

Trading structure and diversity of German firms in the light of EU enlargement: How do importers differ from exporters?

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Abstract

In this paper we analyse a unique data set on the trading activities of German firms within the EU. The trade data were linked to the German Business Register to add firm-level data about turnover and number of employees. The data set allows us to study aspects of exports and imports, such as number of goods traded and number of trading partners, that previously were not available. Relating our exploratory analysis to the insights from the new trade theories of heterogeneous firms, we are able to confirm some fundamental determinants of international trade: First, trade flows to and from Germany are a positive function of the size of the import or export market; secondly, there is a positive association between productivity and imports or exports; thirdly, trade flows are a negative function of trade barriers. Evidence on the third result is to a large extent indirect but consistent for various attempts to measure this effect indirectly. A very strong and robust result is that Germany is better integrated with the ten countries that joined the EU in 2004 with respect to its exports to those countries than with respect to the imports that it receives from those countries.

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1 Introduction

Over the last ten years or so, the microeconomic analysis of international trade has gained tremendous momentum.¹ Both on the theoretical front, starting with the seminal papers of Melitz (2003) and Bernard et al. (2003), and on the empirical front, important insights into the causes and effects of international trade have been gained. We follow this recent trend in microeconomic analysis of international trade by studying German trade at the firm level. This paper presents results from transaction-level intra-community trade data of German exporters and importers linked to a comprehensive firm-level data base of the German Statistical Offices, the German Business Register (Unternehmensregistersystem, URS)². This allows us to gain insights not only into the behaviour of German exporters but also of German importers. Most micro analyses of international trade data were restricted to the analysis of turnover figures and of exporters.³

We go beyond previous restrictions by simultaneously exploiting export and import transaction-level information. The data we use were compiled by the official trade statistics (“Intrastat”) for German trade with EU member countries. Using these data, we are able to focus on specific products traded, firms’ product diversity and regional diversification or specialisation in EU-wide trade and to compare import and export values of individual firms. Linking these transaction-level intra-community trade data to the German business register, as described in Stirboeck (2011), provides us with further firm-level information.⁴ Firm-level data of importers and exporters were also studied by Vogel and Wagner (2010). However, their data set is based on manufacturing firms only, whereas our data set includes commercial firms (wholesalers and retailers)

¹ The early literature was surveyed by Tybout (2003).

² The German Business Register is described in Sturm and Tümmler (2006).

³ Previous studies of German exporters used information on sales abroad from the “monthly report on local units in manufacturing and mining” covering all (nearly 50,000) manufacturing firms were conducted by Wagner (2007a,b,c) and Fryges and Wagner (2010). Other data sources were used by Arnold and Hussinger (2005) and Fryges (2009).

⁴ All micro-level data are strictly confidential and for use inside the research data centre of the Federal Statistical Office only; see www.forschungsdatenzentrum.de.

as well. Another difference is that the study of Vogel and Wagner is restricted to issues of productivity⁵ whereas we look at a much broader range of trade issue.

Due to a lack of transaction-level information about traders, so far most analyses of imports, though often differentiated by sectors, have focussed on imports at the country level.⁶ Bernard et al. (2007, 2009) are comprehensive studies of US firms, Andersson et al. (2008) for Swedish firms, Eaton et al. (2009) for French and Lawless (2009) for Irish firms. They all exploit transaction-level trade data. The studies by Bernard et al. and Andersson et al. were also among the first to compare importers and exporters.

Although transaction-level information from the German Intrastat statistics is restricted to intra-community trade, it allows us to focus on issues of EU integration. The EU Single Market was enlarged in 2004. This is exactly the year we focus on in the analysis. Although we are faced with some data problems (see below), this year provides us with the unique chance of analysing a newly extended market. In particular, we can study the differences of German trade with the old EU countries (old member states, OMS) and with the new member countries (new member states, NMS) in the phase of integration.

The rest of the paper is organized as follows. In Section 2 we draw on the theoretical literature on international trade at the firm level to derive hypotheses about the trading structure of firms. In Section 3 we provide information about our data. Our comprehensive empirical analysis of German importers and exporters is presented in Section 4. Section 5 summarizes the main findings.

⁵ Their main findings are that German importing firms have a significant labour-productivity premium compared to non-importers and that the link between productivity and importing is primarily due to self-selection into importing rather than to learning by importing.

⁶ Broda and Weinstein (2006) define varieties as goods produced in a particular country. This perspective concentrates on welfare gains from the increase in variety and changes in prices due to international trade and open markets. Besedes and Prusa (2006), Cassing and Husted (2009) and Nitsch (2009) analyse the duration of country-product pairs and find a substantial amount of variation.

2 The theoretical role of firm heterogeneity

Although our study is mainly exploratory, we take the new microeconomic trade theories as our starting point and relate our empirical results to them. While the traditional Heckscher-Ohlin trade theory is macroeconomic in nature and predicts that labour-abundant countries will export labour-intensive products and capital-abundant countries will export capital-intensive products, models of new trade theory take a microeconomic perspective based on individual firms and consumers. In a framework where consumers prefer different varieties of products and where there is monopolistic competition and increasing returns of scale at the firm level, Krugman and Helpman (1989) show that countries would gain from exporting and importing similar goods representing different varieties. The specific properties of firms occupy an even more prominent role in the more recent theories of international trade. According to Melitz (2003) firm-level heterogeneity in productivity is crucial for the export decision since firms face fixed market-entry costs.

The trade model that often provides the best macroeconomic fit to international trade data is the gravity model (see e.g. Baldwin and Taglioni, 2006):

$$(1) \quad X_{ij} = \gamma \frac{Y_i Y_j}{\tau_{ij}^{\sigma-1}}$$

where X_{ij} is the volume of exports from country i to country j , γ is a composite variable that includes trade barriers, expenditure shares on traded goods and price levels in other countries⁷, Y is the GDP of a country (more precisely, Y_i is the production of traded goods in country i and Y_j is the expenditure on traded goods in country j), τ_{ij} measures trade barriers between countries i and j (in terms of distance, tariffs or other aspects), and σ is the elasticity of substitution between goods⁸.

⁷ In the physical gravity model, which has the same format as the trade model (hence the name), γ is the gravitational constant. In (1) γ is not a constant.

⁸ In the physical gravity model τ is the distance between two bodies and $\sigma = 3$.

Interestingly, an extended version of (1) can be derived from the new trade theories of heterogeneous firms (see Chaney, 2008). The setup of a Melitz-type model is as follows. There are K sectors in an economy with a continuum of goods, indexed by ω , in each sector. The utility of consumers from the consumption of $q_k(\omega)$ units in sector k is given by:

$$(2) \quad U = \left[\int_{\omega \in \Omega} q(\omega)^{(\sigma_k - 1)/\sigma_k} d\omega \right]^{\sigma_k / (\sigma_k - 1)}$$

where Ω is the set of varieties of good k available and $\sigma_k > 1$ is the elasticity of substitutions between any goods in that sector.

