are larger in terms of employment and sales and are also more productive than non-exporters. In terms of size, non-exporting firms are always clearly smaller, engaging 13 employees on average, while new exporters employ 87 on average and continuing exporters have 115. There is also a clear size ranking within the group of exporters: Established exporters are bigger than new exporters and both are always larger than firms stopping to export. The same pattern emerges from the productivity ranking. It is interesting that the size advantage of exporting firms is larger for service exporting firms from the manufacturing sector, while the productivity advantage is less pronounced. In addition, the simple comparison of means suggests that the service exporter productivity advantages in the service sector are always larger than for service exporters in the manufacturing sector.

[5] It is important to note, that this productivity measure suffers from shortcomings and is a proxy only. One of these shortcomings is that it disregards the amount of input that is obtained from suppliers. Hence, firms with a very low real net output ratio might achieve a much higher productivity (higher level of sales) than firms who are performing most of the value adding processes in house. A measure for labor productivity which controls for the real net output ratio would be to correct total sales by inputs (sales-input)/employees. Ideally one would prefer a measure of total factor productivity (TFP). However, the relevant data to compute these measures are not available in our dataset.

Table 5.1: Firm characteristics by service exporter status

		Service sector			Manufacturing sector		
		2007	2008	2009	2007	2008	2009
		Employment					
Non-exporters	Mean	13	14	13	22	22	21
	Median	3	3	3	7	7	7
	# of obs.	(88,762)	(85,644)	(93,046)	(25,267)	(25,161)	(26,808)
Exiting	Mean	88	29	34	163	108	100
	Median	9	7	5	40	52	63
	# of obs.	(287)	(116)	(166)	(91)	(41)	(38)
New	Mean	76	105	80	195	256	182
	Median	8	9	9	71	79	104
	# of obs.	(268)	(209)	(191)	(79)	(49)	(63)
Continuing	Mean	113	114	119	382	396	396
	Median	18	19	18	137	150	155
	# of obs.	(2,651)	(2,609)	(2,601)	(657)	(658)	(663)
		Sales (mn €)					
Non-exporters	Mean	2.9	3.0	2.9	4.1	4.6	4.4
	Median	0.3	0.3	0.3	0.6	0.7	0.7
	# of obs.	(101,057)	(103,943)	(99,717)	(27,548)	(27,846)	(27,161)
Exiting	Mean	16.9	10.7	12.4	48.1	28.8	29.6
	Median	1.6	1.9	1.1	10.8	15.9	9.7
	# of obs.	(308)	(127)	(185)	(91)	(41)	(38)
New	Mean	37.3	27.7	24.3	60.6	100.5	46.4
	Median	2.4	1.8	1.9	19.2	21.6	21.1
	# of obs.	(308)	(224)	(193)	(91)	(49)	(64)
Continuing	Mean	39.8	43.9	38.1	126.3	136.8	126.8
	Median	5.4	5.3	4.8	35.7	39.1	37.3
	# of obs.	(2,703)	(2,677)	(2,608)	(657)	(660)	(657)
		Productivity (sales/employee in 1,000 €)					
Non-exporters	Mean	277.6	299.4	286.4	311.3	255.8	219.9
	Median	86.0	90.0	81.1	101.0	103.3	98.0
	# of obs.	(88,762)	(85,644)	(93,046)	(25,267)	(25,161)	(26,808)
Exiting	Mean	466.9	874.5	739.0	660.9	657.4	223.1
	Median	171.0	206.5	145.7	176.9	236.3	177.9
	# of obs.	(287)	(116)	(166)	(91)	(41)	(38)
New	Mean	4,672.2	929.1	631.6	972.1	409.6	299.8
	Median	184.4	205.5	160.3	215.1	250.7	201.3
	# of obs.	(268)	(209)	(191)	(79)	(49)	(63)
Continuing	Mean	1,489.9	1,562.8	1,103.2	353.8	390.3	314.6
	Median	235.4	232.7	203.7	208.6	209.3	194.8
	# of obs.	(2,651)	(2,609)	(2,601)	(657)	(658)	(663)

Source: OeNB, Statistics Austria, WIFO calculations.

As argued earlier, service exports of manufacturing firms are very likely to come along with the export of manufactured goods (maintenance and repair, installations and assembly,

marketing), thus most service exporters in the manufacturing sector should be goods exporters. In this sense while this is not a direct test, our evidence should indirectly confirm the finding of the earlier literature of a higher average productivity advantage of the service sector selling "genuine" services as compared to goods exporters.

To offer a more structured analysis, we follow the earlier papers by estimating the percentage differences between non-exporters' and service exporters' productivity (export productivity premium) from simple OLS regressions of the log productivity on an indicator variable indicating the firms' service exporter status and a set of control variables. We estimate different models. It is important to point out at this stage, that these kinds of regressions are of a purely descriptive and explorative nature and not at all suited for any causal inference.

In a first step the export premium is estimated from a regression of productivity (Prod) on an exporter dummy variable (Exporter) indicating the current export status in given years (1 if the firm exports services in year t, 0 otherwise). In this first step we do not distinguish between different exporter types:

$$(5.1) \quad lnProd_{it} = \alpha + \beta\, Exporter_{it} + c\, Control_{it} + e_{it}$$

where (i) and (t) index firms and time, respectively. Control either includes year fixed effects only, year and industry fixed effects to additionally isolate within-sector variation in the data apart from common time effects (e.g., economic cycles), or both fixed effects plus employment to additionally control for firm size.

Table 5.2: Service exporter productivity premium

		Service sector			Manufacturing sector		
		Productivity level (ln $Prod_{it}$)					
		I	II	III	IV	V	VI
$Exporter_{it}$	Coeff.	1.02	0.86	0.81	0.73	0.63	0.49
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln $Employment_{it}$	Coeff.			0.03			0.05
				(0.00)			(0.00)
ln $Employment_{i,t-1}$	Coeff.						
Constant	Coeff.	4.43	5.00	4.95	4.59	4.28	4.18
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R^2		0.02	0.17	0.18	0.02	0.08	0.09
Adj. R^2		0.02	0.17	0.18	0.02	0.08	0.09
Time dummies		Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies		No	Yes	Yes	No	Yes	Yes
Exporter premium	$e^{Coeff.}$	*2.77*	*2.36*	*2.26*	*2.08*	*1.88*	*1.64*
# of observations		362,201	362,201	362,201	104,505	104,505	104,505

Source: OeNB, Statistics Austria, WIFO calculations. – p-values in parenthesis.

Table 5.2 presents the results of this regression by the main sector affiliation of the firms. The export premium (next to last row in the table) is calculated from the estimated coefficients by taking the exponent of the coefficient ($exp^{Coeff.}$) and is easier to interpret. The coefficient on the export dummy variable is always clearly positive and statistically significant. The implied exporter productivity premium suggests that the productivity of exporters is 2.3 times higher than for non-exporters. The regressions also confirm the earlier result that the productivity premium for service exporters from the service sector is higher than for manufacturing firms that export services.

In a second step we design dummy variables defining the export status in such a way that it becomes possible to distinguish between new exporters and established (continuing) exporters and non-exporting firms as the reference group. In specific, the new exporter dummy variable is 1 if the firm exports in year (t) but not in year (t-1), while the established exporter dummy variable is 1 if the firm exports in year (t) and in year (t-1). Non-exporters are in the reference group. To summarize:

$$New\ exporter_{it} = 1, if\ Export_{i,t-1} = 0\ and\ Export_{it} = 1$$

$$Established\ exporter_{it} = 1, if\ Export_{i,t-1} = 1\ and\ Export_{it} = 1$$

First, we regress the log level of productivity on this set of dummy variables as well as the controls specified earlier:

(5.2) $$\ln Prod_{it} = \alpha + \beta_1\ \text{New exporter}_{it} + \beta_2\ \text{Established exporter}_{it} + c\ \text{Control}_{it} + e_{it}$$

Then we use the following specification to estimate differences in productivity growth:

(5.3) $$\ln Prod_{it} - \ln Prod_{i,t-1} = \alpha + \beta_1\ \text{New exporter}_{it} + \beta_2\ \text{Established exporter}_{it} + c\ \text{Control}_{i,t-1} + e_{it}$$

We find positive and significant coefficients for both types of exporters (Table 5.3) in the level equations (I-III and VII-IX). Established exporters have a higher productivity premium than new exporters in the service sector. In the manufacturing sector the premium of new and established exporters is of about the same size.

The growth equations result in a productivity growth premium only for new exporters, established exporters, while having higher productivity levels than either new exporter and non-exporters do not have any growth advantage over the two groups. This can tentatively be interpreted that there is not much "learning-by-exporting" for "old" exporters. The productivity growth premium for new exporters is again higher for service sector firms than for service traders in the manufacturing sector. The coefficient on new exporters in this specification measures the post entry differences in productivity growth in the first year of exporting and thus suggests that exporting fosters productivity growth at least in the very short run. Due to the short time span of the data, we are not able to analyze the ex-post

productivity growth premium for new investors to test for learning effects after more than one year after their entry to exporting.

Table 5.3: Service exporter productivity premium separated for new and established exporters

		Service sector						Manufacturing sector					
		Productivity level ($\ln Prod_{it}$)			Productivity growth ($\ln Prod_{it}$-$\ln Prod_{i,t-1}$)			Productivity level ($\ln Prod_{it}$)			Productivity growth ($\ln Prod_{it}$-$\ln Prod_{i,t-1}$)		
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
New exporter$_{it}$	Coeff.	0.83	0.74	0.71	0.20	0.21	0.16	0.78	0.68	0.58	0.17	0.14	0.09
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.07)
Established exporter$_{it}$	Coeff.	1.04	0.88	0.84	-0.02	-0.01	-0.10	0.74	0.63	0.49	0.00	0.00	-0.07
		(0.00)	(0.00)	(0.00)	(0.07)	(0.17)	(0.00)	(0.00)	(0.00)	(0.00)	(0.89)	(0.86)	(0.00)
ln Employment$_{it}$	Coeff.			0.02						0.05			
				(0.00)						(0.00)			
ln Employment$_{i,t-1}$	Coeff.						0.05						0.03
							(0.00)						(0.00)
Constant	Coeff.	4.50	5.06	5.01	0.03	0.04	-0.13	4.69	4.41	4.30	0.06	0.09	0.02
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.28)	(0.82)
R^2		0.02	0.18	0.18	0.00	0.00	0.01	0.02	0.08	0.08	0.00	0.00	0.01
Adj. R^2		0.02	0.18	0.18	0.00	0.00	0.01	0.02	0.08	0.08	0.00	0.00	0.01
Time dummies		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies		No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Premium													
New exporters	$e^{Coeff.}$	*2.29*	*2.09*	*2.04*	*1.23*	*1.23*	*1.17*	*2.18*	*1.98*	*1.78*	*1.19*	*1.15*	*1.10*
Established exporters	$e^{Coeff.}$	*2.82*	*2.41*	*2.32*	*0.98*	*0.99*	*0.90*	*2.09*	*1.88*	*1.63*	*1.00*	*1.00*	*0.93*
# of observations		271,027	271,027	271,027	245,683	245,683	245,683	78,445	78,445	78,445	72,732	72,732	72,732

Source: OeNB, Statistics Austria, WIFO calculations. – p-values in parenthesis.

Again, it is interesting to compare the results for the service sector and the manufacturing sector. We find that the productivity premium in the service sector is always clearly higher for established service exporters, but is of about the same size in both sectors for new service exporters. The productivity growth premium for new exporters is roughly the same for both sectors.

In the next step, we approach the question of self-selection, that is, whether firms are already more productive or exhibit higher productivity growth ex-ante, i.e. before the decision to export. We test for pre-entry productivity differences between new exporters and non-exporters, i.e. "future exporters" and "future non-exporters" one year before part of the firms decide to start to export. The dummy variable "New exporter" now selects all firms that started exporting in a given year and compares to firms that never exported during the periods covered in the sample. That is:

$$New\ exporter_{it} = 1, if\ Export_{i,t-1} = 0\ and\ Export_{it} = 1$$

$$New\ exporter_{it} = 0, if\ \sum_{x=1}^{3} Export_{i,t-x} = 0\ and\ Export_{it} = 0$$

We apply the following specifications:

$$(5.4) \quad \ln\mathrm{Prod}_{i,t-1} = \alpha + \beta\ \mathrm{New\ exporter}_{it} + c\ \mathrm{Control}_{i,t-1} + e_{it}$$

Next, to investigate the related question whether there are ex-ante differences in productivity growth we define the dummy New Exporter in the following way:

$$\mathrm{New\ exporter}_{it} = 1, \mathrm{if}\ \mathrm{Export}_{i,t-1} = 0 \ \mathrm{and}\ \mathrm{Export}_{i,t-2} = 0 \ \mathrm{and}\ \mathrm{Export}_{it} = 1$$

$$\mathrm{New\ exporter}_{it} = 0, \mathrm{if}\ \sum_{x=1}^{3} \mathrm{Export}_{i,t-x} = 0 \ \mathrm{and}\ \mathrm{Export}_{it} = 0$$

And use the following specification:

$$(5.5) \quad \ln\mathrm{Prod}_{i,t-1} - \ln\mathrm{Prod}_{i,t-2} = \alpha + \beta\ \mathrm{New\ exporter}_{it} + c\ \mathrm{Control}_{i,t-2} + e_{it}$$

Table 5.4: Ex-ante productivity premium for Austrian service exporters

		Service sector						Manufacturing sector					
		Productivity level ($\ln Prod_{i,t-1}$)			Productivity growth ($\ln Prod_{i,t-1}$-$\ln Prod_{i,t-2}$)			Productivity level ($\ln Prod_{i,t-1}$)			Productivity growth ($\ln Prod_{i,t-1}$-$\ln Prod_{i,t-2}$)		
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
New exportes$_{it}$	Coeff.	0.57	0.46	0.43	0.13	0.12	0.15	0.65	0.54	0.44	0.14	0.02	0.05
		(0.00)	(0.00)	(0.00)	(0.01)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.09)	(0.79)	(0.57)
ln Employment$_{i,t-1}$	Coeff.			0.03			-0.03			0.05			-0.01
				(0.00)			(0.00)			(0.00)			(0.00)
Constant	Coeff.	4.42	4.99	4.93	0.01	0.00	0.05	4.69	4.38	4.30	0.02	0.08	0.11
		(0.00)	(0.00)	(0.00)	(0.01)	(0.95)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.47)	(0.31)
R^2		0.00	0.16	0.16	0.00	0.00	0.00	0.00	0.07	0.07	0.00	0.01	0.01
Adj. R^2		0.00	0.16	0.16	0.00	0.00	0.00	0.00	0.06	0.07	0.00	0.00	0.00
Time dummies		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies		No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
New exporters premium	$e^{Coeff.}$	*1.77*	*1.59*	*1.53*	*1.14*	*1.13*	*1.16*	*1.92*	*1.71*	*1.56*	*1.15*	*1.02*	*1.05*
# of observations		261,336	261,336	261,336	157,214	157,214	157,214	75,365	75,365	75,365	46,565	46,565	46,565

Source: OeNB, Statistics Austria, WIFO calculations. – p-values in parenthesis.

Results in Table 5.4 reveal a positive pre-entry premium for future service exporters over non-exporters of 1.5 to 1.9 depending on the specification and the sector affiliation of the exporters (specifications I-III and VII-IX). As such, the descriptive evidence suggests a self-selection of more productive firms into exporting. Interestingly, the coefficients do not differ much between the service sector and the manufacturing sector service exporting firms comparing ex-ante productivity levels. This suggests that there are no different productivity thresholds for the first entry into exports for service traders from the different sectors. Earlier we saw however, that there is a clear higher productivity premium of service exporters in the service sectors compared to service traders from the manufacturing sector with respect to

established exporters. As established exporters are likely to be the more active traders, serving more markets than first entrants, this result suggests that being a full-fletched service trader of "genuine" services involves higher sunk costs than for manufacturing firms trading service packages that come along the goods traded, explaining the higher average productivity premium in this case. Table 5.4 also summarizes the results from specification (5) on pre-entry productivity growth (see specification IV-VI and X-XII). We find significant coefficients for service sector firms, but insignificant coefficients for service exporters in the manufacturing sector firms. Thus, there is a clear ex-ant productivity growth premium for new service exporters from the service sector, but no growth pre-entry premium for new service exporters from the manufacturing sector.

5.2 Firm heterogeneity and market coverage

While exporters of services were clearly shown to be more productive than non-exporters, another interesting question is whether service exporters differ in size and performance characteristics according to the number of markets they serve ("within heterogeneity").

