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Tor Eriksson, Valérie Smeets and Frédéric Warzynski

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Evidence from Danish Transactions-Level Data

Department of Economics

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# **Small Open Economy Firms in International Trade: Evidence from Danish Transactions-Level Data**

Tor Eriksson, Valérie Smeets and Frédéric Warzynski

Aarhus School of Business, Aarhus University

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## **Abstract**

In this paper, we use a rich dataset disaggregating imports and exports decisions by product and origin/destination of all Danish companies for the period 1993-2003 to provide key elements in characterizing Danish firms in international trade. Most evidence to date emanates from the U.S. or developing economies like Columbia or Mexico. Benchmarking on these studies, we find some similarities but also differences which we think are representative of European-type, small open economies. We find that Danish exporters make up a fairly small fraction of the total of firms, but that this fraction is higher than in e.g., the U.S. Firms engaged in exporting have the same positive performance characteristics – size, capital and skilled labour intensity, labour as well as total factor productivity, and wages – found in also in previous studies. But most exporter premia are significantly larger in Denmark than in the U.S. There are few traces of the European Union's Single Market Program and the adoption the Euro in 1998. We observe no impact of these changes on the number of exporters, but some signs of impacts on the number of products and export destination countries. Finally, we find that trade is positively related to productivity of firms. The association between productivity and the firm's imports of intermediate goods is particularly strong.

**JEL Codes:** F14, F23, D21

**Keywords:** Exporters, exporter premium, firm heterogeneity

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## 1 Introduction

In view of the importance of trade for most economies and the boom in international trade we have witnessed during the last two decades, non-economists would probably be surprised to hear that there is relatively little systematic research-based knowledge on international trade that builds on data where the unit of observation is firms.<sup>1</sup> Rather, the stylized facts regarding international trade and empirical evidence on theories of trade have, until recently, chiefly been based on analyses at the level of countries and, occasionally, industries.

Prior to the seminal paper by Bernard and Jensen (1995), evidence concerning trade at the level of firms and firms' role in international trade was in fact close to non-existent. Their study and a series of research papers that followed have documented some stylized facts regarding the U.S. firms in international trade. The key message from these efforts is that there is a lot of heterogeneity across firms and that trade is quite concentrated on a rather small proportion of the population of firms. The studies show that firms involved in international trade form an exclusive club which are more efficient and pay their employees better and therefore contribute significantly to the welfare of the country where they are located; see Bernard et al. (2007) for a summary on the research for the U.S. and Mayer and Ottaviano (2007) for some European evidence. Less work has been done on the dynamic evolution of trade at the firm level. Recent research has focused on the relative role of changes at the intensive and the extensive margin, i.e., changes in the quantities firms are trading versus changes in the number of firms involved in trade. These new findings have spawned a whole new literature on trade theory, beginning with Melitz (2003), which introduces heterogeneous firms into a standard trade model to analyze how this affects trade. Corresponding empirical studies of the role of firms in international trade for other countries have because of the paucity of adequate data been rather thin on the ground.<sup>2</sup> Consequently, whether, and to which extent, the findings from the U.S. are generalizable to considerably smaller and more open economies like Denmark remain open questions.

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<sup>1</sup> To be fair, there is a literature, mainly emanating from business schools, called International Business, but this is for the most part concerned with single firms and thus associated with all the problems surrounding the case study methodology, not least issues of representativity.

<sup>2</sup> To the best of our knowledge documentation exercises à la Bernard et al. (2007) have been done for France (Eaton et al. (2007a)), Mexico (Verhoogen (2008)), Columbia (Eaton et al. (2007b)) and Sweden (Andersson et al. (2007)). Moreover, we are aware of some ongoing work on China and Thailand. The Danish economy clearly differs substantially from these countries. Although the differences are smaller relative to Sweden, the two Scandinavian neighbours have markedly different industrial structures and firm size distributions. Pedersen (2008) also uses the same dataset as we do. His focus is, however, on the number of products and markets firms trade with.

The aim of this paper is to provide some new stylized facts concerning Danish firms in international trade by exploiting a data set containing information about every single international trade transaction involving Danish firms that has recently become available. Thus, we look at the concentration of trade, how firms engaged in international trade differ from those which do not, how changes in international trade develop at the level of firms, and finally we turn to look at the statistical relationship between firm productivity and trade. Most of the emerging empirical firms-and-trade literature focuses mainly on firms' exporting behaviour. Consequently, less is known about firms' imports. As imports of intermediate goods and capital are frequently referred to as key drivers of technological progress and knowledge transfer, we also provide some new information about Danish companies' importing behaviour.