Output q_k is produced with only one input factor (labour) according to a linear production function and workers are paid the wage rate w_i in country i . Firms are subject to sector-specific productivity shocks ξ that follow a Pareto distribution:

$$(3) \quad \text{Prob}(\Xi_k < \xi) = 1 - \xi^{-\alpha_k}$$

with parameter $\alpha_k > 2$ and where $\exp(1/\alpha_k)$ is the geometric mean of the distribution. Furthermore, it is assumed that there are fixed costs f_{ij}^k and variable cost τ_{ij}^k of exporting good k from country i to country j . Therefore, goods from sector k can be exported (shipped c.i.f.) to country j at the cost of

$$(4) \quad c_{ij}^k = f_{ij}^k + \frac{w_i \tau_{ij}^k}{\xi} q^k$$

It turns out that, with these assumptions, country i 's exports of goods from sector k to country j follow a gravity-type function:

$$(5) \quad X_{ij}^k = \lambda_k \frac{Y_i Y_j}{Y} \left(\frac{w_i \tau_{ij}^k}{\theta_j^k} \right)^{-\alpha_k} \left(f_{ij}^k \right)^{\frac{-\alpha_k - 1}{\sigma_k - 1}}$$

where Y is global output, θ_j^k is a measure of remoteness of country j ,⁹ and λ_k is a scaling factor¹⁰. Equation (5) can be used to derive some fundamental determinants of international trade:

- (a) Exports are an increasing function of the size of the country that exports (Y_i) and the size of the country that imports (Y_j). In the empirical part of our paper, we hold i constant (since we only study German exports) but we vary j .
- (b) An increase in variable (τ_{ij}^k) or fixed (f_{ij}^k) trade costs will decrease exports. This effect is relevant for our empirical analysis because we examine German trade with two sets of European countries: old EU member states (OMS) with zero tariff barriers and new member states (NMS) where formal tariff barriers after joining the EU are zero but where, due to the sluggishness of trade, remaining impediments to trade still exist.
- (c) High productivity has a positive impact on exports. Firms that draw a high-productivity realization from the distribution in (3) will not only export more than low-productivity firms, they will also export to more markets than firms with an unfavourable draw from (3).

We will refer to these determinants as hypotheses (a) to (c) in the remainder of the paper.

Having derived a model to explain exports, as in equation (5), it might seem redundant to develop a model of imports since, after all, the exports of country i to

⁹ More precisely, it is a measure of remoteness of sector k in country j . This measure is a function of global output levels, wage rates, variable and fixed costs of exporting, the Pareto parameter, and the elasticity of substitution (see Chaney, 2008, p. 1713). The larger θ_j^k , the more is sector k in country j sheltered from international competition.

country j are the imports of country j from country i . However, it has been argued that the link between international trade and productivity is different for imports than for exports. In fact, this link has attracted much attention in the analysis of firm-level export data. It is a robust finding, supported by numerous studies, that exporting firms are more productive than non-exporting firms (see the survey by Wagner, 2007d). There is also a general consensus about the major direction of causality: more productive firms self-select to become exporters (i.e. high productivity causes exporting) whereas there is only scant evidence for the reverse causality that firms become more productive through exporting (see e.g. the comprehensive study of ISGEP, 2008). In fact, it is the former causality that is the decisive ingredient of the new trade theories of heterogeneous firms (see equation (3)).

In a similar vein it could be argued that the nexus between productivity and importing can go both ways: it is the more productive firms that import because there are fixed costs of importing or, alternatively, importing intermediate goods can increase the productivity of firms; see the empirical evidence on technology transfer through imports in Acharya and Keller (2009). It has to be stressed that both channels of causality are not mutually exclusive, see Halpern et al. (2005) and Kasahara and Lapham (2008). Empirical work has indeed confirmed that importers are more productive than non-importers (see Bernard et al, 2007). In addition, analyzing a panel of German firms, Vogel and Wagner (2010) find that there is more evidence for self-selection of importers (high-productivity firms tend to be importers, low-productivity firms tend to be non-importers) than for productivity-increasing effects of imports (learning by importing).

Since we have data for one year only, we cannot contribute to this issue of causality. Our aim, instead, is to investigate export and import participation of German firms in the EU, drawing conclusions about firm behaviour in differently integrated markets: the previous EU-member states (OMS or EU-14, excluding Germany) and the ten new member states (NMS). In a world without fixed or variable trade barriers and no transportation costs, firms would export to a wide range of countries, because consumers have a preference for varieties, and would import from a wide range of

¹⁰ With $\lambda_0 + \sum_{k=1}^K \lambda_k$ where λ_0 represents the good that serves as numéraire.

countries, because *inter alia* imported intermediate goods would enhance their productivity. However, if markets are not perfectly integrated then a hierarchy of export and import markets will emerge. Firms will export to those markets first (or most) that are large (see equation (5)) or where trade barriers are low. Similarly, firms will tend to import from large and open markets. Our fundamental hypothesis, therefore, is that German trade with the NMS is more restricted, and hence lower, than trade with the OMS. On the macroeconomic level this hypothesis is easily verified by comparing aggregate export and import data. However, we will study trade at the transaction level and that allows us to consider additional attributes such as size and productivity of firms, number of goods traded or number of countries exported to and imported from.

3 Data set: description, transformations, and coverage

We make use of a unique and comprehensive dataset of international trade at the transaction level for the year 2004. The trade data are associated with firms and have been linked by us to the German Business Register. Important firm-specific information from the Business Register cover turnover¹¹, number of employees (who pay social insurance contributions), industrial sector classification and year of business registration.¹² The construction of the dataset is described in detail by Stirboeck (2011). The trade data are collected via obligatory and detailed direct declarations when a specific threshold is reached (threshold of € 200,000 in 2004). This provides extensive information about regional export and import markets and about goods traded.

However, firm-level information from the business register is restricted to the variables mentioned above. Information on firm-level value added would have been desirable to compute firm-level productivity. Like other studies (e.g. Vogel and

¹¹ With respect to turnover, we have information about taxable turnover (steuerbarer Umsatz) as declared in advance turnover tax returns (Umsatzsteuervoranmeldung) if the annual threshold of € 17,500 is exceeded by a firm. Since any corrective declaration concerning turnover tax prepayments until June of the following year is taken into account, the advance turnover tax returns cover annual turnover quite well.

¹² However, this firm-specific information is not available for multinational enterprises that are not linkable to the German business register because they have a foreign address (see Stirboeck, 2011 for details).

Wagner, 2010) we have to use the ratio of turnover to number of employees as the best available proxy for productivity.

Furthermore, we face some additional data limitations. This concerns in particular the statistical impact of EU-enlargement in 2004 and the plausibility of the employee-variable. We try to overcome these limitations with data transformations (for details see Stirboeck, 2011). When feasible, robustness checks were performed. Altogether, biases appear to be small and are taken into account in the following when we draw conclusions from our analysis.

4 Trading structure and micro-level characteristics of German importers and exporters

In the following, we study German exporters and importers from different perspectives. First, we focus on firms and their intensity of international trade. Second, we analyse regional diversification of trade and the hierarchy of market entry. Third, we examine patterns of diversification and the role of market size, and, finally, firm heterogeneity.

4.1 Firm size and openness: exporters vs. importers

The first empirical regularity that we can deduce is that *importing is as common as exporting* in our sample of German firms active in the EU Single Market.¹³ Table 1 shows that the number of all importers (47,239) was slightly higher than the number of all exporters (44,367) in 2004.¹⁴ In addition, importing is not only as frequent as exporting among larger firms but *even more so for smaller firms*. For the smallest-size group of firms with sales of up to half a million € nearly twice as many firms import compared to those that export.

However, the roughly equal number of importers and exporters among German firms engaged in EU-trade is in contrast to the findings of Bernard et al. (2007), who found that 27 per cent of US firms were exporters but only 14 per cent were importers,

¹³ As mentioned above, our sample includes only firms with exports or imports of € 200,000 or more.