Table 5.5 reports summary statistics comparing service exporters selling in a small number of markets to those selling in many markets as a first snapshot taking averages over the period 2006 to 2009. It first confirms that firms serving a greater number of markets are larger in terms of both, employment and the sales volume. Furthermore, we find evidence that productivity, measured as sales per employee tends to increase with greater market coverage. This is true for both service exports from the service and from the manufacturing sector, although the relationship as revealed by a comparison of simple means is less strict in the latter.

A more detailed picture, exploiting the panel structure of our data can again be given by the simple regression analysis. Table 5.6 presents the results of a regression of a set of different firm characteristics (in logs) on dummy variables indicating the number of markets firms export services to. Service exporting firms with only one export market is the reference group.

We consider the following model:

$$(5.6) \qquad \ln X_{it} = \alpha + \beta_1 \, MC1_{it} + \beta_2 \, MC2_{it} + \beta_3 \, MC3_{it} + \beta_4 \, MC4_{it} + c \, Control_{it} + e_{it}$$

(lnX) denotes a specific firm characteristic of firm (i) at time (t) (productivity or employment, sales, FDI and foreign control) and (MC1) to (MC4) denote the different market coverage classes considered. All regressions include year and industry fixed effects as controls. Regressing market coverage classes on productivity we also include results from a specification including an employment control (specifications II and VIII). Again we distinguish between service exporters from the service sector to service exporters from the manufacturing sector.

Table 5.5: Service exporter characteristics by market coverage, 2006-2009

		Employ-ment	Sales (mn €)	Productivity (sales/empl. in 1,000 €)
		Service sector		
1 market	Mean	50	13.7	852.7
	Median	8	1.5	155.6
	# of obs.	(725)	(761)	(725)
2-5 markets	Mean	75	22.9	1,022.8
	Median	13	3.0	185.6
	# of obs.	(1,156)	(1,186)	(1,156)
6-10 markets	Mean	120	34.8	1,165.9
	Median	19	5.4	252.3
	# of obs.	(656)	(664)	(656)
11-25 markets	Mean	92	41.7	2,547.9
	Median	29	11.1	318.8
	# of obs.	(648)	(653)	(648)
26 or more markets	Mean	443	179.9	4,003.3
	Median	65	24.3	303.4
	# of obs.	(223)	(225)	(223)
		Manufacturing sector		
1 market	Mean	145	40.0	437.5
	Median	62	12.6	165.0
	# of obs.	(223)	(231)	(223)
2-5 markets	Mean	290	73.5	304.2
	Median	86	22.3	193.5
	# of obs.	(287)	(289)	(287)
6-10 markets	Mean	318	118.7	275.3
	Median	166	36.2	218.8
	# of obs.	(139)	(140)	(139)
11-25 markets	Mean	602	231.3	524.3
	Median	316	80.2	237.8
	# of obs.	(142)	(143)	(142)
26 or more markets	Mean	892	280.8	347.6
	Median	434	113.7	263.8
	# of obs.	(53)	(53)	(53)

Source: OeNB, Statistics Austria, WIFO calculations.

The lower part of the panel in Table 5.6 presents the market coverage premium implied by the estimated coefficients. All coefficients are significant at the 1 percent level. We find consistently higher productivity and firm sizes with increasing market coverage. Firms with the largest market coverage, serving more than 25 markets are roughly 2.7 times more productive than service exporters delivering services to only one market; they are 7 times larger in terms of employment and have almost 15 times more sales. Firms serving more markets are also more likely to be active as foreign direct investors while they are less likely to be foreign owned. Looking at differences between service sector and manufacturing sector

exporters of services we observe that the relationship between productivity and firm sizes is less pronounced for manufacturing firms. On the other hand, for manufacturing firms we may observe a clearer relationship between higher market coverage and the likelihood of a firm being an active foreign direct investor or to be foreign-owned.

Table 5.6: Exporter premium and market coverage

		Service sector						Manufacturing sector					
		Productivity		Employ-ment	Sales	FDI	Foreign control	Productivity		Employ-ment	Sales	FDI	Foreign control
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2-5 markets	Coeff.	0.29	0.34	0.41	0.78	0.03	-0.07	0.07	0.06	0.46	0.54	0.05	0.05
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.06)	(0.08)	(0.00)	(0.00)	(0.01)	(0.03)
6-10 markets	Coeff.	0.61	0.72	0.80	1.47	0.07	-0.07	0.19	0.18	0.88	1.08	0.13	0.07
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
11-25 markets	Coeff.	0.73	0.90	1.26	2.04	0.09	-0.04	0.28	0.27	1.42	1.71	0.23	-0.01
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.70)
26 or more markets	Coeff.	0.71	0.98	1.96	2.70	0.15	0.04	0.41	0.39	1.77	2.18	0.28	0.04
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.25)
ln Employment	Coeff.		-0.14						0.01				
			(0.00)						(0.33)				
Constant	Coeff.	6.28	6.74	3.24	9.47	0.09	0.68	4.32	4.26	5.90	10.22	0.28	-0.05
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.06)	(0.75)
R^2		0.20	0.22	0.20	0.24	0.10	0.12	0.25	0.25	0.28	0.34	0.16	0.17
Adj. R^2		0.19	0.21	0.20	0.23	0.09	0.11	0.24	0.24	0.27	0.33	0.15	0.16
Premium													
2-5 markets	$e^{Coeff.}$	*1.33*	*1.41*	*1.51*	*2.17*			*1.07*	*1.07*	*1.59*	*1.72*		
6-10 markets	$e^{Coeff.}$	*1.83*	*2.05*	*2.22*	*4.33*			*1.20*	*1.19*	*2.42*	*2.95*		
11-25 markets	$e^{Coeff.}$	*2.06*	*2.46*	*3.53*	*7.68*			*1.32*	*1.31*	*4.13*	*5.53*		
26 or more markets	$e^{Coeff.}$	*2.03*	*2.66*	*7.07*	*14.88*			*1.50*	*1.47*	*5.89*	*8.88*		
# of observations		11,400	11,400	11,476	11,763	12,044	12,044	2,924	2,924	2,932	2,942	2,991	2,991

Source: OeNB, Statistics Austria, WIFO calculations. – p-values in parenthesis.

5.3 Major findings

The main findings of this chapter are:

- Service exporters are larger and more productive than non-exporters. We also find a clear ranking of firm size and productivity from established exporters to new exporters and to exiting exporters. Size advantages are higher in the manufacturing sector while the productivity advantage is higher in the services sector.
- The descriptive results suggest "learning-by-exporting" effects for new exporters as well as a self-selection of firms into the export of services. The evidence is descriptive leaving the more detailed analysis of the causality issue to further research.
- The productivity premium and the average productivity are higher for service exporters from the service sector selling "genuine" services than for service exporters from the

manufacturing sector selling service packages along with their manufactured products. While this is no direct proof it suggests that sunk costs of exports – especially for firms expanding to more and to less traditional markets – are larger for service traders than for goods traders. For this argument to hold, we have to assume that manufacturers that are engaged in service trade are also successful goods exporters.

- The analysis finds significant differences also within the group of service exporters with respect to market coverage. Firms exporting services to a greater number of markets are larger and more productive. Firms with higher market coverage are also more likely to be active as foreign direct investors. The market coverage premium is higher in the service sector than in the manufacturing sector suggesting higher fixed costs of exporting to multiple markets in services.

6. The micro-dynamics of exporting

We now turn to a study of the dynamic patterns of service exports. We start with an examination of entry, exit and survival of Austrian service traders in foreign markets and will then proceed in presenting a decomposition of export growth into contributions of surviving exporters and those that switch their export status. This decomposition procedure will allow us to distinguish between export expansion through the extensive margin (entry and exits into markets) and through the intensive margin (contribution of surviving service exporters). As outlined in the introduction in discussing the theoretical models, we should expect entering and exiting firms to be closer to the productivity thresholds for export participation across different markets. Furthermore, uncertainty about the true costs of market entry and the "quality" of the foreign partner increase the volatility of trade relations and induces firms to start exporting with small quantities. The extensive margin, while more frequent in less traditional markets will therefore be less important quantitatively.

6.1 Transition matrices – entry, exit and survival in foreign markets

Table 6.1 shows transition probabilities between different exporting states. It distinguishes between non-exporters, firms that stop exporting (exits), firms that start exporting (new exporters) and established exporters (continuers: firms that export in at least two consecutive years) and compares the status of each firm in year (t) to its status one year (t-1) or two years (t-2) before.

Table 6.1: Entry, exit and survival in foreign markets

	Non-exporters	Stoppers	Starters	Continuing
	Percentage shares			
Non-exporters				
t-1	99.84	0.00	0.16	0.00
t-2	99.70	0.02	0.15	0.13
Stoppers				
t-1	93.48	0.00	6.52	0.00
t-2	87.20	2.66	4.11	6.04
Starters				
t-1	0.00	28.00	0.00	72.00
t-2	34.83	9.70	1.24	54.23
Continuing				
t-1	0.00	7.76	0.00	92.24
t-2	8.04	5.85	0.42	85.70

Source: OeNB, Statistics Austria, WIFO calculations.

The first row in the Table shows the probability of non-exporters to start exporting. This probability is very small reaching only 0.16 percent. The probability of exiting exporters to

switch back to exporting after one year is 6.5 percent as is the likelihood to then continue exporting (6.0 percent). Switching back to exporting after two years has a probability of 4.1 percent. Export starters have much less stable export relations than established exporters. With 28 percent, the probability of new exporters to exit after one year is quite high, but shrinks to roughly 9.7 percent in the second year. The probability of survival is much higher for established exporters.

Table 6.2: Transition matrices by firm size

	Percentage shares			
	Non-exporters	Stoppers	Starters	Continuing
	Small and medium sized firms (1-250 employees)			
Non-exporters				
t-1	99.85	0.00	0.15	0.00
t-2	99.71	0.02	0.14	0.13
Stoppers				
t-1	93.73	0.00	6.27	0.00
t-2	89.28	2.41	3.49	4.83
Starters				
t-1	0.00	23.10	0.00	76.90
t-2	26.81	12.30	1.26	59.62
Continuing				
t-1	0.00	8.20	0.00	91.80
t-2	8.23	6.29	0.48	85.01
	Large sized firms (>250 employees)			
Non-exporters				
t-1	97.36	0.00	2.64	0.00
t-2	94.97	0.39	2.58	2.06
Stoppers				
t-1	83.02	0.00	16.98	0.00
t-2	62.96	7.41	7.41	22.22
Starters				
t-1	0.00	19.67	0.00	80.33
t-2	17.65	0.00	2.94	79.41
Continuing				
t-1	0.00	3.60	0.00	96.40
t-2	4.76	2.51	0.00	92.73

Source: OeNB, Statistics Austria, WIFO calculations.

Table 6.2 presents transition matrices separated by firm size. Confirming the descriptive analysis on firm characteristics, the probability of becoming an exporter is clearly higher for large firms than for small and medium sized firms (SMEs) as is the probability of switching back from exiting to start exporting again (6.3 percent vs. 17 percent). New exporters of large firm size are somewhat more likely to continue exporting after one year (76.9 percent versus 80.3 percent), but have a much higher probability of continuing after two years (59.6 percent

versus 79.4 percent). Vice versa for the probabilities of exit – virtually no large firm that started exporting exits after 2 years. The probability of continuing firms to exit is again smaller than for switching exporters for both size groups, albeit higher for SMEs.

Table 6.3: Transition matrices for market coverage

Change in market coverage		0	1	2	3	4	5	6	7	8	9	10
		2006-2009										
	-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.68
	-9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.84	1.23
	-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.13	1.42	0.00
	-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.73	1.47	1.14	1.23
	-6	0.00	0.00	0.00	0.00	0.00	0.00	5.39	1.75	0.73	0.85	1.23
	-5	0.00	0.00	0.00	0.00	0.00	5.56	1.16	1.54	2.20	1.42	2.76
	-4	0.00	0.00	0.00	0.00	7.25	2.47	2.50	3.51	3.42	7.41	3.07
	-3	0.00	0.00	0.00	9.00	4.05	6.03	5.97	7.24	6.36	4.56	4.60
	-2	0.00	0.00	13.11	8.69	10.20	9.43	10.60	9.87	10.27	9.69	8.59
	-1	0.00	20.30	19.74	19.54	18.55	17.77	17.34	14.47	13.69	13.11	15.34
	0	99.81	61.03	40.78	30.92	27.64	22.10	22.16	18.42	20.29	19.37	16.26
	1	0.07	9.71	12.82	15.62	12.53	16.23	15.22	11.84	11.00	10.83	13.50
	2	0.03	3.11	5.33	5.69	8.97	8.04	4.62	10.96	8.07	8.83	9.51
	3	0.02	1.56	2.81	2.90	3.93	3.71	5.20	5.48	5.13	6.55	7.67
	4	0.01	0.59	1.15	2.28	3.19	2.47	2.89	5.04	4.40	2.56	3.99
	5	0.01	0.42	0.72	1.34	0.98	1.39	2.50	1.54	1.22	2.56	1.53
	6	0.01	0.34	0.29	0.41	0.49	0.31	0.39	1.32	1.47	0.57	1.84
	7	0.01	0.29	0.36	0.41	0.25	0.77	0.58	0.22	0.49	0.57	0.92
	8	0.01	0.34	0.29	0.31	0.00	0.77	0.39	0.00	1.22	1.42	0.92
	9	0.00	0.00	0.22	0.21	0.12	0.77	0.19	0.00	0.24	0.57	0.00
	10	0.00	0.04	0.07	0.10	0.00	0.31	0.39	0.22	0.49	0.28	0.31
	Total entry	*0.19*	*18.66*	*26.37*	*31.85*	*32.31*	*36.63*	*34.87*	*39.47*	*36.43*	*36.18*	*42.02*
	Total exit	*0.00*	*20.30*	*32.85*	*37.23*	*40.05*	*41.27*	*42.97*	*42.11*	*43.28*	*44.44*	*41.72*
		2006-2008										
	-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.81
	-9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.26	0.48
	-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.69	0.85	0.00
	-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.27	1.42	0.85	0.95
	-6	0.00	0.00	0.00	0.00	0.00	0.00	5.01	1.63	0.71	0.43	1.43
	-5	0.00	0.00	0.00	0.00	0.00	5.19	0.59	1.31	0.71	0.43	1.90
	-4	0.00	0.00	0.00	0.00	7.14	2.26	2.65	3.92	4.27	7.23	2.38
	-3	0.00	0.00	0.00	8.30	4.03	6.09	4.42	7.19	7.47	3.40	5.71
	-2	0.00	0.00	11.87	8.30	8.42	9.48	10.91	9.80	9.61	8.09	9.52
	-1	0.00	21.00	19.89	19.31	18.13	17.16	17.99	13.40	13.52	14.04	12.38
	0	99.81	59.57	40.53	30.77	27.29	21.90	23.30	15.36	19.93	18.72	15.71
	1	0.07	9.63	13.26	16.74	13.92	16.03	16.22	12.75	10.68	11.91	14.29
	2	0.04	3.19	5.13	5.58	8.79	7.90	4.42	11.11	8.19	8.51	9.52
	3	0.02	1.74	3.10	3.17	4.03	4.29	5.01	6.86	5.34	8.51	7.62
	4	0.01	0.78	1.28	1.96	3.66	2.71	2.95	5.88	3.91	3.83	4.76
	5	0.01	0.18	0.96	1.21	1.28	2.03	2.36	1.63	1.07	2.98	1.90
	6	0.01	0.42	0.43	0.60	0.73	0.45	0.29	1.63	2.14	0.85	2.86
	7	0.01	0.30	0.43	0.60	0.37	0.68	0.29	0.33	0.36	0.85	1.43
	8	0.01	0.36	0.32	0.45	0.00	1.13	0.29	0.00	1.42	2.13	0.95
	9	0.00	0.00	0.21	0.15	0.18	0.45	0.00	0.00	0.36	0.43	0.00
	10	0.00	0.06	0.11	0.00	0.00	0.23	0.59	0.33	0.71	0.00	0.48
	Total entry	*0.19*	*19.43*	*27.70*	*33.33*	*34.98*	*37.92*	*35.10*	*44.12*	*36.65*	*41.70*	*45.71*
	Total exit	*0.00*	*21.00*	*31.76*	*35.90*	*37.73*	*40.18*	*41.59*	*40.52*	*43.42*	*39.57*	*38.57*

Source: OeNB, Statistics Austria, WIFO calculations.

Table 6.3 reports the pattern of changes in firms' market coverage. Following the analysis of Lawless (2009) we now look at the process of changing market coverage from (n) markets at a specific point in period(t-1) and the changes to (n+x) or (n-x) markets in the following year (t). First, the probability of becoming a service exporter is very small as we have already elaborated in the preceding paragraphs. Most service exporters add markets in a gradual way and it is most common to add only one market. For firms serving only one market it is most common to leave market coverage unchanged. As the market coverage reaches a level of about 7 markets adding more markets occurs more often.