The next section discusses briefly the recent relevant literature which has been built owing to the increasing availability of new detailed trade datasets at the product level in various countries. We then describe our dataset in section 3 and provide some stylized facts for Danish firms in international trade in section 4. In Section 5, we conduct our analysis on the dynamics of exporting and importing, while section 6 looks at the relationship between exports, imports and productivity. Section 7 concludes and offers policy implications.

## **2 Previous research**

Inspired by the literature on the natural evolution of industries (e.g. Jovanovic, 1979; Hopenhayn, 1992; Ericson and Pakes, 1995), the last generation of theoretical models of international trade with heterogeneous firms has described firms' import and export behavior in terms of selection (Melitz, 2003; Bernard et al., 2003; Melitz and Ottaviano, 2008a). Faced with increased competition, less productive firms are pushed towards the exit. The more efficient firms become exporters. By addressing the question why some producers export and others do not, these new models aim at explaining the set of stylized facts described in the empirical literature over the last ten years. Another, smaller literature has dealt with the relationship between firms' productivity levels and the foreign markets they serve (Eaton, Kortum, and Kramarz, 2004; 2007).

However, the recent availability of datasets describing the detailed import and export decisions taken by firms by product and by origin/destination, such as the one we use in this paper, has led to new challenges and show that there are more dimensions to take into account, in particular the multi-product dimension in export behavior. Bernard, Redding and Schott (2006) discuss how firms readjust their product mix as a consequence of falling trade costs, a decision that affects their productivity. They also introduce a distinction between firm level ability and firm-product-level expertise.<sup>3</sup> Pedersen (2007) suggests an alternative and more dynamic approach where firms invest in product lines. He also calibrates his model using the same Danish transactions level dataset used in this paper.

On the empirical side, a burgeoning literature documents the importance of multi-product firms in international trade: Bernard, Jensen and Schott (2009) describe stylized facts from the US Linked-Longitudinal Firm Trade Transaction Database (LFTTD) over the period 1992-2000; Eaton, Kortum and Kramarz (2007) analyze the case of France over the period 1986-1992; Verhoogen (2008) relates quality upgrading and wage inequality in the Mexican manufacturing sector over the period 1984-2001; Kugler and Verhoogen (2008) analyze input and output price differences between firms and relate it to firm heterogeneity using the Colombian census over the period 1982-2005. Another paper specifically addresses the dynamic evolution of exports using the same Colombian dataset (Eaton, Eslava, Kugler and Tybout, 2007). They document the importance of entry into exporting and exit from exporting status, as well as the typical pattern of entry.

### **3 Data description**

The dataset used in this paper includes information about all import and export transactions made by Danish firms during the period 1993-2003.<sup>4</sup> For each transaction, we know the identification number of the firm buying or selling, the type of good (according to the 8-digit Combined Nomenclature product code), the value, the quantity, and the destination or origin of the transaction. The statistics were introduced at the beginning of the European Union's Single Market project in

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<sup>3</sup> See also Melitz and Ottaviano (2008b), Eckel and Neary (2008), and Nocke and Yeaple (2008).

<sup>4</sup> See [http://www.dst.dk/HomeUK/Statistics/focus\\_on/focus\\_on\\_show.aspx?sci=1202](http://www.dst.dk/HomeUK/Statistics/focus_on/focus_on_show.aspx?sci=1202) for more information about the dataset.

1993.<sup>5</sup> Prior to 1993, all flows of goods were recorded by means of the customs and shipping documents reported by firms to the Customs and Tax Authorities. This still continues to be the case trade to and from countries outside the European Union.

Figure 1 shows the development of the number of firms importing and exporting during the period 1993-2003. Hitting a low in 1997, the number of firms involved in international trade has since recovered, but it still remains lower than at the beginning of the period, and this holds for both importers and exporters. This observation suggests that the dynamics of export and import decisions is a key element in studying the evolution of trade. Thus, a first glance at the data suggests that trade has increased mostly as a consequence of the role of the intensive margin: less firms export more goods on average and to more countries. However, one needs to look more closely at the evolution of the number of products by firm. We will return to that below.

The trade information is next matched with the Firms Accounting Statistics dataset, which contains balance sheet information for the population of Danish firms during the period 1993-2003. We make use of the information concerning total sales, turnover, material costs, total assets, tangible fixed assets, employment, and wage costs. The dataset covers around 350,000 firms per year over the period. However, many of these firms are legal entities with little or no actual turnover. When we restrict our analysis to firms with at least 10 employees, the number of firms is reduced to a subset of between 15,000 and 25,000 firms.<sup>6</sup>

Finally, we have linked the trade data to the IDA dataset, which covers the entire population of Danish individuals from 1980 to 2003. In IDA individuals are linked to firms for which they work, and we are able to retrieve information for all employees regarding their level of education, wage, age and experience in the labor market.