¹⁴ Referring to the total population as given by the tax statistics, almost twice as many firms imported from (380,230) than exported to (205,980) EU member countries in 2004 (see Statistisches Bundesamt, 2005)

and of Andersson et al. (2008), who reported corresponding figures of 71 per cent and 60 per cent for Swedish firms. The fact that both exporting and importing within EU-borders are so widespread among German firms is probably a reflection of the Single-Market integration.

Table 1: Characteristics of Traders: Firm Size and Trade Activity

	#	#	Intensity		Openness	
Sales Turnover (thousand €)	Importers	Exporters	Mi / turnover	Xi / turnover	(Mi + Xi) / turnover	(M + X) / turnover
<i>All Firms</i>	47,239	44,367	0.18	0.20		0.28
<500	2,927	1,576	0.21	0.25		0.26
500- 999	2,999	2,002	0.24	0.24		0.29
1,000- 1,999	4,862	4,153	0.25	0.25		0.32
2,000- 4,999	8,711	8,890	0.21	0.21		0.29
5,000- 9,999	7,175	7,778	0.17	0.19		0.27
10,000-49,999	11,678	12,027	0.14	0.18		0.26
>50,000	5,384	4,954	0.12	0.18		0.27
<i>Firms active in NMS</i>	14,378	25,303	0.08	0.05	0.08	0.32
<500	222	372	0.20	0.11	0.16	0.36
500- 999	378	708	0.17	0.08	0.12	0.37
1,000- 1,999	921	1,950	0.15	0.06	0.10	0.37
2,000- 4,999	2,320	4,971	0.12	0.06	0.09	0.33
5,000- 9,999	2,394	4,943	0.08	0.05	0.07	0.30
10,000-49,999	4,966	8,406	0.06	0.04	0.07	0.30
>50,000	3,177	3,953	0.04	0.04	0.06	0.30

In contrast to all other tables, the data exclude traders with trade turnover higher than sales turnover because of their influence on results in small turnover groups.

The upper panel of Table 1 refers to total EU-trade of German firms and the lower panel to firms that are active (export to or import from) the NMS. With respect to the NMS, it is striking that markedly *more firms export to the NMS than import from them*. Only one third of all firms import goods from the ten new member countries whereas 60 per cent of firms export to those countries. In sum, German trade relations with the OMS are closer than with the NMS. This observation is in line with hypothesis (b).

The relationships between firm size and trade (export or import) intensity follow inverted U-(J)-shaped patterns according to Table 1.¹⁵ This is in line with the inverted

¹⁵ In our dataset small firms (i.e. those with import of export value of less than € 200,000) are excluded, This left-side truncation might explain why we find inverted J-shaped relationships between trade intensity and size than the expected inverted U-shape.

U-shaped relationships that were reported in similar studies.¹⁶ Fryges and Wagner (2010) found that firm size has a significant positive but decreasing effect on firms' export-sales ratios. Firms, to some extent, profit from expanded exports when they have to incur some fixed costs of exporting; at some point, costs of coordination rise so much that export intensity decreases or at least increases more slowly (Wagner, 2003). Accordingly, German mid-size firms show some slightly larger openness than smaller or bigger firms. The most important conclusion, however, is that *smaller enterprises do not face higher entry costs to be active in EU partner countries than larger firms*. This can be interpreted as a *sign of integrated markets* (hypothesis b).

However, if a firm is engaged in trade with the NMS, the overall trade openness with respect to all EU-countries (last column, lower panel of Table 1) is higher than the corresponding unconditional openness (last column, upper panel) – and this is the case for all size groups. This is in contrast to French exporters. When they trade with more remote or sheltered markets they have relatively low overall openness ratios according to Eaton et al. (2009). It should also be noted that firms importing from or exporting to NMS (the lower panel of Table 1) show decreasing trade intensities (4th and 5th column of Table 1) and decreasing openness to NMS countries (penultimate column of Table 1) when total turnover increases. Thus, for those firms the inverted U-shaped pattern between size and trade intensity disappears.

Furthermore, it seems that *bigger enterprises start to exploit advantages of new markets first*. The average size of firms, in terms of sales turnover, is much larger among firms that import from NMS than among those that do not (see Table 2). The same is true for exporting firms. This preponderance of larger firms is also reflected in the fact that, on average, firms have more employees if they trade with NMS than if they do not. From the new trade theories one would expect to find higher productivity in the group of firms that export to NMS than in the group of non-exporters. Similarly, firms that obtain imports from NMS should be more productive than non-importers – either because they are more likely to overcome trade barriers or because imported intermediate goods enhance their productivity. However, the productivity premium of importers as opposed to non-importers is relatively small. Surprisingly, firms that do not

¹⁶ See the empirical evidence for Swedish firms in Andersson et al. (2008).

export to NMS have a higher average productivity than firms that export to NMS. Thus hypothesis (c) is not confirmed. But, again, our productivity measure is not ideal. We also want to stress that the productivity of firms is not the central aspect of our study.

Table 2: Main characteristics of German traders – comparing engagement in new EU markets with non-engagement

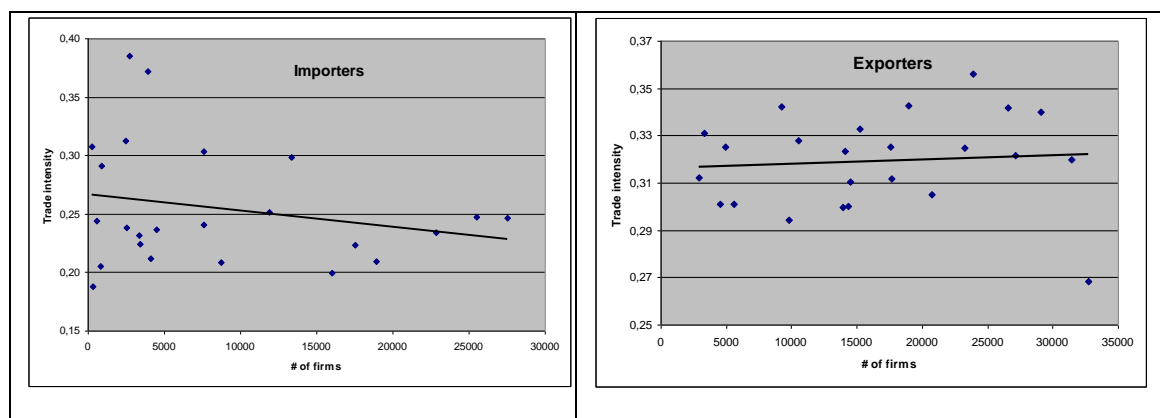
All Firms	# firms	Trade turnover	Sales turnover	# employees	Productivity	# import goods	# export goods
M							
Engagement	15,469	14,002	115,183	402	712	19.6	26.2
Non-engagement	32,782	3,032	24,055	98	681	8.0	9.7
X							
Engagement	26,970	15,307	74,295	262	589	15.7	17.0
Non-engagement	18,374	1,931	21,740	78	873	9.5	6.2

It is probably not surprising that the average number of goods imported or exported is higher among firms that import from NMS than among the non-importers. The same is true for exporters and non-exporters (see the last two columns of Table 2).

According to Eaton et al. (2009) there is a positive relationship between trade intensity and the popularity of markets among French exporters when the popularity of a market is measured by the number of French firms exporting to that market. This result has some intuitive appeal. However, for German exporters we find the firm-level export-intensity to be independent of the popularity of EU export markets (see Graph 1).

In Graph 1, trade intensity with respect to Germany's 24 trading-partner countries within the EU (as of 2004) is measured as the average ratio of imports and exports, respectively, to turnover for those firms that trade with these countries. Along the horizontal axis, popularity is measured as the number of firms that trade with these countries.