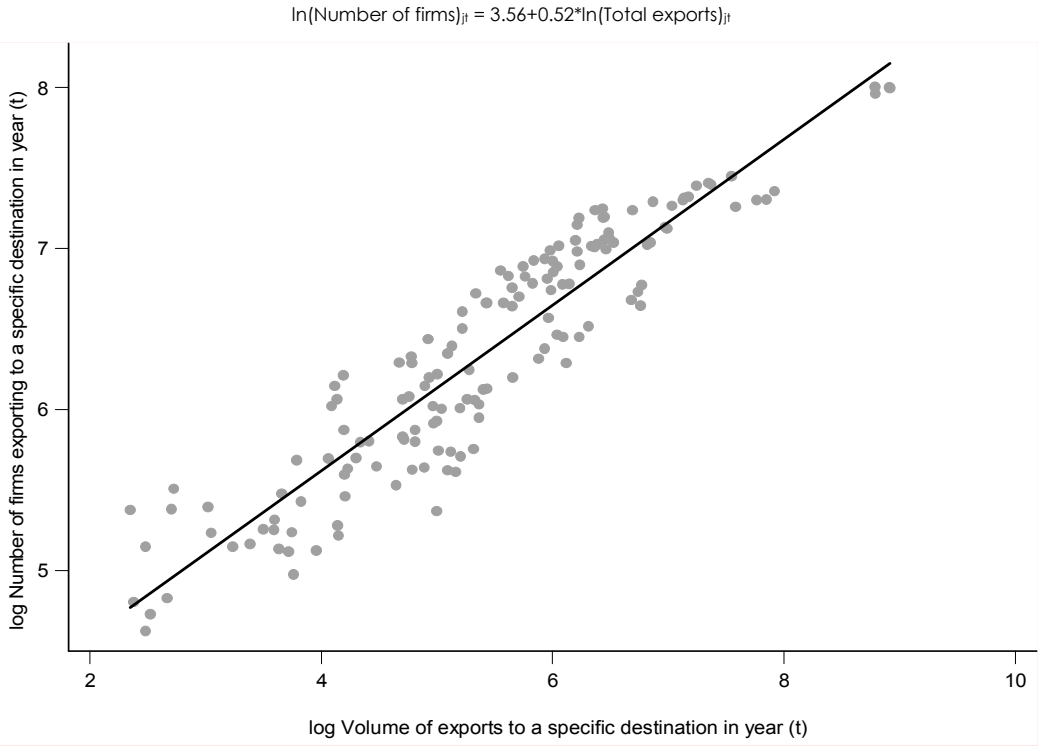
A striking feature of Table 6.3 is the high share of exits from markets over the period considered, but this might be due to the inclusion of the economic crisis year 2009 in the calculations. We repeated the calculations for the years prior to the crisis (2006 and 2008) in the lower panel of Table 6.3. Exit rates indeed become smaller, but there are otherwise no significant changes in the general patterns. Looking at the lower panel of Table 6.3, we see that up to a market coverage of 7 markets firms are always more likely to exit markets than to enter. While it is again most common to subtract one market, the likelihood of exiting multiple markets is higher than of adding multiple markets. This latter observation is especially true for the smaller market coverage class of firms. As we have seen earlier these are likely to be the smaller firms and the export starters.

While we cannot directly compare these dynamic patterns of service exporters to goods exporters in Austria, we could relate our findings to the evidence available for other countries. As to changes in market coverage, Lawless (2009) finds basically the same general patterns for goods trade in Ireland. However, her findings indicate a much higher probability of switching from non-exporting to exporting (higher entry rates) and on the other hand much less volatility in changing the number of markets than our results for Austrian service traders suggest. Ariu (2012) analyzing Belgian foreign trade of services and goods finds a lower entry rate to service exports, but a higher volatility of trade relations than in goods trade.

6.2 Decomposition of Austrian service export dynamics

Aggregate export flows change either because of a change in the export volumes within existing relations (changes on the intensive margin), or because of a change in the export volume that is due to an increasing/decreasing number of export relations (changes on the extensive margin). In this subchapter we decompose the net change in service exports to find out the relative contribution of the two types of margins. Figure 6.1 plotting the number of firms exporting to a specific destination (j) in a specific year ($t_{2006\text{-}2009}$) N_{jt} against the volume of exports per destination and year X_{jt} gives a first impression on the relevance of the two margins in Austrian service exports. The fitted line from a regression of the log of N_{jt} against the log of X_{jt} is clearly upward sloping, indicating that the entry of firms into exporting (extensive margin) is relevant. Specifically, the simple regression results in a coefficient of 0.52 on the number of firms, implying, that each doubling of the export volume to a specific destination involves on average 50 percent more exporters.

Figure 6.1: Number of exporters and total export volume to a specific destination



Source: OeNB, Statistics Austria, WIFO calculations.

We now proceed by decomposing the net export change into the contribution of firms who start exporting or quit exporting and the contributions of firms decreasing and increasing exports within existing export relations. Our analysis is related to the papers of Eaton et al., 2007 studying the dynamics of Columbian exporters across destinations and Lawless (2009) investigating the simultaneous entry and exit of Irish firms in a given destination and their contribution to aggregate growth. Furthermore, Gleeson and Ruane (2006) decompose export dynamics in Irish manufacturing export growth and compare firms' export reactions in boom and bust years. They compare their results for the small open Irish economy to the findings for Germany (Wagner, 2003) and explain the higher exit/entry rate in Ireland with the higher share of "early stage" exporters (i.e. greater number of small firms engaging in export activities) in small countries. Wagner (2012b) also applied the growth decomposition for German goods export dynamics during the export collapse of 2008/2009 as did Bricongne et al. (2012) for French goods exports during the crisis. Looking at the crisis year 2009, it has been argued that as long as adjustments to the crisis occur at the intensive margin as opposed to harder-to-reverse firm exits, trade would more quickly recover afterwards and possibly have less long lasting effects on aggregate export capacity. In this literature changes in the total export volume were shown to be mostly accounted for by increases/decreases of exports in existing export relations (intensive margin) while increases/decreases in the number of export

relations through entries and exits (extensive margin) play a minor role. The evidence for Ireland suggests that in small economies the intensive margin is also predominant but that there is a higher role of entries and exits in export markets. Besedes and Prusa (2006) show that the duration of export relations has a profound impact on long-term export dynamics.

The findings so far are confined to goods trade only. There is not yet any study on the micro-dynamics in service trade. In addition, we provide the first evidence for a small open economy. We will especially concentrate on the micro-structure of export changes during the crisis to see whether the reaction of Austrian service exporters was different to other years.

6.2.1 Decomposition methodology

We build on earlier empirical papers examining the micro-structure of export dynamics and adapt the decomposition methodology introduced by Davis et al. (1996) used widely in the job turnover literature, to decompose the net change of Austrian service exports into the contributions of firms that (i) start exporting, (ii) increase exports, (iii) decrease exports or (iv) stop exporting. We define the different exporter relations for each firm by individual destinations and by year. The decomposition of net export growth is applied to service exporters as a whole, across individual destinations and different firm sizes. We also separate firms according to their foreign ownership status and their FDI status (exporting firm has foreign direct investments or has no FDI). We apply the decomposition for the years 2007 and 2009, to compare the crisis year to a year of relatively high export growth.

Following DHS for each firm we calculate the generalized growth rate of the exports of a single firm i as:

$$(6.1) \qquad g_{it} = 2\frac{X_{it} - X_{it-1}}{X_{it} + X_{it-1}}$$

The main advantage of this measure of growth is that it is also defined for firms that stop ($X_{it} = 0$) and start exporting ($X_{it-1} = 0$) and that it can easily be used to calculate aggregates. Note that in the case of firm exits in foreign marekts we have $g_{it} = -2$, in the case of firm entries into export markets we have $g_{it} = 2$. To obtain the aggregate growth rates for a group of firms (e.g. firm size classes or groups serving specific destination markets) with index k and N_k members, DHS suggest to calulate weighted averages using the weights

$$(6.2) \qquad w_{it,k} = \frac{X_{it} + X_{it-1}}{\sum_{j=1}^{N_k} X_{jt} + X_{jt-1}} \quad \text{to obtain}$$

$$\sum_{i=1}^{N_k} w_{it,k} g_{it} = \sum_{i=1}^{N_k^N} w_{it,k} 2 + \sum_{i=1}^{N_k^+} w_{it,k} g_{it}^+ + \sum_{i=1}^{N_k^-} w_{it,k} g_{it}^- - \sum_{i=1}^{N_k^X} w_{it,k} 2$$

$$= \frac{\sum_{i=1}^{N_k^N} X_{it} + \sum_{i=1}^{N_k^+} \left(X_{it} - X_{it-1}\right)^+ + \sum_{i=1}^{N_k^-} \left(X_{it} - X_{it-1}\right) - \sum_{i=1}^{N_k^X} X_{it-1}}{0.5 \sum_{j=1}^{N_k} \left(X_{jt} + X_{jt-1}\right)} \tag{6.3}$$

$$:= g_{t,+}^k + g_{t,-}^k + g_{t,N}^k + g_{t,X}^k$$

which splits the export growth into the contribution of continuing export increasers, continuing export decreasing firms as well as of entries and exits into foreign markets within a specified group of firms.

Equation (6.3) can be reformulated to arrive at the equivalent of (6.1)

$$\sum_{i=1}^{N_k} w_{it,k} g_{it} = 2 \sum_{i=1}^{N_k} \frac{X_{it} + X_{it-1}}{\sum_{j=1}^{N_k} \left(X_{jt} + X_{jt-1}\right)} \frac{X_{it} - X_{it-1}}{X_{it} + X_{it-1}} = \frac{\sum_{i=1}^{N_k} X_{it} - X_{it-1}}{0.5 \sum_{j=1}^{N_k} \left(X_{jt} + X_{jt-1}\right)} \tag{6.4}$$

6.2.2 General results

Table 6.4 shows the numbers and shares of the four exporter types distinguished. The first striking result is the extent to which gross flows of entry and exit in both years outweigh net changes in the number of exporters. We find a net decrease in the number of exporters by about 2,600 in 2009, but the underlying pattern is much more dynamic with roughly 8,800 exits (export stoppers) and 6,100 entries (export starters). The other interesting finding is that even in a deep crisis such as that of 2009 we find an impressive amount of export creation: over 6,000 firms started to export in the crisis year and roughly a quarter of firms still was able to increase cross-border sales of services. This heterogeneity of exporting behaviour is also evident in 2007, a year of high service exports growth.

Table 6.5 shows the total net change in service exports as well as its decomposition into the positive contributions of firms who started exporting or increased exports and the negative contributions due to firms that stopped exporting or reduced exports. Broadly confirming earlier findings in the literature, the main contributions to net export changes in all years come from the activities of continuing exporters. However, this was especially true during the crisis of 2009. As stated earlier, this distinction is important also with a view to the pattern and speed of recovering after a marked downturn in export volumes. Continuing to export, but decreasing the scale of exporting to various markets is potentially easier than to re-enter a market.

Table 6.4: Entry, exit and survival in foreign markets, 2007 and 2009

Number of firms and percentage shares

		2007	2009
Starters	# of firms	7,861	6,145
	Percentage shares	22.5	16.9
Increasers	# of firms	11,671	9,431
	Percentage shares	33.4	25.9
Decreasers	# of firms	9,027	12,013
	Percentage shares	25.8	33.0
Stoppers	# of firms	6,441	8,770
	Percentage shares	18.4	24.1
Total	# of firms	35,000	36,359
	Percentage shares	100.0	100.0
Net entry	# of firms	*1,420*	*-2,625*
	Percentage shares	*4.1*	*-7.2*
Net continuing	# of firms	*2,644*	*-2,582*
	Percentage shares	*7.6*	*-7.1*

Source: OeNB, Statistics Austria, WIFO calculations.

Table 6.5: Decomposition of Austrian service export growth by export status

	Starters	In-creasers	De-creasers	Stoppers	Total	*Net entry*	*Net con-tinuing*
	Contributions in percentage points				Percentage changes	Contributions in percentage points	
2007	7.21	22.11	-14.32	-3.36	11.64	*3.85*	*7.79*
2009	4.17	15.03	-28.36	-4.56	-13.72	*-0.40*	*-13.33*
Cumulative growth (t=2009, t-1=2006)	18.34	25.31	-26.45	-11.87	5.33	*6.47*	*-1.14*

Source: OeNB, Statistics Austria, WIFO calculations.

Compared to results of Wagner (2012b) who studied goods trade dynamics in Germany during 2009, we find a much larger share of entering and exiting exporters and much larger contributions from entries and exits. This could partly be due to the different country size as proposed by Gleeson and Ruane (2006) performing decomposition exercise for Irish firms. They also find evidence for more entries and exits in goods exports of Irish firms in comparison to the results of Wagner (2012b) for Germany and explain this by the fact that firms in small open economies start exporting at an earlier stage in search for larger markets due to the limited size of the domestic market. The greater number of small firms engaging in exporting activities in turn increases the likelihood of exits and re-entries. Ariu's (2012) paper offers another possible explanation for our finding of higher entry and exit rates. For Belgian firms she found higher volatility in export relations in service trade than in goods trade and attributes this to the higher uncertainty involved in service trade. Austria's service exports indeed also exhibit a higher share of starting and stopping exporters than was found for Ireland during the bust year 2002 (Gleeson and Ruane, 2006): goods exports in Ireland in that year shrank by a

much higher rate of –26.2 percent and the share of firms switching their export status was 33 percent. In Austria the share of switchers during the crisis amounted to 41 percent when Austrian service exports decreased by 11.6 percent according to the micro-data. Certainly this is a very crude comparison and should not be taken as conclusive evidence.

The cumulative effect of entry and exit at the beginning of the period to growth over the total period considered (2006 to 2009) is presented in the last row of Table 6.5. Following Gleeson and Ruane (2006) we calculate these effects by defining export starters as exporters observed in 2009 but not in 2006, export stoppers are firms that were exporting in 2006 but not in 2009, and continuing exporters are firms exporting at the beginning and at the end of the period. We find that the cumulative effect of entry and exit over a period of three years is relatively high and over the period considered had a substantial impact on total growth over the period. Gross entry contributed 18.3 percentage points to total export growth while gross exit contracted exports by 11.9 percentage points. The contributions of gross flows of continuing exporters are still higher, however, net entry over the period contributed 6.5 percent, while the net impact of increasing and decreasing exports of continuing exporters was negative and small (–1.14 percent).

6.2.3 Results by destination market

How prevalent were entries and exits across different markets in 2009? Table 6.6 reveals the distribution of different exporter types in individual markets ranked by the destination's popularity in Austrian service exports.[6] Again we see that in each market gross flows outweigh net changes by a high degree. Most interestingly, however, rates of entry and exit tend to increase as we move from the more popular markets to less popular destinations. The exit rate (and entry rate) was lowest in Germany (12.3 percent) which is by far the most important export market for Austrian service exporters – the 2,868 firms who exported at least some of services to this market represent 80 percent of the exporters in the sample. The role of stoppers increases to an average of about 22 percent for the next markets among the 10 most popular destinations and increases to 26.2 percent, 30.6 percent and 34 percent as we move from the group of the 10 to 20 most popular, 20 to 30 most popular to the least popular in our sample of destination markets. In general, the share of starters and stoppers is lower for the more popular markets than it is for the less popular markets.

[6] The database used comprises only selected 37 countries and a "rest" group.

Table 6.6: Entry, exit and survival by export destination, 2009

	Starters	In-creasers	De-creasers	Stoppers	Total	*Net entry*	*Net con-tinuing*
			Percentage shares				
DE	9.2	32.5	45.9	12.3	100.0	-3.1	-13.4
CH	14.5	30.1	36.4	18.9	100.0	-4.4	-6.3
IT	15.1	25.6	39.3	20.0	100.0	-4.9	-13.6
GB	15.2	27.0	33.7	24.1	100.0	-8.9	-6.7
US	16.9	25.6	33.2	24.3	100.0	-7.4	-7.6
HU	14.7	27.3	35.2	22.8	100.0	-8.1	-7.8
NL	14.9	27.9	34.0	23.3	100.0	-8.4	-6.1
FR	17.2	26.4	35.0	21.4	100.0	-4.2	-8.6
CZ	16.7	29.7	32.3	21.3	100.0	-4.6	-2.7
RO	16.5	23.4	34.0	26.0	100.0	-9.5	-10.6
SE	20.9	24.2	29.8	25.1	100.0	-4.2	-5.6
RU	18.2	20.8	30.5	30.4	100.0	-12.2	-9.7
PL	17.9	25.8	31.3	25.0	100.0	-7.1	-5.5
SK	18.3	27.8	30.6	23.3	100.0	-5.0	-2.8
BE	16.9	27.7	29.4	25.9	100.0	-9.0	-1.7
SI	19.2	26.4	30.1	24.4	100.0	-5.2	-3.7
ES	18.9	23.4	31.5	26.2	100.0	-7.4	-8.1
FI	21.1	20.8	29.6	28.5	100.0	-7.4	-8.8
HR	18.1	26.3	29.0	26.7	100.0	-8.6	-2.7
TR	21.6	23.0	24.9	30.6	100.0	-9.0	-2.0
JP	18.9	24.4	28.3	28.5	100.0	-9.7	-3.9
UA	19.9	15.1	31.0	34.1	100.0	-14.2	-15.9
BG	20.8	24.2	26.1	28.9	100.0	-8.1	-1.9
GR	20.6	19.9	28.8	30.7	100.0	-10.1	-8.9
LI	20.5	21.0	27.0	31.5	100.0	-11.0	-6.0
IE	21.8	17.7	29.1	31.4	100.0	-9.6	-11.4
DK	18.8	21.6	30.0	29.6	100.0	-10.8	-8.4
CY	19.6	20.7	26.4	33.2	100.0	-13.6	-5.7
AU	19.5	25.4	27.8	27.3	100.0	-7.8	-2.4
PT	23.7	22.6	24.5	29.3	100.0	-5.6	-1.9
LU	17.1	21.9	29.4	31.6	100.0	-14.5	-7.5
EE	25.5	19.0	20.9	34.6	100.0	-9.1	-1.9
LV	18.7	12.2	26.2	42.9	100.0	-24.2	-14.0
MT	21.5	17.9	25.6	35.0	100.0	-13.5	-7.6
BR	16.8	23.4	28.5	31.4	100.0	-14.6	-5.1
LT	25.2	19.8	21.9	33.1	100.0	-7.9	-2.1
NZ	17.6	21.6	29.7	31.1	100.0	-13.5	-8.1
Rest	15.8	29.1	35.1	20.0	100.0	-4.2	-6.0
Total	16.9	25.9	33.0	24.1	100.0	-7.2	-7.1

Source: OeNB, Statistics Austria, WIFO calculations. – For an explanation of country codes see Table A.1 in the appendix. Countries ranked by popularity (volume of service exports).

Table 6.7: Decomposition of Austrian service export growth by export status and by destination, 2009

	Starters	In-creasers	De-creasers	Stoppers	Total	*Net entry*	*Net con-tinuing*
	Contributions in percentage points				Percentage changes	Contributions in percentage points	
DE	1.90	10.99	-22.00	-3.40	-12.52	*-1.50*	*-11.01*
CH	3.67	19.80	-33.28	-7.56	-17.38	*-3.90*	*-13.48*
IT	3.01	9.39	-23.32	-2.86	-13.79	*0.15*	*-13.93*
GB	5.78	13.22	-29.85	-4.65	-15.50	*1.13*	*-16.63*
US	3.10	14.46	-23.67	-3.13	-9.24	*-0.03*	*-9.21*
HU	3.46	16.12	-54.44	-7.82	-42.68	*-4.37*	*-38.32*
NL	10.63	17.22	-25.99	-4.47	-2.61	*6.17*	*-8.77*
FR	3.24	13.23	-28.78	-3.42	-15.74	*-0.18*	*-15.55*
CZ	2.75	19.41	-36.67	-5.55	-20.06	*-2.81*	*-17.25*
RO	1.92	20.43	-31.80	-5.72	-15.18	*-3.80*	*-11.38*
SE	1.40	9.76	-36.76	-1.81	-27.40	*-0.40*	*-27.00*
RU	16.41	12.48	-34.66	-5.90	-11.67	*10.51*	*-22.18*
PL	4.97	23.86	-39.67	-6.67	-17.51	*-1.70*	*-15.81*
SK	2.97	18.28	-35.48	-7.61	-21.83	*-4.63*	*-17.20*
BE	13.63	10.93	-22.71	-3.74	-1.89	*9.90*	*-11.78*
SI	6.68	14.12	-37.86	-11.44	-28.50	*-4.76*	*-23.74*
ES	3.36	12.98	-31.72	-5.51	-20.89	*-2.15*	*-18.74*
FI	5.89	13.57	-22.52	-3.55	-6.62	*2.33*	*-8.95*
HR	9.70	17.90	-27.24	-11.77	-11.42	*-2.08*	*-9.35*
TR	20.28	24.70	-27.09	-5.79	12.10	*14.49*	*-2.39*
JP	1.22	17.32	-12.49	-2.04	4.01	*-0.82*	*4.83*
UA	16.73	35.16	-51.82	-5.03	-4.96	*11.70*	*-16.67*
BG	7.22	22.86	-26.75	-12.00	-8.68	*-4.79*	*-3.89*
GR	2.65	19.69	-30.92	-15.38	-23.96	*-12.73*	*-11.23*
LI	2.19	15.85	-25.21	-8.14	-15.32	*-5.95*	*-9.36*
IE	6.93	9.27	-29.42	-5.08	-18.30	*1.86*	*-20.16*
DK	6.60	9.98	-36.13	-5.37	-24.93	*1.23*	*-26.16*
CY	9.90	13.26	-43.71	-6.93	-27.49	*2.97*	*-30.46*
AU	3.82	17.95	-30.39	-1.58	-10.21	*2.24*	*-12.44*
PT	7.01	25.40	-8.96	-9.20	14.26	*-2.19*	*16.45*
LU	4.96	23.83	-21.84	-16.67	-9.72	*-11.71*	*1.99*
EE	5.22	2.66	-137.01	-6.70	-135.84	*-1.48*	*-134.36*
LV	62.62	22.92	-47.44	-8.89	29.21	*53.73*	*-24.52*
MT	5.39	58.39	-13.27	-13.03	37.47	*-7.64*	*45.11*
BR	7.39	16.46	-26.27	-5.60	-8.02	*1.80*	*-9.81*
LT	19.85	44.07	-21.18	-13.62	29.13	*6.23*	*22.90*
NZ	4.88	21.82	-14.08	-2.38	10.24	*2.50*	*7.75*
Rest	2.64	19.79	-27.36	-1.99	-6.92	*0.65*	*-7.57*

Source: OeNB, Statistics Austria, WIFO calculations. – For an explanation of country codes see Table A.1 in the appendix. Countries ranked by popularity (volume of service exports).

What does this pattern imply for net growth of exports across the different markets? In Table 6.7 we find that apart from some of the less traditional Austrian service export markets, the main contribution to the negative net export change in 2009 comes from shrinking

exports of continuing exporters. This is especially true for the more popular markets with generally less switching between exporting states. Other than that the data reveal a great deal of heterogeneity of growth patterns across different markets. Despite its generally lower rate, it is interesting to find a positive contribution of net entry in almost half of the markets listed in Table 6.7 during the crisis with especially high contributions in some of the emerging markets, such as Russia, Turkey, the Ukraine and Latvia.

6.2.4 Results by firm size

Table 6.8 shows the numbers and shares of the different exporter types by size classes. The distributions presented in Table 6.8 clearly show a different role of the extensive margin and the intensive margin in a comparison of the smallest and the largest firms. Export stoppers accounted for the largest share in the smallest size group (30.3 percent) while for all other size groups – especially the largest firms – continuing exporters that decreased exports in 2009 held the largest shares. Overall, again we may note that even during the crisis we find quite significant export creation in all firm size classes – again the intensive margin (firms increasing exports) outweighs the extensive margin (entry into exporting), especially in the larger size groups.

Table 6.8: Entry, exit and survival in foreign markets by employment classes, 2009

Number of firms and percentage shares

		Starters	In-creasers	De-creasers	Stoppers	Total	*Net entry*	*Net continuing*
1-24	# of firms	3,007	3,235	4,105	4,494	14,841	-1,487	-870
	Percentage shares	*20.3*	*21.8*	*27.7*	*30.3*	*100.0*	*-10.0*	*-5.9*
25-49	# of firms	977	1,533	2,015	1,488	6,013	-511	-482
	Percentage shares	*16.3*	*25.5*	*33.5*	*24.8*	*100.0*	*-8.5*	*-8.0*
50-99	# of firms	753	1,230	1,591	943	4,517	-190	-361
	Percentage shares	*16.7*	*27.2*	*35.2*	*20.9*	*100.0*	*-4.2*	*-8.0*
100-249	# of firms	694	1,419	1,714	959	4,786	-265	-295
	Percentage shares	*14.5*	*29.7*	*35.8*	*20.0*	*100.0*	*-5.5*	*-6.2*
>250	# of firms	714	2,014	2,588	886	6,202	-172	-574
	Percentage shares	*11.5*	*32.5*	*41.7*	*14.3*	*100.0*	*-2.8*	*-9.3*
Total	# of firms	6,145	9,431	12,013	8,770	36,359	-2,625	-2,582
	Percentage shares	*16.9*	*25.9*	*33.0*	*24.1*	*100.0*	*-7.2*	*-7.1*

Source: OeNB, Statistics Austria, WIFO calculations.

Decomposing net export changes across different size groups confirms this pattern of the role of intensive and extensive margins in general (Table 6.9). While export destruction of export decreasing firms dominates in all size classes, its contribution is much less in the smallest size group. The smallest decline in exports occurred in the smallest size group of exporters (–1.8 percent) and most interestingly, we find a positive contribution to export growth of the extensive margin (net entry) among the smallest firms. Overall, export creation due to starters and export increasing firms was quite significant within the group of the smallest firms. Firms in

the size group of 25 to 49 employees marked the sharpest decline in the volume of exports – most of this downturn was however due to less intense trade rather than firm exit.

Table 6.9: Decomposition of Austrian service export growth by export status and by employment classes, 2009

	Starters	In-creasers	De-creasers	Stoppers	Total	*Net entry*	*Net con-tinuing*
	Contributions in percentage points				Percentage changes	Contributions in percentage points	
1-24	16.26	22.86	-29.61	-11.33	-1.82	*4.93*	*-6.75*
25-49	3.35	13.54	-42.51	-5.95	-31.56	*-2.60*	*-28.96*
50-99	3.50	16.71	-30.06	-4.06	-13.91	*-0.57*	*-13.34*
100-249	2.56	15.42	-28.17	-5.52	-15.71	-2.96	*-12.75*
>250	1.17	12.41	-24.67	-1.92	-13.01	*-0.75*	*-12.26*

Source: OeNB, Statistics Austria, WIFO calculations.

6.2.5 Results by ownership and FDI status of service exporting firms

Finally, we provide an analysis that differentiates firms by their ownership status and by the FDI status. We find no marked difference in the underlying pattern of export dynamics with respect to the ownership status. Table 6.11 reveals that foreign-owned Austrian service exporters experienced a smaller net decrease in total exports in 2009, which is mostly due to quite significant export creation from firms' increasing exports and export starters. However, the data reveal no role of foreign ownership with respect to the role of the intensive or extensive margins: in both types of firms the activity of continuing exporters strongly dominates.

Table 6.10: Entry, exit and survival by ownership and FDI status, 2009

Number of firms and percentage shares

		Starters	In-creasers	De-creasers	Stoppers	Total	*Net entry*	*Net con-tinuing*
No foreign ownership	# of firms	3,860	5,743	7,431	5,288	22,322	*-1,428*	*-1,688*
	Percentage shares	*17.3*	*25.7*	*33.3*	*23.7*	*100.0*	*-6.4*	*-7.6*
Foreign-owned	# of firms	2,285	3,688	4,582	3,482	14,037	*-1,197*	*-894*
	Percentage shares	*16.3*	*26.3*	*32.6*	*24.8*	*100.0*	*-8.5*	*-6.4*
No activ e FDI	# of firms	5,297	7,456	9,636	7,639	30,028	*-2,342*	*-2,180*
	Percentage shares	*17.6*	*24.8*	*32.1*	*25.4*	*100.0*	*-7.8*	*-7.3*
Activ e FDI	# of firms	848	1,975	2,377	1,131	6,331	*-283*	*-402*
	Percentage shares	*13.4*	*31.2*	*37.6*	*17.9*	*100.0*	*-4.5*	*-6.4*

Source: OeNB, Statistics Austria, WIFO calculations.

Table 6.11: Decomposition of Austrian service export growth by export status, foreign ownership and FDI status, 2009

	Starters	In-creasers	De-creasers	Stoppers	Total	*Net entry*	*Net con-tinuing*
	Contributions in percentage points				Percentage changes	Contributions in percentage points	
No foreign ownership	2.66	12.63	-27.83	-3.79	-16.34	*-1.13*	*-15.21*
Foreign-owned	5.65	17.41	-28.88	-5.32	-11.15	*0.33*	*-11.48*
No activ e FDI	3.84	16.70	-26.39	-6.02	-11.87	*-2.18*	*-9.69*
Activ e FDI	4.58	12.92	-30.86	-2.71	-16.08	*1.86*	*-17.94*

Source: OeNB, Statistics Austria, WIFO calculations.

On the other hand, the data suggest different behaviour of exporting firms that are also foreign direct investors and those that are not. Active foreign direct investors are more likely to adapt at the intensive margin. During the crisis of 2009 export decreasing continuers accounted for the largest share (almost 40 percent) while stoppers accounted for only about 20 percent. Conversely, entries and exits are more likely among firms without foreign direct investments. Partly this could reveal the closer and deeper connection to foreign markets in which firms own subsidiaries and the likelihood of intra-firm exports. It might however also relate to firm size which is most likely to be correlated to internationalization propensity via FDI.

6.2.6 *Major findings*

The main findings of this chapter on the micro-structure of service export dynamics in Austria may be summarized as follows:

- The probability of non-exporting firms to start exporting is very small (0.16 percent). Firms that enter and exit several times "switching firms" have a higher probability of 6.5 percent to re-start exporting after one year which drops to 4 percent after 2 years. Most of them remain in the non-exporting status. New exporters have less stable export relationships than established exporters. With 28 percent, the probability of new exporters to exit after one year is quite high, but exits are much less likely in the second year of exporting with the probability shrinking to roughly 10 percent in the second year. This result points at the importance of continuing exporting over the first years. This reflects mostly the picture of small and medium sized firms (SMEs), large firms have much more stable export relationships and a higher probability of entry.
- Many firms only serve one market and for these firms it is most common to leave market coverage unchanged. In general, most service exporters add markets in a gradual way and it is most common to add only one market. As the market coverage reaches a level of about 7 markets adding more markets occurs more often. There is no comparable analysis for Austrian trade in goods. Comparisons to evidence for goods trade in other countries suggest a clearly higher likelihood of changes in the number of markets in service export relations.

- Survival of export relationships is a necessary requirement for trade deepening and export growth, as poor survival prevents deepening from taking place. The duration of export relations thus has a profound impact on long term export dynamics.
- The decomposition of service exports growth into the contribution of entering, exiting and surviving firms in foreign markets found support for the prediction that export growth should be largely driven by continuing firms. Most of the change in exports occurs within existing trade relations in a given year (intensive margin), newly created or destroyed relations (extensive margin) account for a small fraction of the overall net export change.
- Net export flows and growth dynamics conceal the very dynamic pattern in the gross flows of entries and exits (as they mostly cancel out).
- The focus on gross flows also reveals a large amount of export creation even during the crisis (and conversely a large amount of export destruction in years of high export growth).
- Export dynamics in individual destinations are to a large part due to variations in existing export relations, with new entries or exits accounting only for a small fraction. Trade relations, however, are much more stable in more popular export destinations while exits and entries are much more common in less popular markets and the extensive margin is more relevant for less popular export markets.
- Smaller firms have less stable export relations and the extensive margin is more relevant for small service exporting firms. The stability of export relations and the importance of the intensive margin clearly increase with firm size.
- Austrian foreign direct investors have more stable export relations and service export growth of active foreign direct investors is mostly driven by the intensive margin.
- The detailed firm-level data on Austrian service exporters also suggest that most of the service trade collapse in 2009 was due to the decline in existing trade relations rather than firms stopping to export in specific markets or all-together. Overall, the reactions of exporters to the crisis of 2009 fit very well into the patterns of a typical year. There are no signs that small firms have been particularly hit by a higher than usual share of harder-to-reverse firm exits – due for instance to credit shortages.

7. Gravity analysis of service exports at the firm-level

7.1 Introduction

Following the new trade theory literature pioneered by Melitz (2003) and further developed by Chaney (2008), Helpman et al. (2008) and Crozet and Koenig (2010), the presence of zero trade flows of firms can be attributed to the self-selection of the more productive firms into the export destination markets. As elaborated in the earlier chapters, firms exhibit heterogeneity in their productivity and only those firms that earn operating profits in a destination market which are large enough to cover the fixed costs will be able to serve that market. Aggregate trade flows, therefore, are driven by two sources of adjustment. On the one hand firms, entering (exiting) a specific destination market contribute to an increase in exports (decrease) to that market (the external margin). On the other hand, firms that continue their exports to a destination may increase or decrease their export activities (the internal margin). For economic policy both margins of adjustment, and especially their relative contributions to overall export growth, seem to be highly relevant. The decomposition of service export growth along these dimensions in Chapter 6 provided a first analysis. In this chapter we will employ an econometric approach on the firm-level and "gravity" (market size and trade barriers) determinants to examine their impact on the magnitude of export flows as well as on the decision of firms to serve the foreign market at all.