Graph 1: Trade intensity and market popularity



Trade intensity (calculated as share of imports or exports to sales turnover of all firms active in a market) is plotted against number of firms active in a market.

With respect to import engagement in less popular markets, there is a tendency of increasing import intensity. This means that, *on the import side, more open firms are less reluctant to enter into new or relatively unpopular markets or to diversify internationally*. Consistent with hypothesis (c), it seems that it needs larger firms to enter the less popular and less integrated NMS. Having passed the threshold of importing, these markets are used more to procure goods from them, i.e. they are associated with higher import intensities.

4.2 Target markets and self-selection: diversification of trading partners

Turning to firms' diversification in trade, we now focus on hierarchy and simultaneity of market entry as well as the number of trading partners in terms of countries. *Exporters are always more diversified with respect to their target markets than importers*. To be more precise: the average German trader exports to twice as many EU countries (8.6) as it sources products from (4.3, see Table 3). Roughly, this also applies separately to trade with OMS and NMS. Such a stronger regional diversification is also evident for Swedish exporters compared to importers and (to a much lower extent) for US exporters relative to importers (see Andersson et al., 2008, and Eaton et al., 2004).¹⁷ Not surprisingly, the standard deviation of partner countries is also higher for exporting than for importing.

¹⁷ While - globally - Swedish exporters (importers) trade with 12 (7) countries on average, US exporters (importers) have a mean of only 3½ (3) export destinations (import sources) in terms of countries.

Table 3: Number of trading partners (countries)

	All firms			Manufacturing firms		
	# firms	Mean	Std. Dev.	# firms	Mean	Std. Dev.
<i>All EU regions</i>						
Imports	48,251	4.3	3.5	22,046	5.0	3.7
Exports	45,344	8.6	6.3	26,241	9.8	6.4
<i>Old Member States</i>						
Imports	46,832	3.8	2.9	21,455	4.4	3.0
Exports	44,460	6.8	4.3	25,848	7.6	4.3
<i>New Member States</i>						
Imports	15,469	1.8	1.2	8,748	1.8	1.2
Exports	26,970	3.3	2.3	17,350	3.5	2.4

It might be expected that manufacturing firms source from fewer countries than commercial firms (retailers or wholesalers) because of the latter's specialization in procurement. However, as Table 3 shows, the average number of countries from which manufacturing firms import is larger than the corresponding number for all firms (5.0 vs. 4.3).¹⁸ Interestingly, this does not only apply to importing but also to exporting and it applies to trade with OMS as well as trade with NMS.¹⁹ Table 3 suggests that focusing on manufacturing firms does not change the results for the regional diversity of international trade. Obviously, the number of firms decreases when commercial firms are excluded but the average number of trading partners (i.e. countries) per firm goes up.

Market hierarchy

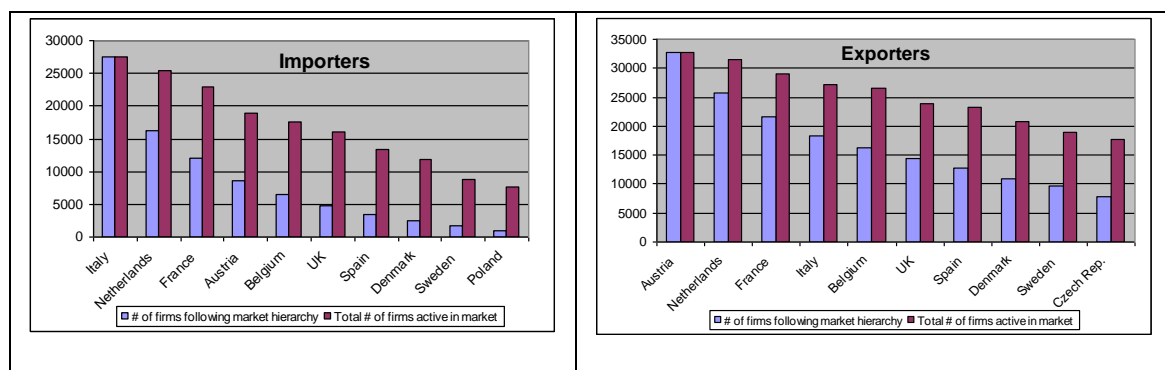
According to theory, because firms are heterogeneous with respect to productivity, not all firms will be able to overcome the specific thresholds of export and import markets. These thresholds depend on market size and market-specific entry costs. Empirically we find for German firms that *export market entry follows a*

¹⁸ There are some technical problems of distinguishing between all firms and manufacturing firms; see footnote 12.

¹⁹ This is based on each firm's sector assignment according to the "Wirtschaftszweige, Ausgabe 2003" (WZ 2003) classification, the German version of the NACE classification, based on its main activity. We define non-commercial enterprises as not belonging to WZ 50-52 and restrict the analysis to those units linkable to the business register. This restriction is necessary since we have no information about the sector assignment for any unit not linkable to the business register. This, unfortunately, results in too many exclusions and it turns the focus on domestic entities.

somewhat weaker (i.e. flatter) hierarchy than import market entry. More than four fifth of firms enter the second most important export market while being active in the first, but it is only a corresponding share of 63 per cent for importers (see Graph 2). Firms, once having reached a certain productivity threshold, thus engage more easily in a number of export markets than in numerous import markets. This is even more obvious when looking at the tenth most important market: while 44 per cent of exporters are simultaneously engaged in all of the ten most important export markets, only 13 per cent of importers are active in all of the ten most important import markets. In summary, it seems that *import market choice is more dependent on heterogeneous country characteristics such as country-specific market opportunities than export market choice.*

Graph 2: Hierarchy of market entry (ten most popular markets)