7.2 Empirical specification and decomposition of export growth

Based on the theoretical model with heterogeneous firms (as presented in Chapter 2) this subchapter derives the empirical specification and motivates the application of the Heckman sample selection model. To elaborate on the role of certain key determinants we additionally consider a counterfactual analysis where we decompose the expected aggregate export volume into two components in order to analyze the response of the intensive and the extensive margin of adjustment to changes in exogenous variables. We also motivate the functional composition of the counterfactual analysis.

Our empirical analysis relies on a large-cross section of service firms. However, as the theoretical model with the Pareto distribution leads to an intractable empirical model, it seems more plausible to use a standard Heckman sample selection specification based on a bivariate normal distribution of the latent propensity to export, z_{ij}^{*} and the export volume x_{ij}. Thereby, we subsume the set of explanatory variables including industry dummies into w_{ij} with corresponding parameter vector β in the outcome equation and γ in the selection equation, respectively. Furthermore, the model includes iid[7] bivariate normal disturbances (u_{ij}, v_{ij}) for each service trade flow of a firm:

[7] Independently and identically distributed.

(7.1) $$z_{ij}^{*} = w_{ij}\gamma + v_{ij}$$

(7.2) $$x_{ij} = \begin{cases} w_{ij}\beta + u_{ij} \; if \; z_{ij}^{*} \geq 0 \\ unobserved \; if \; z_{ij}^{*} < 0 \end{cases}$$

(7.3) $$u_{ij}, v_{ij} \sim N(0, (1, \sigma_u^2, \rho\sigma_u))$$

The model can be estimated by Maximum Likelihood. Ideally, one would like to impose exclusion restrictions to ensure that parameters are identified and to rule out poor performance of the estimators. However, the theoretical model does not suggest any such exclusion restriction as fixed trade costs remain unobserved or its determinants are indistinguishable from that of the variable trade costs. Cameron and Trivedi (2006) show that the model, since it is a non-linear one, is formally identified and precise estimation will be possible if the variation of $w_{ij}\gamma$ is large enough.

For the interpretation of the parameters and the comparative static analysis the impact of selection into exporter status has to be taken into account, in addition to the direct impact on export volumes. For firms, which decided to export, the conditional expectation of their trade can be derived as (see Cameron and Trivedi, 2006):

(7.4) $$E[x_{ij} \mid z_{ij}^{*} \geq 0] = w_{ij}\beta + \rho\sigma_u\lambda(w_{ij}\gamma), \; \lambda(w_{ij}\gamma) = \frac{\phi(w_{ij}\gamma)}{\Phi(w_{ij}\gamma)}$$

while the unconditional expectation relevant for the analysis of a group of firms is given as:

(7.5) $$E[x_{ij}] = P(z_{ij}^{*} \geq 0)E[x_{ij} \mid z_{ij}^{*} \geq 0] = \Phi(w_{ij}\gamma)w_{ij}\beta + \rho\sigma_u\lambda(w_{ij}\gamma)\Phi(w_{ij}\gamma)$$

Marginal Effects can thus be calculated as:

(7.6) $$\frac{\partial E[x_{ij} \mid z_{ij}^{*} \geq 0]}{\partial x_{ij,k}} = \beta_k - \rho\sigma_u\gamma_k(\lambda_{ij}^2 + w_{ij}\gamma\lambda_{ij})$$

To illustrate the role of the main determinants and to quantify the size of their impact we compare predicted export flows in the counterfactual and the baseline scenario and aggregate the implied percentage changes to weighted averages of groups of firms. For this, we follow Yen and Rosinski (2008) and calculate the estimated expectation of the positive trade flows in levels as:

(7.7) $$E[e^{x_{ij}} \mid z_{ij}^{*} \geq 0] = e^{x_{ij}\beta + \sigma_u^2/2} \frac{\Phi(w_{ij}\gamma + \rho\sigma_u)}{\Phi(w_{ij}\gamma)}$$

The unconditional expectation is therefore given by:

(7.8) $$E[e^{x_{ij}}] = E[e^{x_{ij}} \mid z_{ij}^{*} \geq 0]P(z_{ij}^{*} \geq 0) = e^{x_{ij}\beta + \sigma_u^2/2}\Phi(w_{ij}\gamma + \rho\sigma_u)$$

Aggregating over the firms yields $\sum_{i=1}^{N} E[e^{x_{ij}}]$ as a measure of the expected aggregate nominal trade flow to country j. Note, this measure considers both exporting and non-exporting firms, but sets exports for the non-exporter status that occurs with probability $1-P(z_{ij}^{*} \geq 0)$ to zero. The main advantage of this approach is that it avoids the prediction of the actual exporter status under both the base and the counterfactual scenario.

In our comparative static exercises we decompose the expected aggregate export volume into two components in order to analyze the reaction of the internal and the external margin of adjustment to changes in exogenous variables. First, we consider continuing exporters (internal margin) holding the probability of exporting constant. Second, the probability of exporting changes at given conditional expectations of positive exports (external margin). In particular, we analyze percent changes (G_{ij}), where superscript C refers to the counterfactually changed situation. For firm i exporting to destination country j one obtains:

$$(7.9) \quad G_{ij} = \frac{E[e^{x_{ij}^{C}}] - E[e^{x_{ij}}]}{E[e^{x_{ij}}]}$$

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

(internal margin at constant probability to export)

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

(external margin at constant positive export flows)

Inserting the conditional expectations and the probabilities to export from above to obtain the unconditional expectation (7.8) yields the decomposition:

$$(7.10) \quad G_{ij} = \frac{\Phi(w_{ij}^{C}\gamma + \rho\sigma_u)\left[e^{x_{ij}^{C}\beta+\sigma_u^2/2} - e^{x_{ij}\beta+\sigma_u^2/2}\right]}{e^{x_{ij}\beta+\sigma_u^2/2}\Phi(w_{ij}\gamma + \rho\sigma_u)}$$

$$+ \frac{\left(\Phi(w_{ij}^{C}\gamma + \rho\sigma_u) - \Phi(w_{ij}\gamma + \rho\sigma_u)\right)\left[e^{x_{ij}\beta+\sigma_u^2/2}\right]}{e^{x_{ij}\beta+\sigma_u^2/2}\Phi(w_{ij}\gamma + \rho\sigma_u)}$$

$$= \frac{\Phi(w_{ij}^{C}\gamma + \rho\sigma_u)}{\Phi(w_{ij}\gamma + \rho\sigma_u)}\left[e^{(x_{ij}^{C}-x_{ij})\beta+\sigma_u^2/2} - 1\right] + \left(\frac{\Phi(w_{ij}^{C}\gamma + \rho\sigma_u)}{\Phi(w_{ij}\gamma + \rho\sigma_u)} - 1\right)$$

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

$$(7.11) \quad int_i = \frac{\Phi(w_{ij}^C \gamma + \rho\sigma_u)}{\Phi(w_{ij}\gamma + \rho\sigma_u)} \left[e^{(x_{ij}^C - x_{ij})\beta + \sigma_u^2/2} - 1 \right]$$

While that to the external margin reads:

$$(7.12) \quad ext_i = \left(\frac{\Phi(w_{ij}^C \gamma + \rho\sigma_u)}{\Phi(w_{ij}\gamma + \rho\sigma_u)} - 1 \right)$$

Adding these two components yields the corresponding total change:

$$(7.13) \quad tot_i = \frac{\Phi(w_{ij}^C \gamma + \rho\sigma_u)}{\Phi(w_{ij}\gamma + \rho\sigma_u)} e^{(x_{ij}^C - x_{ij})\beta + \sigma_u^2/2} - 1$$

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

$$(7.14) \quad \frac{\sum_{i=1}^{N} G_{ij}^C - \sum_{i=1}^{N} G_{ij}}{\sum_{i=1}^{N} G_{ij}} = \sum_{i=1}^{N} tot_i \frac{E[e^{x_{ij}}]}{\sum_{k=1}^{N} E[e^{x_{kj}}]}$$

and similarly for the external an internal margin. In our empirical exercise these weights are based on the predictions of the baseline model.

7.3 Data and estimation results

7.3.1 Data description

For the empirical analysis in this chapter we use a data sample covering only firms that exported during the years 2006 to 2009 with additional information on the respective destination country (see Chapter 3 for a detailed overview). In the empirical specification we consider the observed volume of bilateral export flows (in 1,000 €) from firm i to the respective destination market j, which also comprises zero trade flows whenever the firm does not deliver services there. In the country dimension the dataset distinguishes between 37 export destinations which belong to the EU-27, emerging markets and overseas countries. Table A.1 in the appendix provides an overview on the total list of countries covered. The vector of explanatory variables comprises firm specific characteristics, bilateral geographical characteristics and destination market characteristics. To account for differences among

firms we proxy for productivity by a combined look at sales and sales per employee. In addition, variables on geographical characteristics and cultural and historical ties are taken from the CEPII database additionally merged to the dataset. This set of explanatory variables includes information on bilateral distance and time zone differences between the trading partners, contiguity, common language familiarities, past colonial links and whether the destination country is landlocked. The size of the destination market is captured by GDP (measured in billions of current US Dollars) which in addition to GDP per capita is drawn from the World Bank's World Development Indicators (WDI) database. Information on the policy environment is taken from the OECD's product market regulation database which measures the restrictiveness of economy-wide product market regulation on a scale from least (0) to most restrictive (6). Moreover, information on the strength of legal rights (0=weak to 10=strong), a proxy for the quality of economic institutions, is compiled in the World Development Indicators (WDI) database provided by the World Bank. As the index on product market regulation is only provided for OECD countries we lose a subset of our sample (slightly more than one third of total observations) due to the inclusion of variables measuring the policy environment. As this might cause problems by excluding a certain sample of countries we therefore consider two specifications. First, in the so-called "big sample" we do not account for policy indices and use the full set of observations provided in our dataset. In a second specification, the so called "policy-sample", we also include the policy indicators as explanatory variables. The main interpretation of the results from the Heckman sample selection model change only slightly when we account for the policy environment. Table A.2 in the appendix provides a description of the variables and an overview on the data sources.

Summary statistics for both the dependent variable as well as the set of explanatory variables are reported in Table 7.1 for service exporters belonging to the service and manufacturing sector. Interestingly, in our dataset the percentage of active exporters across all 37 individual destination countries is higher in the subsample of service firms (22.5 percent) than for manufacturing firms (17 percent). However, the observed volumes of export and import flows are higher for manufacturing firms. These firms are also characterized by higher sales and more employees and are more often foreign direct investors and less likely to be under foreign control compared to service firms. In general, destination markets are on average 2,507 kilometres away from Austria and 21 percent of the export markets share a common border with Austria. Regarding time zone differences that are seen to be important for service transactions export markets are on average 1.5 hours away from Austria, however also distant destination countries with differences up to 11 hours are represented in the dataset. While 16 percent of the individual destination countries are landlocked, they share in 14 percent common language familiarities and in 8 percent past colonial links. More than the majority of the countries are members of the European Union (66 percent). Regarding the policy environment the average level of the product market regulation amounts to 1.38, which is in the lower third of the index scale. The quality of economic institutions with an average level of 6.9 is in the upper half of the index scale.

Table 7.1: Descriptive statistics

		Service sector					Manufacturing sector				
		# of obs.	Mean	Standard deviation	Minimum	Maximum	# of obs.	Mean	Standard deviation	Minimum	Maximum
Exports	1,000 €	159,470	372	7,739	0	1,370,000	46,028	399	12,400	0	1,850,000
Imports	1,000 €	159,470	257	5,248	0	855,000	46,028	359	11,000	0	1,880,000
Sales	1,000 €	159,470	35,828	209,954	1	9,827,039	46,028	98,724	327,253	20	7,382,305
Employment	Persons	154,882	106	697	1	25,159	45,325	304	826	1	19,237
Active exporter	0=No, 1=Yes	159,470	0.226	0.418	0	1	46,028	0.172	0.378	0	1
Active FDI	0=No, 1=Yes	159,470	0.072	0.238	0	1	46,028	0.196	0.369	0	1
Foreign-owned	0=No, 1=Yes	159,470	0.365	0.468	0	1	46,028	0.356	0.467	0	1
ln Exports		36,007	3.567	3.052	-6.908	14.129	7,928	4.061	2.939	-6.908	14.433
ln Sales		159,470	8.319	2.094	0.000	16.101	46,028	10.091	1.763	2.996	15.815
ln Sales/empl.		154,882	5.583	1.473	-4.687	13.016	45,325	5.442	0.816	2.234	10.739

		Service and manufacturing sector					
		# of obs. Services	# of obs. Manuf.	Mean	Standard deviation	Minimum	Maximum
Distance	km	159,470	46,028	2,507.5	4,136.7	59.6	18,322.3
Time zone difference	Hours	159,470	46,028	1.5	2.7	0	11
Common border	0=No, 1=Yes	159,470	46,028	0.216	0.412	0	1
Colony	0=No, 1=Yes	159,470	46,028	0.081	0.273	0	1
Common language	0=No, 1=Yes	159,470	46,028	0.135	0.342	0	1
Landlocked	0=No, 1=Yes	159,470	46,028	0.162	0.369	0	1
EU member	0=No, 1=Yes	159,470	46,028	0.662	0.462	0	1
Product market regulation	0=least restrictive, 6=most restrictive	103,440	29,856	1.377	0.421	0.840	2.370
Legal rights	0=weak, 10=strong	150,850	43,540	6.89	2.16	3	10
GDP	bn $	159,470	46,028	1,074	2,370	5	13,848
GDP per capita	$	159,470	46,028	32,509	25,849	2,952	129,544
ln GDP		159,470	46,028	5.540	1.820	1.523	9.536
ln GDP/capita		159,470	46,028	10.086	0.820	7.990	11.772
ln GDP 2017		159,470	46,028	5.814	1.847	1.848	9.891
ln Distance		159,470	46,028	7.069	1.145	4.088	9.816

Source: OeNB, Statistics Austria, WIFO calculations. – For an overview of the additional data sources see Table A.2 in the appendix.

7.3.2 Econometric analysis

Tables 7.2 and 7.3 present the econometric results based on the specification discussed in Chapter 7.2 and distinguish between service exporters in services sectors (NACE divisions from 45 onwards) and manufacturing sectors (NACE divisions 01-43). To consider the systematic selection between exporting and non-exporting firms we employ the Heckman sample selection model with industry group fixed effects. Accordingly, the tables refer to the probability of trading (selection equation) and the value of exports traded (output equation). Table 7.2 is based on the full set of observations ("big sample"), whereas Table 7.3 includes the policy dimension ("policy sample").

Regarding the trade friction variables in Table 7.2 all coefficients point to the expected sign and are significant in explaining the probability of exporting services as well as the magnitude of export flows. The only exemption is the dummy variable on former colonial links which does

not influence the volume of export flows in the subsample of manufacturing firms. Interestingly, in both subsamples of Table 7.2 the dummy variable indicating EU membership positively impacts the probability of trading, but has a negative impact on the volume of services traded. This finding may indicate that less uncertain market conditions combined with better legal and policy frameworks alleviate the decision of firms to enter foreign markets. On the other hand, the observed provision of services may compete more intensively with other service providers in the destination market as consumer tastes are very similar within the EU such that export flows of Austrian service firms might be smaller.

Table 7.2: Heckman estimates - big sample

	Service sector		Manufacturing sector	
	Selection equation	Output equation	Selection equation	Output equation
ln Sales	0.184***	0.615***	0.209***	0.614***
	(0.00)	(0.01)	(0.01)	(0.04)
ln Sales per employee	-0.037***	0.023*	-0.119***	0.066
	(0.00)	(0.01)	(0.01)	(0.05)
ln Distance	-0.277***	-0.621***	-0.228***	-0.370***
	(0.01)	(0.04)	(0.02)	(0.09)
Time zone difference	-0.023***	-0.049***	-0.017**	-0.060**
	(0.00)	(0.01)	(0.01)	(0.03)
ln GDP	0.205***	0.636***	0.224***	0.627***
	(0.00)	(0.02)	(0.01)	(0.05)
ln GDP per capita	-0.017**	-0.155***	-0.056***	-0.280***
	(0.01)	(0.03)	(0.01)	(0.06)
Common border	0.350***	1.093***	0.396***	1.048***
	(0.01)	(0.05)	(0.03)	(0.12)
Colony	0.111***	0.208***	0.137***	0.149
	(0.02)	(0.06)	(0.03)	(0.12)
Common language	0.395***	1.291***	0.344***	1.006***
	(0.02)	(0.06)	(0.03)	(0.12)
Landlocked	-0.203***	-0.668***	-0.197***	-0.411***
	(0.02)	(0.06)	(0.03)	(0.12)
EU	0.023*	-0.289***	0.046*	-0.229**
	(0.01)	(0.05)	(0.02)	(0.10)
Constant	-1.574***	-2.339***	-1.595***	-3.083***
	(0.07)	(0.33)	(0.16)	(0.84)
Industry dummies	Yes	Yes	Yes	Yes
ρ		0.325***		0.247***
σ		2.822***		2.702***
Mills ratio		0.917***		0.667***
# of observations	154,882		45,325	
Log-Likelihood	-155,041		-36,716	

Source: OeNB, Statistics Austria, WIFO calculations.

Productivity related determinants enter twofold in our Heckman specification. First, productivity defined as sales per employee is used a rough proxy for productivity. Second, we use sales as a size measure that is positively related to productivity according to the theoretical model outlined in Chapter 2. This implies that coefficients of both variables have to be interpreted jointly to identify the impact of an increase in labour productivity, i.e., in sales at a given number of employees, correctly. The corresponding figure in our specification presented in Table 7.2 amounts to 0.184 (coefficient of ln sales) plus -0.037 (coefficient of ln sales per employee) so that the combined effect aggregates to 0.147 in the service sector. In the output equation the corresponding effect is 0.638 for the service sector.

Table 7.3: Heckman estimates - policy sample

	Service sector		Manufacturing sector	
	Selection equation	Output equation	Selection equation	Output equation
ln Sales	0.189***	0.621***	0.210***	0.610***
	(0.00)	(0.01)	(0.01)	(0.05)
ln Sales per employee	-0.049***	-0.008	-0.138***	0.028
	(0.00)	(0.01)	(0.01)	(0.06)
ln Distance	-0.112***	-0.286***	-0.044	0.232**
	(0.01)	(0.05)	(0.03)	(0.11)
Time zone difference	-0.077***	-0.127***	-0.077***	-0.240***
	(0.00)	(0.02)	(0.01)	(0.04)
ln GDP	0.209***	0.691***	0.190***	0.608***
	(0.01)	(0.03)	(0.01)	(0.06)
ln GDP per capita	-0.102***	-0.328***	-0.120***	-0.494***
	(0.01)	(0.06)	(0.03)	(0.12)
Common border	0.488***	1.335***	0.599***	1.617***
	(0.02)	(0.07)	(0.04)	(0.18)
Colony	0.135***	0.306***	0.145***	0.122
	(0.02)	(0.08)	(0.05)	(0.17)
Common language	0.391***	1.231***	0.293***	0.698***
	(0.02)	(0.07)	(0.03)	(0.14)
Landlocked	-0.096***	-0.309***	-0.191***	-0.154
	(0.02)	(0.08)	(0.04)	(0.17)
Legal rights	0.043***	0.114***	0.048***	0.199***
	(0.00)	(0.01)	(0.01)	(0.03)
Product market regulation	-0.043**	-0.149**	-0.017	-0.009
	(0.02)	(0.07)	(0.04)	(0.15)
Constant	-2.097***	-4.078***	-2.172***	-6.245***
	(0.20)	(0.76)	(0.40)	(1.71)
Industry dummies	Yes	Yes	Yes	Yes
ρ		0.302***		0.217**
σ		2.740***		2.660***
Mills ratio		0.826***		0.577**
# of observations	100,464		29,400	
Log-Likelihood	-113,073		-27,784	

Source: OeNB, Statistics Austria, WIFO calculations.

Turning to the results of the specification that additionally includes the policy variables reported in Table 7.3, the coefficients reflecting the policy environment meet the expectations. In the subsample of service firms, the likelihood to start exporting as well as the volume of service trade decrease with higher economy-wide product market regulation. In contrast, these restrictions seem to have no significant impact on manufacturing firms which may result from the fact that in manufacturing sectors services are provided as a bundle with goods exports and as such are not affected by service regulations directly. However, the strength of legal rights has a significant positive impact on the selection and the magnitude of service exports in both subsamples. Regarding the coefficients on the trade friction variables the results for the policy sample confirm the findings from the big sample. Again, to discuss the impact of the productivity proxy both coefficients on sales and sales per employee need to be considered together. The combined effect of an increase in sales for a given number of employees in Table 7.3 corresponds to 0.14 in the selection equation and 0.613 in the output equation for the service sector.

In both tables, the significant coefficients in the selection equation as well as the significant Mills ratio[8] 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.

Table 7.4: Marginal effects on export flows - big sample

	Mean	Standard deviation	Minimum	Maximum
	Service sector			
ln Distance	-0.425	0.024	-0.593	-0.377
ln Sales	0.485	0.016	0.452	0.596
ln Sales per employee	0.049	0.003	0.027	0.055
ln GDP	0.492	0.018	0.456	0.616
	Manufacturing sector			
ln Distance	-0.248	0.011	-0.332	-0.226
ln Sales	0.503	0.010	0.483	0.579
ln Sales per employee	0.130	0.006	0.086	0.141
ln GDP	0.508	0.011	0.486	0.589

Source: OeNB, Statistics Austria, WIFO calculations.

In order to interpret the coefficients not only in terms of their sign but in quantitative terms we also compute marginal effects for the most important explanatory variables which are reported in Tables 7.4 and 7.5 (with respect to the big sample and the policy sample). The calculated marginal effects following Greene (2008) give the full effect of a change in one regressor (that explains the selection as well as the volume of trade) on service exports and can be interpreted as elasticities when specified in logs. Comparing the marginal effects for a change in distance by 1 percent across firms we can conclude that the impact of distance is

[8] Actually, only in the robustness analysis in the manufacturing sample (see Table 7.14) the coefficient of the mills ratio could not be estimated precisely, although it's size is comparable to the estimates in the other tables.

almost twice as large for service firms than manufacturing firms (export flows are reduced by 0.425 percent for service firms compared to 0.248 percent for manufacturing firms all other factors equal). In contrast, the marginal effects from changes in market size (proxied by GDP) on service exports are relatively balanced across service and manufacturing firms. A 1 percent increase in market size raises service exports by 0.5 percent in manufacturing sectors all other factors held constant, while the impact in service sectors is only slightly smaller (+0.49 percent). Following the arguments above on the interpretation of the productivity impact the corresponding marginal effect is calculated as the sum of the marginal effect of ln sales and ln sales per employee. In Table 7.4 the implied marginal elasticity amounts to 0.54 (0.49+0.05) for the service sector.

The calculated marginal effects in the policy sample (see Table 7.5) support the significant impact of restrictions on the product market for service firms in contrast to the minor importance of these indices for manufacturing service exporters. Thus, an amplification of the PMR index by one standard deviation leads to a reduction in export flows by 5.17 percent for service firms, while exports remain almost unchanged in manufacturing sectors. A change in the strength of legal rights by one standard deviation results in a corresponding export change by 18.8 percent.[9] Overall these results indicate that regulation and economic institutions heavily affect the export activity of service firms in Austria. Policy reforms in partner countries aiming at reducing restrictions in the service sector may substantially enhance trade volumes of Austrian services firms with these countries.

Table 7.5: Marginal effects on export flows - policy sample

	Mean	Standard deviation	Minimum	Maximum
	Service sector			
Product market regulation	-0.123	0.004	-0.146	-0.115
Legal rights	0.087	0.004	0.080	0.111
	Manufacturing sector			
Product market regulation	-0.002	0.001	-0.007	0.000
Legal rights	0.178	0.002	0.173	0.193

Source: OeNB, Statistics Austria, WIFO calculations.

The empirical results point at the relevance of trade frictions, firm characteristics and destination market conditions for Austrian service exports. To assess the impact of substantial changes in trade related costs, market conditions and policy issues we perform a counterfactual analysis in the subsequent section. This enables us to make predictions about the response of service exports to changes in one of the above mentioned dimensions and

[9] This impact is calculated as the product of the mean marginal effect of the product market regulation which amounts to -0.123 and the standard deviation of the PMR variable which is 0.421 as displayed in Table 7.1 multiplied by 100 to yield the respective percentage change.

allows us to examine how this scenarios influence the observed pattern of trade and the composition of service exports between extensive and intensive margins.

7.4 Counterfactual analysis

7.4.1 Design of experiments

The subsequent counterfactual analysis is based on the estimation results from the Heckman sample selection model reported in Table 7.2 and Table 7.3. The empirical results point at the relevance of firm heterogeneity, trade barriers and characteristics of the destination market (market size, policy environment). In order to assess the importance of trade barriers, firm heterogeneity, market size and the policy environment for Austrian service exports we consider five different 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. We therefore decompose the overall response of trade to changes in a particular counterfactual scenario into contributions attributable to the extensive margin, which illustrates the impact of adding new markets in the counterfactual scenario, and intensive margin, which quantifies the increase in trade flows for existing trade relations. The computation of the change in trade flows in a particular counterfactual experiment follows the set-up discussed in Chapter 7.2 by substituting the estimated parameters.

In this chapter we report the results of the counterfactual experiments based on the computation of the unconditional mean following the techniques by Yen and Rosinski (2008) for log-transformed sample selection models. Thereby, we first focus on the overall response in trade flows comparing the predictions from the baseline and counterfactual scenario. In a second step, we decompose the overall percentage change in exports into its contribution at the extensive and intensive margin.

To highlight how these trade responses vary along the country dimension we group the results across certain country characteristics: neighbouring countries (countries sharing a common border with Austria), traditional exporting markets in the EU (the most important exporting markets for Austrian firms based on the export share), traditional exporting markets outside the EU, new markets in the EU (less important exporting markets for Austrian firms within the EU based on the export share), and new markets outside the EU. Regarding the firm's decision to serve foreign markets and the respective productivity threshold we assume important differences across countries, especially with respect to contributions from the extensive and intensive margin. Markets that can be served with exports more easily (less costly) will experience an increase in trade mainly due to an increase in volume of existing trade relationships (intensive margin). In contrast, new markets where 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. Chapter 6.2.2 has already shown for this to be true.

In particular, the five experiments designed are the following.

Reduction in bilateral distance: For this treatment we change bilateral distance between the country pairs by 10 percent, which mirrors a proportional reduction in distance related costs for all countries. This directly impacts the firms' decision to export (extensive margin) such that in the counterfactual world more firms are likely to meet the cut-off conditions and start exporting. Additionally, lower distance related costs also lead to an increase in bilateral export flows (intensive margin) for existing trade relationships.

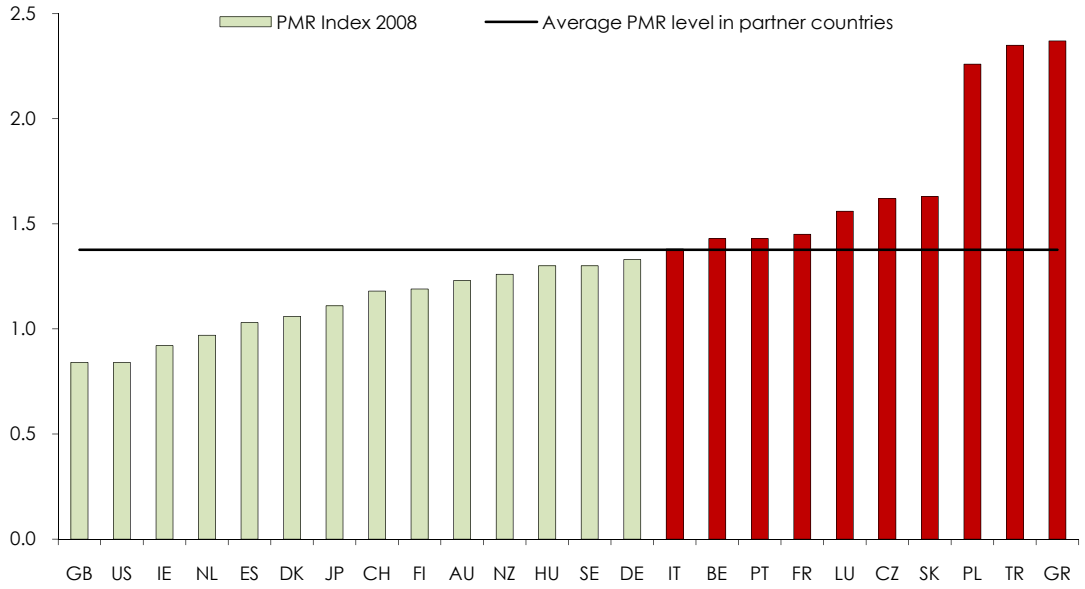
Heterogeneity – upgrade least productive firms: For this experiment we increase sales and sales per employee of least productive firms in the lowest 10 percent percentile to the mean value of sales and productivity (sales per employee) across all firms in the data. Again, these changes stimulate the adjustment at the extensive and the intensive margin of trade.

Increase in market size: For this counterfactual treatment we use the projections from the IMF World Economic Outlook for the GDP in 2017 (measured in billions of US Dollars). These GDP projections proxy changes in market size in the respective destination countries and predict an increase (decrease) in market size in 34 (3, namely Ireland, Portugal and Greece) countries. This counterfactual scenario stimulates adjustments on the extensive margin of trade, as larger destination markets increase the profitability of serving foreign markets by exports and therefore, more firms are likely to start exporting. For observed trade relationships larger destination markets lead to a rise in trade flows as more services can be delivered to the destination market.

Full deregulation of PMR: For this treatment we set the product market regulation (PMR) index to zero, which mirrors a full deregulation of economy-wide product market regulations. As these policy restrictions hamper the entry into export markets as well as bilateral trade flows, we expect adjustments on both trade margins.

Improvements in PMR for restrictive policy environments: Instead of a full deregulation we improve the market regulation in countries with above mean restrictiveness indices and set them to the mean level. As Figure 7.1 shows, the average PMR index in our sample is 1.38 and ten partner countries experience an improvement in this counterfactual scenario (marked in red). The implied changes are largest for Poland, Turkey and Greece. As these policy restrictions influence the likelihood to trade, but also the volume traded we expect growth in trade flows with contributions from both the extensive and intensive margin.

Figure 7.1: Current level of product market regulation by destination market



Source: OeNB, Statistics Austria, WIFO calculations. – For an explanation of country codes see Table A.1 in the appendix.

7.4.2 Empirical results from counterfactuals

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, market size and policy environment. To show how these elasticities vary along specific country dimensions we report the results according to the popularity of the respective export destination by considering the export share and border effects. Hence, we group destination markets into the following 5 groups:

Neighbouring countries: This group comprises all Austrian export destinations that share a common border with Austria and includes the Czech Republic, Germany, Hungary, Italy, Liechtenstein, Slovakia, Slovenia and Switzerland.

Traditional export markets in the EU: This group of countries summarizes the most popular export destinations (according to the export share) in the EU which are not classified as neighbours. The reference "traditional market" in this context implies that trade relationships are already well-developed and the level of risk and uncertainty is rather low. The group includes Belgium, Croatia, Finland, France, Great Britain, the Netherlands, Poland, Romania, Spain and Sweden.

Traditional export markets Extra-EU: Considering the classification of popular and well-established export markets as mentioned above this group comprises the most popular countries in the Extra-EU region including Japan, Russia, Turkey, Ukraine and the USA.

New export markets in the EU: Less important export destination in the EU in terms of the export share are defined as new export markets as trade relations are currently emerging

and the level of risk and uncertainty still hamper the delivery of services by Austrian firms to the respective markets which include Cyprus, Denmark, Estonia, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta and Portugal.

New export markets Extra-EU: Again, implying the same market characteristics (minor relevance, less developed trade relationships) as defined above, this group summarizes all countries in the Extra-EU region with currently low export shares, such as Australia, Brazil and New Zealand.

Results from reducing trade related costs

The first column in Table 7.6 refers to the overall response in service exports associated with a reduction in bilateral distance by 10 percent, which mirrors a proportional reduction in trade related costs. Considering that this change induces the highest impact for distant markets the results highlight a more pronounced increase in export flows the more "distant" (in many respects) export destinations are. The gains in exports vary between 7.17 percent for countries sharing a common border and 8.97 percent for new export markets in the Extra-EU area in the upper panel for service firms. The overall increase in export flows for manufacturing firms (lower panel) is significantly smaller and varies between 4.77 percent and 6.61 percent. However, the pattern of trade responses across different country groups point to the same direction.