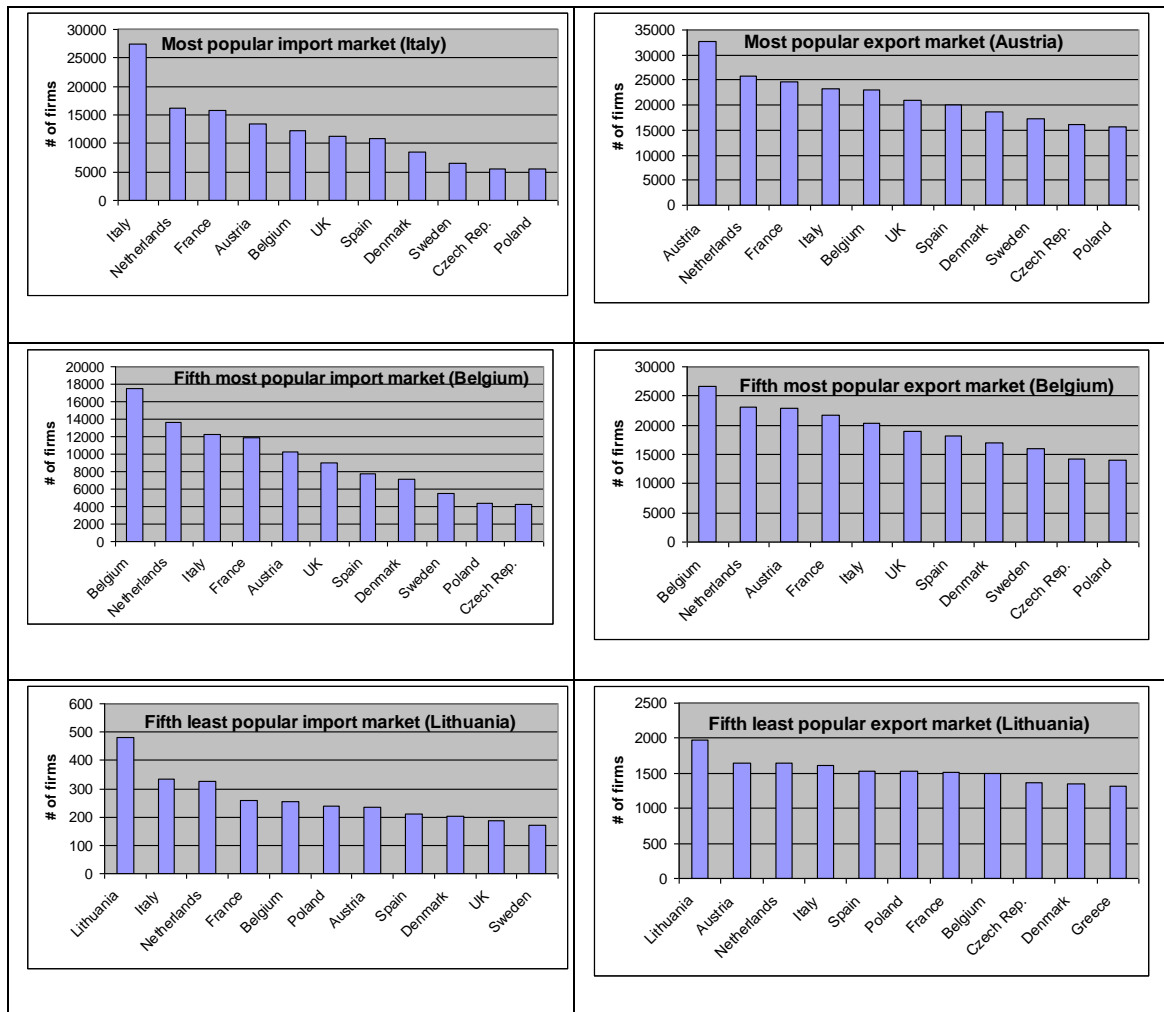
The dark bars display numbers of firms that import from or export to the ten most popular markets. The light bars show conditional numbers: e.g. firms that import from France if they also import from Italy and the Netherlands; or exporters to the Czech Republic that also export to the nine most popular markets.

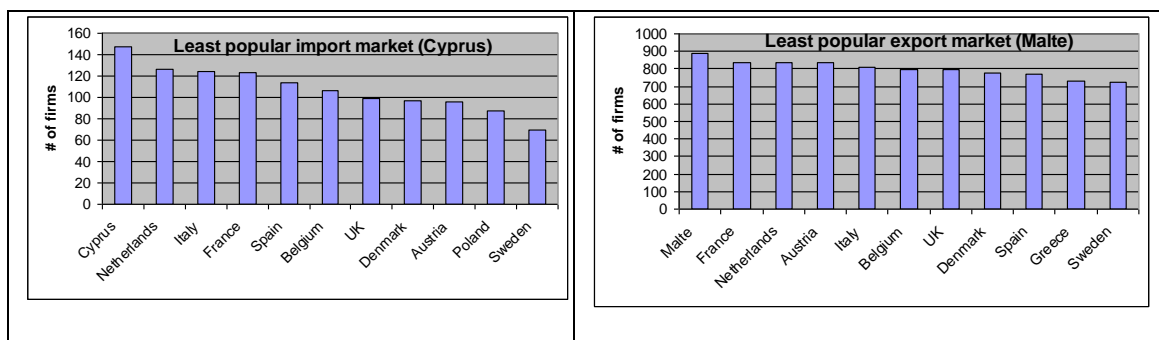
A similar pattern of market hierarchies is evident when looking at further numbers of conditional market entries. Any exporter – no matter whether engaged in the most or the least popular market – is more likely to enter other markets than the corresponding importer (see Graph 3). The difference between Graph 2 and 3 is that the light bars in Graph 2 condition on an increasing number of countries with decreasing popularity of markets whereas Graph 3 conditions on just one particular market (country). For the top left-hand side histogram this is imports to Italy (the most popular import market for German firms). It is interesting to note that the sequence of (conditionally) popular markets is largely unaffected by the choice of reference country. There is very little difference in this sequence of markets between the case of the most popular import

market and the least popular one (Cyprus). The same is true for export markets. It is not surprising, however, that the histograms get flatter as one goes from popular markets (as the reference countries) to relatively unpopular ones, i.e. as one goes from the top row of histograms to the bottom row.

The most remarkable feature of Graph 3 is that the conditional entry numbers for import markets are much lower than the corresponding numbers for export markets. This is true irrespective of reference market, i.e. for every comparison of left-hand side and right-hand side histogram in the same row. This confirms the observation from Graph 2 that market hierarchy is much flatter on export markets than on import markets. This suggests that *sourcing from EU import markets is a more firm-specific decision than exporting to EU markets.*

Graph 3: Conditional market entry numbers





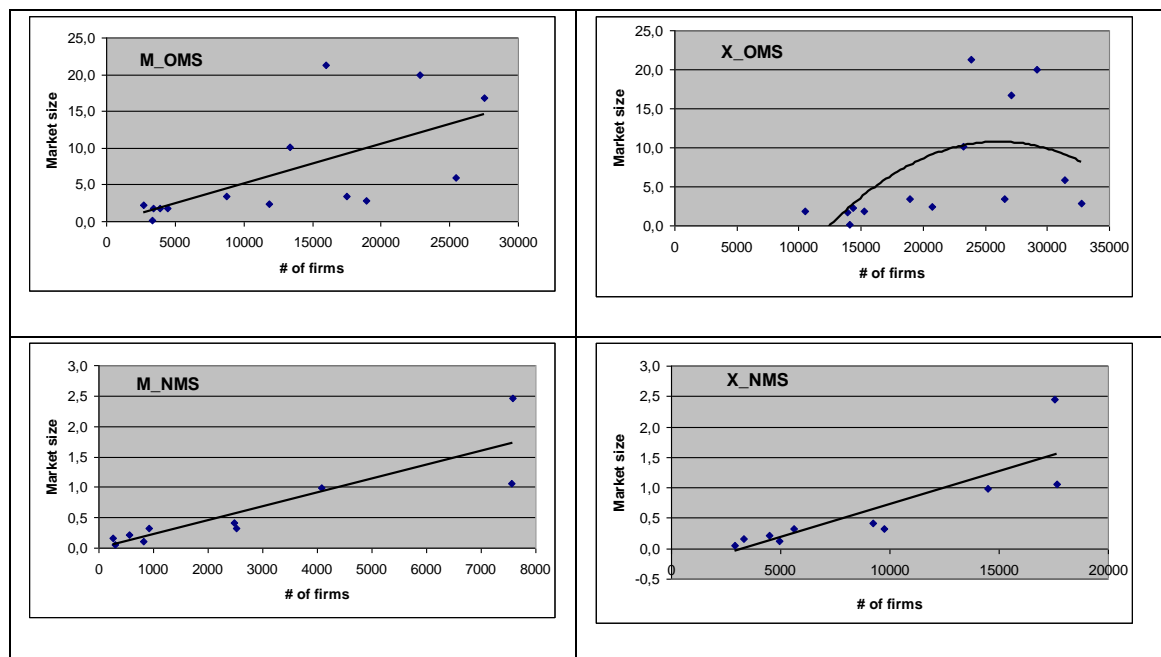
The graphs display conditional entry numbers under the condition that firms import from or export to the corresponding reference market. The two graphs in the first row show the number of firms that import from or export to those markets if they import from Italy (graph on the left-hand side) or export to Austria (right-hand side). For Italy and Austria in those two graphs, these are, of course, unconditional entry numbers.