Table 7.6: Change in overall exports and composition between intensive and extensive margin of trade from a reduction of bilateral distance by 10 percent by export destination groups - services and manufacturing

	Change in exports	Contribution intensive margin	Contribution extensive margin
	As percent	As percent of overall change	
	Service sector		
Neighbouring countries	7.17	94.7	5.3
Traditional export markets in the EU	7.84	87.1	12.9
Traditional export markets Extra-EU	8.18	83.7	16.3
New export markets in the EU	8.48	81.0	19.0
New export markets Extra-EU	8.97	76.9	23.1
Total	7.39	91.9	8.1
	Manufacturing sector		
Neighbouring countries	4.77	84.0	16.0
Traditional export markets in the EU	5.70	71.0	29.0
Traditional export markets Extra-EU	5.93	68.3	31.7
New export markets in the EU	6.46	63.0	37.0
New export markets Extra-EU	6.61	61.7	38.3
Total	5.10	78.8	21.2

Source: OeNB, Statistics Austria, WIFO calculations. – 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: Cyprus, Denmark, Estonia, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta and Portugal; New export markets Extra-EU: Australia, Brazil and New Zealand.

We then further decompose the overall change in exports into contributions from the intensive and extensive margin. Table 7.6 shows that with falling trade costs the increase in service exports is predominately driven by changes in the intensive margin rather than the extensive margin. However, elasticities vary by country groups and imply an unambiguous shift in the pattern of trade. While the intensive margin contributes most in neighbouring countries, the adjustment in the extensive margin gains increased importance the more distant and less popular export markets are. This holds in both subsamples of service exporters. However, the contribution from the extensive margin is more pronounced for manufacturing firms where more than one third of the overall change in service exports in new export markets can be attributed to the formation of new trade relationships. Considering the theoretical model lower trade related costs induce firms to overcome the threshold level of serving a foreign market more easily, and the impact of fallen distance costs is more pronounced for export destination far away which confirms the results predicted in this scenario.

The impacts of changing productivity and size of firms

From a policy viewpoint the relevance of productivity plays a major role in industrial promotion schemes designed to foster internationalization of specific firm classes. To assess the importance of promoting productivity we consider a policy reform which increases the size and productivity of least performing firms (lowest 10 percent) to the mean values of the sample. The role of firms and productivity for the probability to export and the magnitude of service trade are highlighted in our results. Given that these firms now move closer to the productivity threshold, the most pronounced increase in service exports (4.28 percent and 7.42 percent for service and manufacturing firms respectively) can be observed to neighbouring countries (see Table 7.7). Moreover, the decomposition of export growth shows that this policy has the potential to increase the number of exporters in popular, and new export markets, but also to intensify existing trade relations. However, in both scenarios the major contribution is assigned to adjustments along the intensive margin which explains between 95 percent and 99.7 percent of total trade responses. These results suggest that productivity increases are very important for trade deepening. For reasons given in Chapter 2 (uncertainty and incomplete information) exporters are likely to start with small transactions in new markets. The extensive margin will therefore involve small quantities, especially in more distant and difficult markets. While the expansion of new markets is balanced across traditional and new export destinations for firms in the service sector, the pattern for manufacturing firms shows a significantly higher contribution along the extensive margin in traditional markets in the Extra-EU region (4.7 percent) and new markets in the EU (4.6 percent) compared to popular export destinations. Reasons for this are the expected lower productivity and size thresholds for manufacturing firms compared to "genuine" service traders enabling them to be present in more markets and also to serve more distant ones more easily.

Not surprisingly, policy incentives focusing on the promotion of large and productive firms that are already the most intensive traders would exhibit substantial higher potential export growth. In the extreme case of increasing the productivity of the Top-10% firms to the observed maximum productivity and size level exports could be raised to as much as the 6-fold level for service firms and about 3 fold for manufacturing firms. Since many of the high productivity firms are already high scale exporters in the baseline scenario, the role of the extensive margin is further dwarfed, even though this export promotion would allow service exporters to enter new markets in the Extra-EU region and within the EU, which can only be served at higher costs. The substantial difference to the potentials raised for the low productivity firms underlies the primacy of large and productive firms which account for a large share of total service exports in Austria and thus, downscale the export potential of small and less productive firms in a direct comparison. The policy design however, needs to consider the contributions of small and less productive firms to ensure a broad base of service exporters and to enhance export participation by these firms.

Table 7.7: Change in overall exports and composition between intensive and extensive margin of trade from a promotion of less productive firms by export destination groups - services and manufacturing

	Change in exports	Contribution intensive margin	Contribution extensive margin
	As percent	As percent of overall change	
	Service sector		
Neighbouring countries	4.28	98.5	1.5
Traditional export markets in the EU	3.87	97.5	2.5
Traditional export markets Extra-EU	3.65	97.3	2.7
New export markets in the EU	3.45	97.3	2.7
New export markets Extra-EU	3.13	97.5	2.5
Total	4.14	98.3	1.7
	Manufacturing sector		
Neighbouring countries	7.42	97.1	2.9
Traditional export markets in the EU	6.53	95.8	4.2
Traditional export markets Extra-EU	6.29	95.6	4.4
New export markets in the EU	5.76	95.4	4.6
New export markets Extra-EU	5.62	95.3	4.7
Total	7.10	96.8	3.2

Source: OeNB, Statistics Austria, WIFO calculations. – 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: Cyprus, Denmark, Estonia, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta and Portugal; New export markets Extra-EU: Australia, Brazil and New Zealand.

Results from changing the market size

To assess the relevance of increased market size we make use of the GDP projections of the year 2017 which predict increases in market size for almost all countries in our sample (only Ireland, Greece and Portugal experience a decrease). As depicted in Table 7.8 the overall

increase in service exports is extremely pronounced in Extra-EU export destinations, where many countries experience the highest increase in market size. Specifically, five countries out of these two country groups (USA, Japan, Brazil, Russia 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 service exports in Extra-EU markets between 51.39 percent and 83.28 percent for service firms (upper panel) and 55.99 percent to 95.89 percent for manufacturing firms (lower panel). In particular, increases in service exports by 83 percent for service firms (96 percent for manufacturing firms) are most pronounced in new extra-EU markets comprising Australia, Brazil and New Zealand. Service exports have the potential to increase by more than 50 percent in high growth emerging countries, such as Russia, Turkey and the Ukraine.

Table 7.8: Change in overall exports and composition between intensive and extensive margin of trade from a change in market size by export destination groups - services and manufacturing

	Change in exports	Contribution intensive margin	Contribution extensive margin
	As percent	As percent of overall change	
	Service sector		
Neighbouring countries	8.40	96.0	4.0
Traditional export markets in the EU	13.02	90.4	9.6
Traditional export markets Extra-EU	51.39	90.2	9.8
New export markets in the EU	8.78	85.5	14.5
New export markets Extra-EU	83.28	86.6	13.4
Total	12.57	92.9	7.1
	Manufacturing sector		
Neighbouring countries	8.52	90.2	9.8
Traditional export markets in the EU	14.58	81.6	18.4
Traditional export markets Extra-EU	55.99	83.0	17.0
New export markets in the EU	9.05	75.5	24.5
New export markets Extra-EU	95.89	80.2	19.8
Total	15.06	85.3	14.7

Source: OeNB, Statistics Austria, WIFO calculations. – 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: Cyprus, Denmark, Estonia, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta and Portugal; New export markets Extra-EU: Australia, Brazil and New Zealand.

Regarding the composition along the intensive and extensive margin the results allow for different conclusions across sectors, although in both subsamples the major impact comes through the expansion of existing trade relationships. For service firms, the highest contribution to export growth from newly built trade relations (around 14 percent) is predicted in "new export destinations", while Austrian firms expand existing relationships mostly in neighbouring countries. Specifically, for Austrian service exporters the highest contribution to export growth from newly built trade relations is exhibited in less popular export markets within the EU like the

Baltic countries, Malta and Luxembourg and new markets in the Extra-EU region, such as Australia, Brazil and New Zealand. In manufacturing sectors export growth along the extensive margin is in general higher than for service firms and extremely dynamic in new and traditional export markets (both within the EU and in the Extra-EU markets). In particular, almost one fourth (one fifth) of overall export changes in manufacturing sectors can be assigned to firm entries in less popular export markets in the EU (Extra-EU).

Results from changing market regulations

The last two counterfactual scenarios address the relevance of market regulation for service exports. Using the product market regulation index provided by the OECD we conduct two experiments which aim at improving the policy environment. The distribution of PMR indices across our sample for which we can retrieve data is depicted in Figure 7.1 The average regulation index across Austrian trading partner's amounts to 1.38, whereas countries below this threshold level are marked in green and partner countries with restrictive policy environments above this average are displayed in red.

Table 7.9: Change in overall exports and composition between intensive and extensive margin of trade from improvement in market regulations by export markets - services and manufacturing

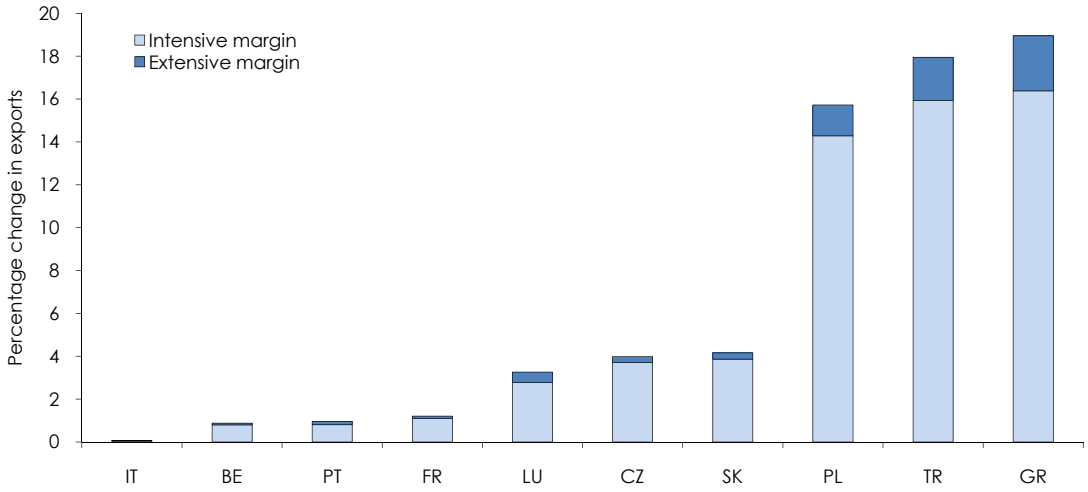
	Service sector			Manufacturing sector		
	Change in exports	Contribution intensive margin	Contribution extensive margin	Change in exports	Contribution intensive margin	Contribution extensive margin
	As percent	As percent of overall change		As percent	As percent of overall change	
BE	0.87	91.4	8.6	0.11	42.9	57.1
CZ	3.98	93.1	6.9	0.46	48.5	51.5
FR	1.21	91.3	8.7	0.15	44.3	55.7
GR	18.95	86.4	13.6	2.69	34.8	65.2
IT	0.05	93.9	6.1	0.01	53.3	46.7
LU	3.26	85.3	14.7	0.54	31.3	68.7
PL	15.73	90.8	9.2	1.93	42.7	57.3
PT	0.95	84.2	15.8	0.15	33.2	66.8
SK	4.16	92.9	7.1	0.50	46.5	53.5
TR	17.95	88.8	11.2	2.35	38.9	61.1
Total	0.68	90.9	9.1	0.09	42.6	57.4

Source: OeNB, Statistics Austria, WIFO calculations. – For an explanation of country codes see Table A.1 in the appendix.

In the first experiment we alleviate the restrictions for countries with above mean regulation indices (marked red) and therefore Table 7.9 only presents results for the respective country selection. Again, the impact of these regulations varies substantially across service (left panel) and manufacturing firms (right panel), whereby for the latter the changes in export flows are smaller but mainly due to changes along the extensive margin. For Austrian service exporters the change in export flows is highest in countries experiencing the biggest gains from policy reforms as Figure 7.2 and Figure 7.3 show. In particular, the remarkably potential increase in

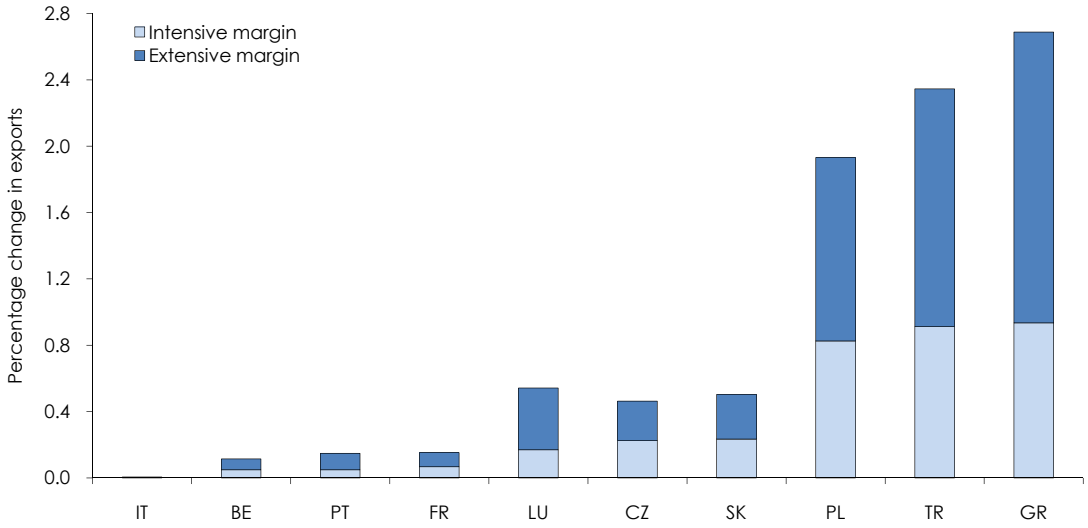
exports by service firms to Greece, Turkey and Poland contrasts strongly with the development in other markets as the growth rates in these three countries are more than three times larger. Further potentials for regulatory improvements are given for the Slovak and the Czech Republic. However, for service firms the magnitude of potential export gains follows the country ranking associated with the initial level of the restrictiveness index (and potential policy improvement) assigning the highest (lowest) changes in exports to the most (least) restrictive trading partners.

Figure 7.2: Change in overall exports and contribution of intensive and extensive margin from improvement in PMR level in restrictive destination markets - services



Source: OeNB, Statistics Austria, WIFO calculations. – For an explanation of country codes see Table A.1 in the appendix.

Figure 7.3: Change in overall exports and contribution of intensive and extensive margin from improvement in PMR level in restrictive destination markets - manufacturing



Source: OeNB, Statistics Austria, WIFO calculations. – For an explanation of country codes see Table A.1 in the appendix.

The composition of export growth for service firms reveals that export flows specifically increase along the intensive margin, but also more than one eight of total growth is assigned to new trade relationships in former high restrictive countries. However, the counterfactual analysis reveals major differences in the composition of export growth when we consider the manufacturing sector subsample. Regarding manufacturing firms (right panel in Table 7.9) the contribution to service export growth is by far higher along the extensive margin than the intensive margin (with Italy as the only exception). However, these effects have to be interpreted with some caution as the coefficients on the market regulation indices are not significant in the sub-sample of manufacturing firms. However, the new pattern of export flows is in line with the findings of the descriptive analysis in earlier chapters suggesting that threshold levels for manufacturing firms to start exporting services are lower compared to service sector firms. Moreover, throughout experiments the contribution of the extensive margins is always larger in manufacturing sectors than in service sectors.