Market size:

In general larger markets should be more attractive for exporters and importers than smaller markets (see equation (5)). Importers would tend to find a broader range of differentiated products in a large market than in a small market rendering market entry into a large market more profitable. Exporters to a large market face more consumers or firms with potential interest in their products. In contrast to this, entry costs should be lower the more integrated EU markets are. If entry costs, other than tariffs, still play a significant role inside the EU, this should be reflected in significant positive correlation between market size and the number of enterprises engaged in a market.

Bernard et al. (2007) demonstrated that both market size and distance are important for the explanation of the number of US-firms engaged in different markets (175 potential partner countries): i.e. trade costs and entry costs are relevant for US traders. Interestingly, market size (reflecting the number of goods available) is much more important than distance in explaining the number of US importers engaged in a market (as well as the number of products imported), while distance (i.e. trade costs) is more important than market size (i.e. entry costs) in explaining the number of US exporters active in a market.

Graph 4: Market size and popularity



The graph plots market size (share of GDP in EU (excluding Germany) in 2004) versus number of German traders active in market.

For German firms, neglecting the role of distance and thus trade costs across the EU, *entry costs seem to be much lower, first, for exporting than for importing, and, second for being engaged in the OMS compared to being active in the NMS.* In principle, we detect a positive relationship between market size and number of firms active in a market: the larger a market in term of GDP (i.e. the lower entry costs), the more firms are active in importing and exporting to that market. But this relationship is not very strong for German firms' export activity in the OMS. Instead, it seems to follow an inverted U-shaped pattern.²⁰ The export market most German firms are engaged in is a rather small market: Austria. This probably reflects the proximity between Germany and Austria, both in terms of geographical distance and language.

Obviously, market entry costs play less of a role across OMS and export activity seems to take place in a relatively integrated Single Market. However, with respect to NMS, market size still appears to be of some importance in explaining the numbers of importers and exporters active. A linear regression line fits the data for trade with NMS

²⁰ Excluding the four largest markets (Great Britain, Italy, France and Spain), there would be a rather flat relationship between market size and number of firms active in export markets.

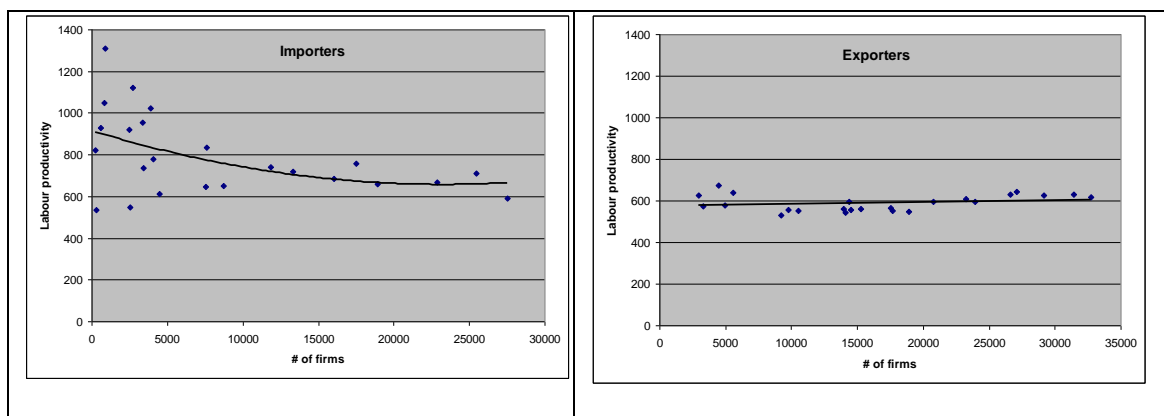
rather well. We interpret this as a sign of a relatively low integration of the NMS because entry costs are still substantial.

Self-selection and productivity thresholds:

In case there are higher market entry costs in unpopular markets than in popular markets, these should theoretically be reflected in higher average productivity levels of those firms engaged in markets where fewer firms are active (hypothesis (c)). Consistent with the different roles of entry costs for importing and exporting, we observe *productivity thresholds which are evident for import activity but not for export activity*.

On the export side, there is no evidence of self-selection of the more productive enterprises into new markets - neither for the markets of the old nor of the new member states. Although larger firms (as we reported above) are the first to start exploring the less integrated new members' markets, these firms are on average as productive as any firm exporting to any market (see Graph 5) i.e. there is no relationship between the number of exporters to a market and the average productivity of firms exporting to that market. On the contrary, productivity and market diversification seem to be slightly negatively correlated.²¹

Graph 5: Firm productivity and market popularity



The graphs display labour productivity (sales turnover in relation to number of employees) versus number of German traders active in market.

²¹ This is also obvious from fact that the numbers of destination countries is lower for high-productivity firms than for low-productivity firms. There is a slightly negative correlation between the numbers of partner countries and productivity which is -0.03 for all exporters and -0.02 for exporting manufacturing firms.

As for importing, the average productivity of firms that import from a market is inversely related to the number of firms sourcing from that market. However, the negatively sloped regression line in Graph 5 is to a large extent driven by a small number of relatively unpopular markets. These observations represent import market mainly from the NMS, but also Greece and Portugal. In summary, our findings cannot answer the question whether productivity is linked to importing because of learning-by-importing (imports improve productivity) or because of self-selection of the most productive firms as importers from new markets. But, again, our results points to *less integrated import than export markets*.

4.3 Diversification of firms: analysing product varieties

The variety of products exported to the EU by the average firm is slightly larger than the one of goods imported from the EU. While the average German importer sources about 12 products, the average exporter delivers almost 13 to its EU partner countries (see Table 4). We thus find that intra-EU trade of German firms differs somewhat from US or Swedish firms' global trade (see Bernard et al., 2009; Andersson et al., 2008). Not only do more Swedish (and US) firms export than import. With respect to importing they are more diversified than exporters are.²²

This comparison reflects the strong export-orientation of the German economy, especially in comparison to the US. In addition, the strong diversification of German firms' intra-EU trade is a consequence of the deep integration of (the old) EU member markets. Importing is the other side of exporting in integrated markets. This picture is also broadly evident for any of the product groups.²³

²² Both studies, however, focus on all and not only above-threshold (i.e. bigger) traders. Thus we should not compare absolute numbers. But we can compare the relative import and export numbers of products of both groups of firms. While Swedish firms import on average 20 products and export 14 products, US traders import on average 10 products and export 9 products. Interestingly, the product variety of US exports increased to some extent between 1993 and 2000 while the one of import products remained constant.

²³ Product-level analysis is usually based on the internationally comparable 5-digit-level Standard International Trade Classification (SITC) Rev.3. SITC includes 3,118 differentiated product categories at the 5-digit level, 1,033 at the 4-digit-level, and 261 at the 3-digit level and goes beyond the pure material composition of the customs-oriented CN (see Hoepfner, 2003). In addition, residual positions in subcategories or positions used for simplified declaration (like e.g. complete plant facilities, for further explanations see Gehle, 2004) are only attributed to reasonably interpretable product categories at a higher aggregation level. We checked that using the CN 8-digit level leads to the same qualitative conclusions with respect to traders' diversification.