Table 7.10: Change in overall exports and composition between intensive and extensive margin of trade from full PMR deregulation by export markets - services and manufacturing

	Service sector			Manufacturing sector		
	Change in exports	Contribution intensive margin	Contribution extensive margin	Change in exports	Contribution intensive margin	Contribution extensive margin
	As percent	As percent of overall change		As percent	As percent of overall change	
AU	25.46	82.6	17.4	3.79	30.8	69.2
BE	26.22	92.5	7.5	3.10	43.5	56.5
CH	20.33	95.5	4.5	2.05	53.7	46.3
CZ	29.62	93.9	6.1	3.11	49.1	50.9
DE	22.53	97.9	2.1	1.80	68.8	31.2
DK	19.57	89.3	10.7	2.56	38.9	61.1
ES	18.62	90.7	9.3	2.29	42.1	57.9
FI	22.79	87.6	12.4	3.09	36.3	63.7
FR	26.65	92.4	7.6	3.04	44.9	55.1
GB	14.60	92.4	7.6	1.70	46.2	53.8
GR	51.07	88.1	11.9	6.50	35.4	64.6
HU	23.42	92.9	7.1	2.65	46.1	53.9
IE	17.18	87.5	12.5	2.36	36.5	63.5
IT	24.46	94.7	5.3	2.40	53.9	46.1
JP	21.49	86.3	13.7	2.98	35.2	64.8
LU	31.31	87.1	12.9	4.69	31.8	68.2
NL	17.62	89.9	10.1	2.29	39.7	60.3
NZ	28.10	78.1	21.9	4.59	26.3	73.7
PL	45.16	92.0	8.0	4.99	43.3	56.7
PT	28.73	86.1	13.9	4.03	33.8	66.2
SE	24.60	89.3	10.7	3.17	38.7	61.3
SK	29.88	93.8	6.2	3.27	47.1	52.9
TR	48.79	90.2	9.8	5.73	39.5	60.5
US	15.01	90.3	9.7	1.85	42.4	57.6
Total	23.06	95.7	4.3	2.17	56.5	43.5

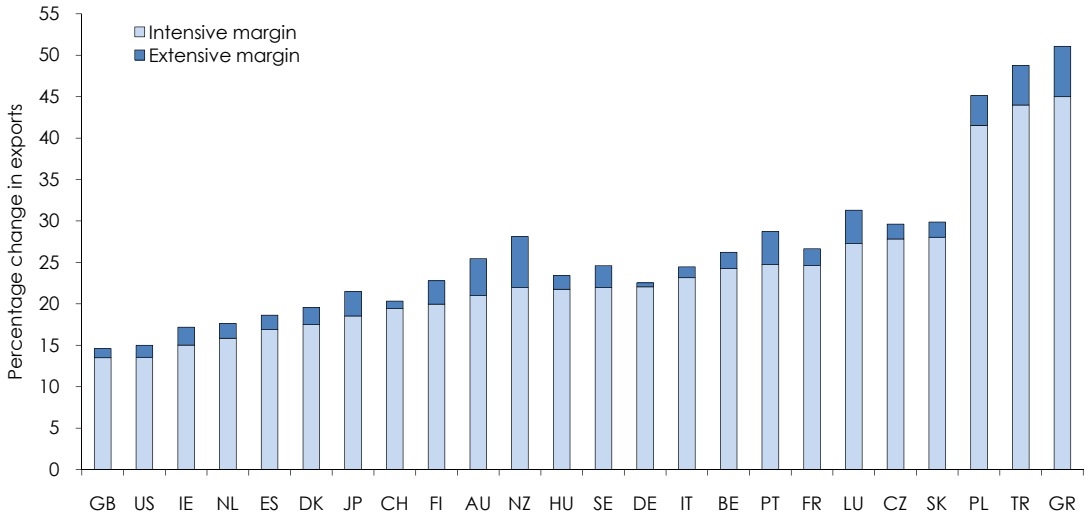
Source: OeNB, Statistics Austria, WIFO calculations. – For an explanation of country codes see Table A.1 in the appendix.

In the second treatment we fully deregulate the service markets in all partner countries covered by our sample. As Table 7.10 shows predicted changes in service export flows across countries vary between 14.6 percent (Great Britain) and 51.07 percent (Greece) for service firms, while trade gains from this treatment are substantially lower for manufacturing firms (up to 6.5 percent for Greece). Again, the impact on export growth in both subsamples of service exporters is highest for trading partners with high pre-reform restrictions. However, in contrast to the results in the first treatment we find heterogeneous changes in export flows within the group of countries with similar initial regulatory restrictiveness. In particular, export growth is slightly lower in neighbouring countries compared to the development in other countries with similar initial restrictiveness indices (see Figure 7.4). For instance, export growth in Germany is around 2 percentage points smaller than in Sweden, although pre-reform market restrictions are higher. Similar conclusions can be drawn when comparing export gains in Switzerland and Finland where Austrian exporters face currently a similar policy environment.

The decomposition into the contribution from existing trade relations and new entries into the respective markets highlight again striking differences across service exporters in service sectors and manufacturing sectors. While for service firms, the majority of export growth is attributable to the intensive margin (at the maximum one fifth of overall change is attributable to the extensive margin in the case of New Zealand) the export growth composition is reversed in manufacturing sectors for almost all trading partners (except for Germany, Italy and Switzerland). Here, again between 50.9 percent and 73.7 percent of overall export growth is attributed to the formation of new trade relationships, which is also depicted in Figure 7.5. Here again note that the coefficients on the product market regulation indices fail to be significant in the manufacturing sub-sample as discussed above.

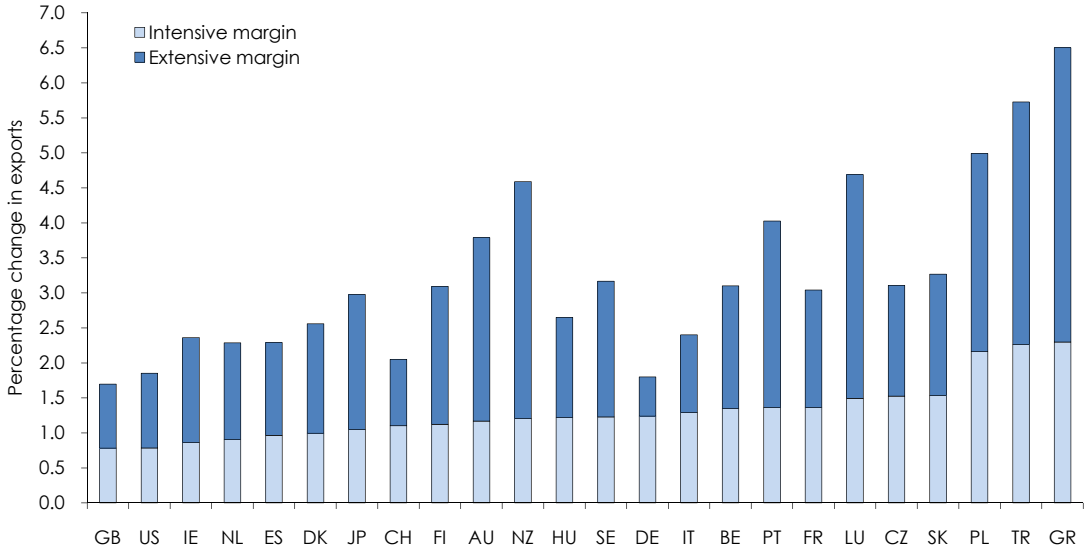
The results found in this counterfactual analysis may be of special interest for the policy community as efforts in negotiations concerning service liberalizations could be directed to trading partners with high market regulations as Austrian service exporters can yield the highest trade benefits there. Moreover, leaving aside Greece for its intensive economic problems, the results suggest that it is possible to reap a large proportion of the overall export growth by focusing attention to Turkey and Poland, two countries which exhibit the most restrictive policy environments at the moment. Additionally, given the importance of the Slovak and Czech Republic for Austrian service exporters policy reforms there can foster stable and intensified export relations.

Figure 7.4: Change in overall exports and contribution of intensive and extensive margin from full deregulation in PMR level - services



Source: OeNB, Statistics Austria, WIFO calculations. – For an explanation of country codes see Table A.1 in the appendix.

Figure 7.5: Change in overall exports and contribution of intensive and extensive margin from full deregulation in PMR level - manufacturing



Source: OeNB, Statistics Austria, WIFO calculations. – For an explanation of country codes see Table A.1 in the appendix.

7.5 Robustness checks

The estimation results discussed above are robust in several dimensions. We also estimated the Heckman sample selection model with more disaggregated data, distinguishing four types of services exported by each firm. The four groups defined comprise transport and

communication services (network services), technical and innovative services (such as information services, R&D etc.), knowlegde-based services (like accounting, management and consulting services, advertising, etc.) and traditional services. We account for heterogeneity across these groups by introducing service type dummy variables, whereby network services are specified as the reference group.

Table 7.11: Robustness analysis including service types: Heckman estimates - policy sample

	Service sector		Manufacturing sector	
	Selection equation	Output equation	Selection equation	Output equation
ln Sales	0.136***	0.475***	0.188***	0.559***
	(0.00)	(0.02)	(0.00)	(0.05)
ln Sales per employee	-0.045***	0.042***	-0.109***	0.010
	(0.00)	(0.02)	(0.01)	(0.06)
ln Distance	-0.084***	-0.224***	-0.062***	0.216**
	(0.01)	(0.05)	(0.02)	(0.10)
Time zone difference	-0.052***	-0.154***	-0.054***	-0.221***
	(0.00)	(0.02)	(0.01)	(0.04)
ln GDP	0.146***	0.660***	0.167***	0.540***
	(0.00)	(0.03)	(0.01)	(0.06)
ln GDP per capita	-0.078***	-0.276***	-0.102***	-0.434***
	(0.01)	(0.06)	(0.02)	(0.11)
Common border	0.253***	1.112***	0.407***	1.430***
	(0.01)	(0.08)	(0.03)	(0.16)
Colony	0.093***	0.231***	0.108***	0.194
	(0.02)	(0.08)	(0.03)	(0.15)
Common language	0.225***	0.924***	0.206***	0.468***
	(0.01)	(0.07)	(0.02)	(0.13)
Landlocked	-0.010	-0.067	-0.113***	-0.066
	(0.01)	(0.08)	(0.03)	(0.15)
Legal rights	0.026***	0.112***	0.036***	0.174***
	(0.00)	(0.01)	(0.00)	(0.02)
Product market regulation	-0.045***	-0.110	-0.037	-0.091
	(0.01)	(0.07)	(0.03)	(0.14)
Constant	-2.075***	-4.665***	-2.506***	-8.698***
	(0.13)	(0.85)	(0.27)	(1.63)
Industry dummies	Yes	Yes	Yes	Yes
Service type dummies	Yes	Yes	Yes	Yes
ρ		0.224***		0.204**
σ		3.103***		2.922***
Mills ratio		0.695***		0.595**
# of observations	401,856		117,600	
Log-Likelihood	-194,540		-50,292	

Source: OeNB, Statistics Austria, WIFO calculations.

Overall, the estimated parameters reported in Table 7.11 are similar to that reported in Table 7.3. The coefficients in the selection and output equation in the model using industry and service type fixed effects are slightly smaller than in the baseline specification. In the

subsample of service exporters in the service sector, the dummy variable indicating if the destination country is landlocked, neither influences the probability to start exporting nor the export volume. Regarding the manufacturing service exporter subsample the coefficients are robust to the inclusion of industry and service type fixed effects. Again, as in the baseline policy Heckman sample selection model (Table 7.3) the regulation indices do not significantly impact the selection into exporting and volume of trade flows. Moreover, sales per employee and the indicator variables whether the destination country is landlocked or shared former colonial links with Austria do not significantly influence the volume of service trade, but only the probability to start exporting.

Considering the marginal effects of a policy reform the impact of a change in the regulation indices are comparable to the effects from the baseline specification. According to Table 7.12 a standard deviation increase in the PMR measure raises service exports by 3.5 percent for exporters in the service sector.

Table 7.12: Robustness analysis including service types: Marginal effects on export flows - policy sample

	Mean	Standard deviation	Minimum	Maximum
	Service sector			
Product market regulation	-0.084	0.001	-0.094	-0.081
Legal rights	0.096	0.001	0.094	0.102
	Manufacturing sector			
Product market regulation	-0.072	0.001	-0.083	-0.070
Legal rights	0.156	0.001	0.154	0.166

Source: OeNB, Statistics Austria, WIFO calculations.

To summarize, the results from the baseline specification seem to be robust to controlling for the type of service exported. In the counterfactual scenario, overall export growth remains unchanged, although the contribution along the extensive margin increases slightly. A decomposition of export growth across the type of service exported (four groups) does not reveal significant differences across the groups and are therefore not reported in the study.

Second, we took ln sales per employee as the only measure of productivity and re-estimated the model without ln sales that is suggested by the theoretical model. Results on this robustness check are reported in Table 7.13. While the fit of this model in terms of the likelihood is worse, ln sales per employee still is an important determinant and highly significant. Both in the sample of service firms and manufacturing firms it's coefficient in the outcome equation is somewhat higher, while in the selection equation it turns out lower. This suggests that besides productivity, firm size is an important predictor for the probability that a firm selects itself into the exporter status. This also confirms our descriptive results in earlier chapters.

Table 7.13: Robustness analysis excluding firm size: Heckman estimates - big sample

	Service sector		Manufacturing sector	
	Selection equation	Output equation	Selection equation	Output equation
ln Sales per employee	0.097***	0.439***	0.090***	0.722***
	(0.00)	(0.01)	(0.01)	(0.05)
ln Distance	-0.266***	-0.532***	-0.219***	-0.297***
	(0.01)	(0.05)	(0.02)	(0.10)
Time zone difference	-0.022***	-0.033**	-0.015**	-0.053*
	(0.00)	(0.02)	(0.01)	(0.03)
ln GDP	0.195***	0.559***	0.213***	0.555***
	(0.00)	(0.02)	(0.01)	(0.06)
ln GDP per capita	-0.015**	-0.149***	-0.053***	-0.246***
	(0.01)	(0.03)	(0.01)	(0.06)
Common border	0.335***	0.979***	0.379***	0.915***
	(0.01)	(0.06)	(0.03)	(0.14)
Colony	0.105***	0.173***	0.129***	0.094
	(0.02)	(0.06)	(0.03)	(0.12)
Common language	0.377***	1.162***	0.327***	0.856***
	(0.02)	(0.06)	(0.03)	(0.13)
Landlocked	-0.196***	-0.612***	-0.190***	-0.332***
	(0.02)	(0.06)	(0.03)	(0.13)
EU	0.023*	-0.258***	0.045*	-0.233**
	(0.01)	(0.05)	(0.02)	(0.10)
Constant	-0.742***	0.991***	-0.753***	-1.039
	(0.07)	(0.34)	(0.16)	(0.83)
Industry dummies	Yes	Yes	Yes	Yes
ρ		0.238***		0.183
σ		2.897***		2.775***
Mills ratio		0.690***		0.509
# of observations	154,882		45,325	
Log-Likelihood	-159,664		-37,817	

Source: OeNB, Statistics Austria, WIFO calculations.

7.6 Major findings

The main findings in this chapter can be summarized as follows:

- As productive firms select themselves into exporter status econometric estimation has to account for sample selection. Estimating a Heckman sample selection for a large sample of Austrian firms with potential trade relations in 37 intra- and extra-EU destination countries reveals an important role of (physical) trade barriers in restricting trade that are comparable to those found in goods trade. Furthermore, market size is an important determinant of service exports of Austrian companies.

- Most importantly, the estimation results confirm significant sample selection effects, and large and productive firms both exhibit a higher probability of exporting and, if positive, a higher volume of exports to a specific destination.
- Economic policy also affects the export activities of firms both at the extensive and the intensive margin as they decrease with higher economy-wide product market regulation. The indicator on the strength of legal rights has a significant positive impact on the selection and the magnitude of service exports.
- This chapter introduces a new approach to decompose changes in exports into one component that refers to the extensive margin and one for the intensive margin. This decomposition to quantify counterfactual scenarios might be relevant for economic policy.
- Our counterfactual calculations reveal that polices aiming at productivity improvements of the least productive firms tend to increase the number of exporters, but also the existing export flows. In particular, the decomposition of export growth shows that this policy (based on export shares) has the potential to increase the number of exporters in popular, and new export markets, but also to intensify existing trade relations mainly in neighbouring countries. Thereby it is possible to broaden the exporter base. Not surprisingly, policy incentives focusing on the promotion of large and productive firms that are already the most intensive traders would exhibit substantial higher potential export growth.
- With respect to medium-term IMF projections of the expected increases in market size, our results indicate an extremely pronounced increase in service exports in Extra-EU export destinations. Specifically, five countries out of these two country groups (USA, Japan, Brazil, Russia and Australia) are ranked top regarding their future market size expansions which induces pronounced potential trade gains for Austrian service exporters. In particular, increases in service exports are most pronounced in new extra-EU markets comprising Australia, Brazil and New Zealand and in high growth emerging countries, such as Russia, Turkey and the Ukraine.
- From a policy viewpoint, the counterfactual scenarios highlight the role of market restrictions for services transactions. Our findings reveal that a substantial liberalization of product market regulation indices yields the potential of reinforced service exports in existing trade relationships and moreover also the potential to broaden the exporter base. Specifically, export markets with currently high levels of market regulation get more attractive for Austrian service exporters. Some of the most restrictive partners are Poland and Turkey where deregulation of services to the mean level of regulation within our country sample would be most rewarding, while trade potentials from deregulation are also given in the Slovak and the Czech Republic which are important export destinations for Austrian service exporters in terms of the export share and the neighbouring status.

8. Literature

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9. Appendix

Table A.1: Country list

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

Table A.2: 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)
Colony	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)
EU member	0=No, 1=Yes	WIFO calculations
Product market regulation	0=least restrictive, 6=most restrictive	OECD (2011)
Legal rights	0=weak, 10=strong	The World Bank (2012)
GDP	bn $	The World Bank (2012)
GDP per capita	$	The World Bank (2012)
GDP 2017	bn $	IMF (2012)