Table 4: Number of products imported or exported (SITC 5-digit)

	Firms	# Firms	Mean	Std. Dev.	Max.
<i>all regions</i>					
# SITC imported	All	48,251	11.7	23.1	711
# SITC exported	All	45,344	12.6	31.4	949
# SITC imported	Manufacturers	22,046	12.6	24.9	711
# SITC exported	Manufacturers	26,241	12.9	31.6	949
<i>OMS</i>					
# SITC imported	All	46,832	11.5	22.8	691
# SITC exported	All	44,460	11.6	29.9	923
# SITC imported	Manufacturers	21,455	12.2	24.4	691
# SITC exported	Manufacturers	25,848	11.5	29.5	923
<i>EU-10 new</i>					
# SITC imported	All	15,469	3.9	8.1	423
# SITC exported	All	26,970	8.3	21.6	622
# SITC imported	Manufacturers	8,748	4.3	8.4	243
# SITC exported	Manufacturers	17,350	8.6	21.9	622

Trade relations with the ten new member countries are, however, not only characterized by fewer importers (compared to exporters), they are also *less differentiated. Importers, on average, also source a smaller number of goods than exporters send to NMS.* Comparing across regions, there are, on average, nearly 12 different products originating from the 14 old EU partner countries, but only four different products per firm from the ten new member countries. This reflects the fact that import structures of trade with these countries are more concentrated and less diversified than trade in general. This finding points to specific trade relations based on heterogeneous firms or country characteristics.

According to Bernard et al. (2007, 2009), US exporters are likely to trade just a single product and are not very likely to export more than ten products. The same is true for German firms (at least in this dataset). However, German importers and German exporters do not differ much with respect to the number of products traded. The rather large traders we look at here are just slightly more likely to trade at least five products

than at most four products (compare Table 5). Their US counterparts, however, are marked by a high probability (about 40 per cent in 2000) to trade just one good and not to trade more than four products with a probability of nearly three in four). Since we do not have transaction-level trade data information for firms below the threshold of € 200,000, we cannot determine how strong the specialisation of small German traders is.

Table 5: Number of firms according to product range

Importers			Exporters		
Number of Products	Number of firms	%	Number of Products	Number of firms	%
All firms	48,251		All firms	45,344	
Of those:			of those:		
1	10,219	21.2	1	11,648	25.7
2- 4	13,590	28.2	2- 4	13,437	29.6
5- 9	9,597	19.9	5- 9	7,971	17.6
10-49	12,751	26.4	10-49	9,788	21.6
50+	2,094	4.3	50+	2,500	5.5
Non-commercial Firms	22,046		Non-commercial Firms	26,241	
1	3,875	17.6	1	6,292	24.0
2- 4	5,878	26.7	2- 4	8,024	30.6
5- 9	4,788	21.7	5- 9	4,667	17.8
10-49	6,523	29.6	10-49	5,732	21.8
50+	982	4.5	50+	1,526	5.8
NMS-engagement	15,469		NMS-engagement	26,970	
1	6,687	43.2	1	9,749	36.1
2- 4	5,520	35.7	2- 4	8,572	31.8
5- 9	2,032	13.1	5- 9	3,859	14.3
10-49	1,162	7.5	10-49	3,925	14.6
50+	68	0.4	50+	865	3.2
EU-old engagement	46,832		EU-old engagement	44,460	
1	10,047	21.5	1	11,927	26.8
2- 4	13,344	28.5	2- 4	13,616	30.6
5- 9	9,315	19.9	5- 9	7,799	17.5
10-49	12,153	26.0	10-49	9,036	20.3
50+	1,973	4.2	50+	2,082	4.7

In German intra-community trading, more trade is executed by smaller (and less diversified) firms than in global US trade. In the US, just 6 per cent of exports are accounted for by firms shipping fewer than ten products (Bernard et al., 2009). With respect to German intra-EU trade, however, exporters with at least ten 5-digit-level products just cover three fourth of trade value (compared to 94 per cent in global US trade). At a lower digit level, this proportion would even decrease. However, this is only

valid for intra-community trading. But it might be a sign of increasing firm specialisation and *of low trade costs within the EU and easier market access for smaller firms*. However, since we only have data for one point in time we cannot analyze the dynamic aspects of diversification and specialization.

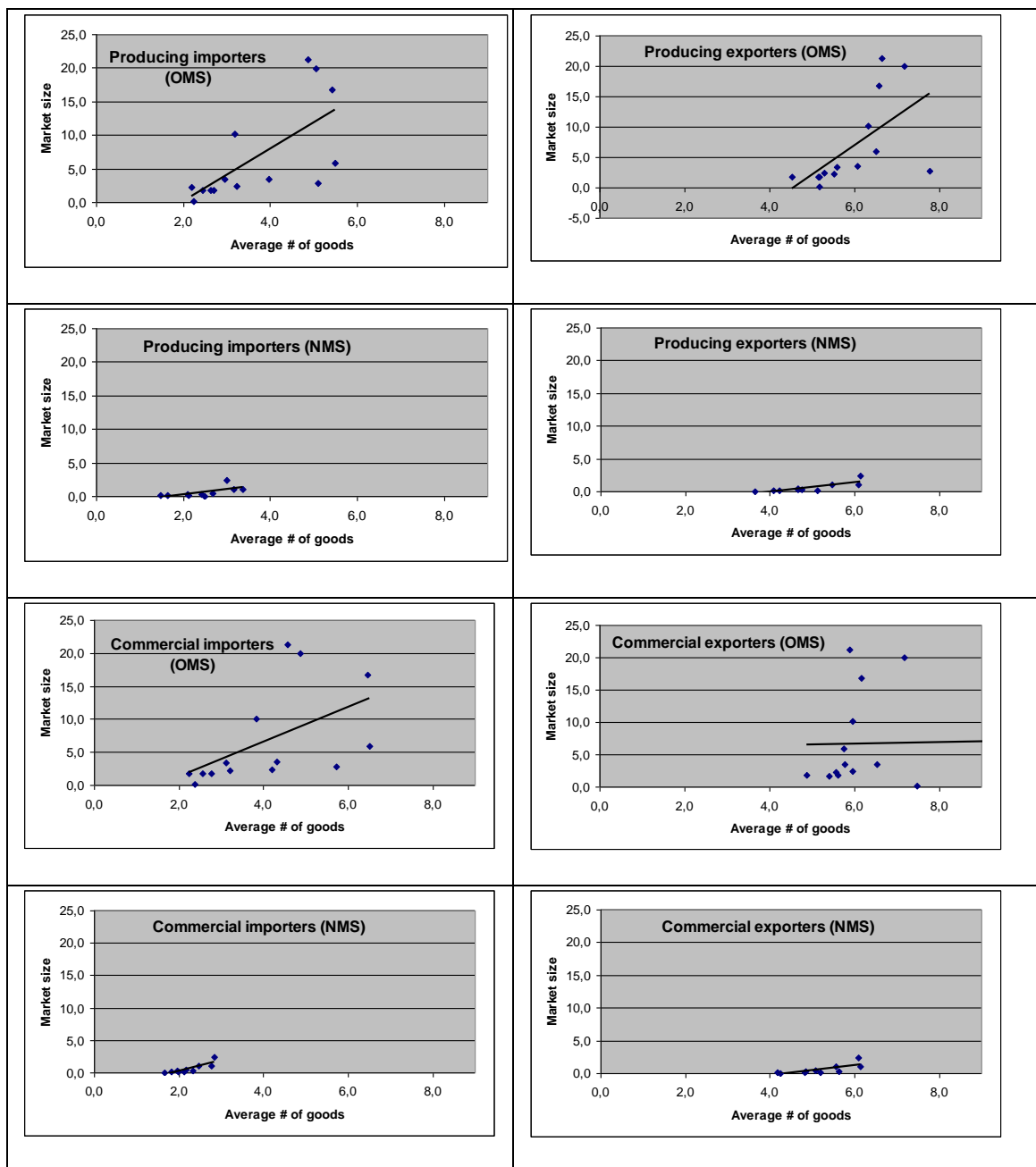
Concerning the engagement in the new EU markets, the probability of single-product trade relations is much higher than for EU-trade as a whole. On the import side, more than 43 per cent of firms sourcing from these countries and on the export side 36 per cent of firms exporting to these countries trade only one product with the NMS (compare Table 5). In contrast to this, the share of firms trading more than four goods with the NMS is quite low – like it is for global US trade. This is indicative of high market barriers in NMS (hypothesis (b)).

Market size

The hypothesis of monopolistic competition in new trade models explains that the larger a market, the greater the variety of goods on it. With respect to imports, we would thus expect that German firms could source more import products on larger a market.

On the export side, theory points to different features for commercial and producing firms. Commercial firms serving the love of variety of consumers should trade independently of export market sizes. The utility of a Dixit-Stiglitz consumer depends on the number of products consumed and but is independent of the size of the consumer's home market. However, the number of products, above all intermediate and capital goods, being requested from German producers should depend on market size and the number of firms active in the destination country (hypothesis (a)). The more integrated EU markets are, the more evident this relationship should be. Indeed, in line with the conclusions from mainstream trade theory, we find market size to obviously matter for the number of products exported by manufacturing (producing) firms to the OMS – though not for those exported by commercial firms (see Graph 6).

Graph 6: Market size and variety of goods traded



The graphs plots market size (share of GDP in EU (excluding Germany) in 2004) versus average number of goods traded by German firms active in a particular market.

Graph 6 also shows that market size matters strongly for both the number of export products of German producers as well as the number of import products. The same is true for the number of export and import products traded with the ten new markets. However, the variety of goods traded increases to a somewhat smaller extent with larger market size in NMS (i.e. the regression line is much flatter). *Market size*

obviously influences the number of goods traded to a somewhat small extent in NMS while trade costs do play a stronger role than in OMS.

4.4 Identifying firm-specific trade structures

Diversification and firm size

While the *degree of diversification in terms of goods* obviously depends strongly on firm size, it *does not differ between importers and exporters of similar firm size*. This means that importing is usually as diversified as exporting: Once firms are active across borders, they, on average, engage in importing and exporting with similar broadness. Concerning market diversification, however, it is usually stronger for exporters and increases with firm size.

Trade with the NMS, however, differs in two respects: First, firms, on average, are much less diversified in terms of goods. Also, exporters are more diversified than importers across all size groups. Second, market diversification turns out to be much lower, even for big firms. To put this into figures: While, on average, large exporters (importers) engage in 13½ (8½) of the EU-14 countries, they only engage in half (one fourth) of the new markets (see Table 6).

Importers have stronger country-product specific structures than exporters. In aggregate terms, as shown above, importers import on average almost 12 products while exporters export almost 13. Importers do not only trade with fewer countries, they also, on average, import fewer differentiated goods. We noticed before that firms engaged in trade with the ten new member countries are the bigger ones, and even if they are small, their trade intensity is above-average. *This points to a higher degree of specific trading structures such as established relations with foreign suppliers (“offshorers”) as well as outsourcing procedures.*

Table 6: Characteristics of traders

Turnover (thousand €)	# Importers	# Exporters	# M goods	# X goods	# M countries	# X countries
All Firms	48251	45344	11.7	12.6	4.3	8.6
<500	3215	1876	4.2	4.0	1.7	3.6
500- 999	3122	2129	5.1	4.7	2.1	4.7
1,000- 1,999	5015	4313	6.1	5.3	2.7	5.9
2,000- 4,999	8901	9044	7.7	6.8	3.4	7.4
5,000- 9,999	7285	7891	9.5	9.0	4.3	8.7
10,000-49,999	11797	12122	13.2	14.3	5.5	10.4
>50,000	5413	4982	33.5	39.7	8.4	13.6
NMS-Engagement	15469	26970	3.9	8.3	1.8	3.3
<500	280	471	2.1	3.3	1.2	1.8
500- 999	434	768	2.4	3.3	1.3	1.8
1,000- 1,999	988	2028	2.4	3.4	1.3	2.2
2,000- 4,999	2389	5049	2.5	4.0	1.5	2.6
5,000- 9,999	2455	5015	2.9	5.3	1.5	3.0
10,000-49,999	5032	8469	3.5	8.2	1.7	3.7
>50,000	3192	3972	7.2	22.5	2.4	5.0

Correlation of product and market diversification

If we have integrated markets and low trade costs, the correlation between the number of export products and the number of export markets should be low. Each exporter would try to maximise the number of trading partner countries it exports to – independently of the number of its export products. In other words, a firm should export its export product(s) to all EU partner countries. However, Table 7 shows *lower correlations coefficients between the number of export products and markets for OMS than for NMS*. Again, this can be interpreted as *a sign of stronger integration of the OMS*.

Table 7: Correlation of number of products with number of trading partner countries

Number of products	up to 4	at least 5	up to 4	at least 5
Product group	Imports	Imports	Exports	Exports
All	0.23	0.48	0.20	0.27
Non-commercial firms	0.27	0.55	0.22	0.33
OMS	0.24	0.44	0.21	0.21
NMS	0.42	0.31	0.31	0.25

These are pair-wise correlations, relating to different numbers and subgroups of firms. All coefficients are significant at the 1 per cent level.

On the import side, however, the more markets are part of the Single market, the more products importers will encounter. Therefore, we should expect a high correlation of partner countries and import products in case of deeply integrated markets. If market barriers were very high and importers only sourced import products from one large market, the correlation instead would be low. The more diversified importers actually show some high correlation of partner countries and number of products sourced from. However, when the diversified importers are considered (column 3) the correlation is lower for import-product-country relationships of the NMS than the OMS pointing to some higher import market barriers in NMS.

Our outcomes are broadly in line with models of heterogeneous firms and monopolistic competition in which one country (one firm) produces one product and exports it. While importers tend to buy one product from one country, exporters export their products to several countries. However, on the export side, we find – at least in this dataset – evidence against the simplified model-type firm producing just one product: German exporters are not very likely to sell just one product to many countries. Generally, quite a number of different products are sold abroad by the average firm.

5 Conclusions

German firms appear to act in a highly integrated EU Single Market – at least when trading with old member states. Importing is as widespread as exporting and even more common among small firms (this is in general not the case in global trade according to other studies). Even though we found some similarity in the importance of import and export engagement in EU markets, there are still a number of differences between importing and exporting.

These relate especially to importer self-selection into new markets, a relatively strong hierarchy of entry into import markets as a consequence of firm-specific import decisions as well as lower regional diversification of import relationships. Altogether, export markets seem to be strongly integrated across OMS while, from the perspective of German firms, importing reacts more strongly to remaining barriers or trade costs.

In addition, import or export activities with new member states differ significantly. Smaller firms generally seem to be more reluctant to engage in the new

markets, and exporting is more common than importing from the new markets. However, if small firms import to OMS, the value of imports relative to turnover (import intensity) is generally much stronger than for large firms. All these are signs of relatively high market entry costs of importing from NMS.

This leaves us with many questions for future research: How do the variety, kind and volume of goods traded influence firms' productivity and employment. There are a number of results that point to interesting questions on simultaneity and on the interaction of importing and exporting. Clearly, the role of imported intermediate goods in enhancing productivity deserved more attention – both at the theoretical and the empirical level.

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