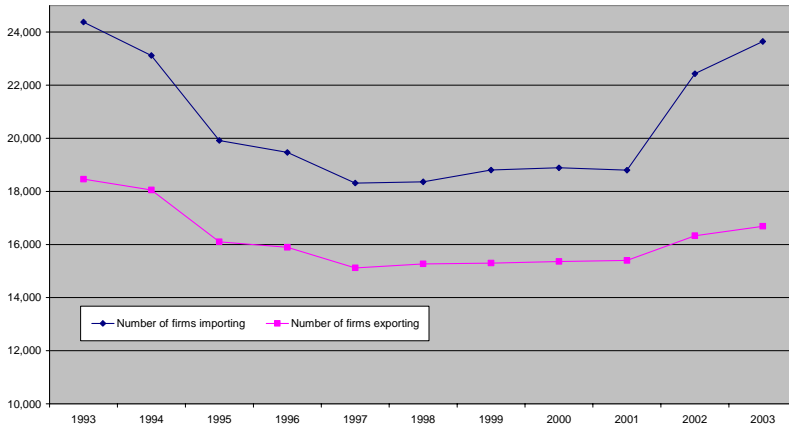
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<sup>5</sup> The data about trade with EU member states come from two sources: a monthly data collection (covering about 10,000 firms) using the so called Intrastat system and the VAT register for all VAT registered companies.

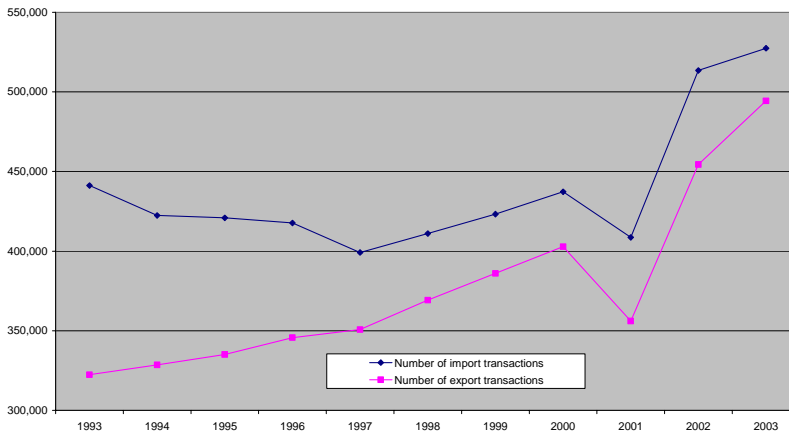
<sup>6</sup> We also observe that the number of firms jumps between 1999 and 2000 due to the fact that Statistics Denmark cleaned the dataset after 1999 to make sure that most firms included had an economic activity, and at the same time more sectors were included. A data appendix describing the distribution of firms across sectors is available from the authors

*Figure 1: Summary Statistics from Foreign Trade Statistics*

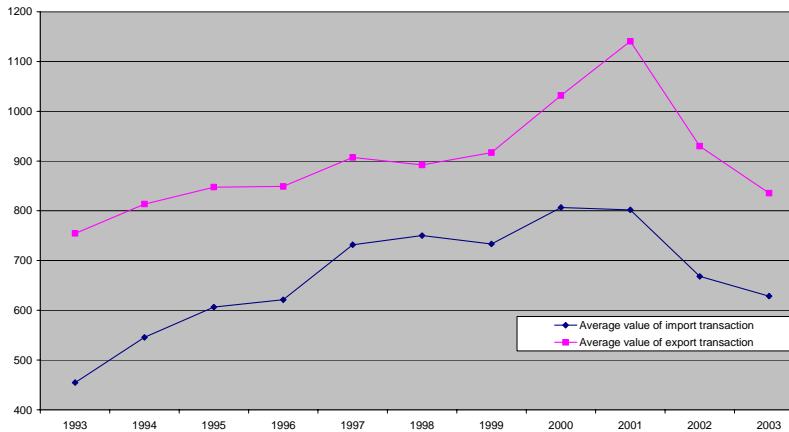
**Part A: Evolution of the number of firms involved in international trade**



**Part B: Number of import and export transactions**



**Part C: Average value of international trade transactions**



## 4 New facts on Danish firms in international trade

As Denmark is a small open economy of around 5.5m people, naturally limited by the size of the market, continuous exporting is obviously a must for firms that wish to grow. In this section we provide for the first time some key facts about "Danish firms that trade". Moreover, we briefly describe how the patterns how Danish firms trade have changed during the period under study.

### 4.1 Concentration of exports

To begin with we examine the concentration of exports. As can be seen from Table 1, the exporting firms' share of all firms with at least one employee varies between 15 and 20 percent. This is a considerably higher number than the corresponding figure for the U.S. which is 4 percent (Bernard et al. (2007)). The differential is by no means surprising in view of the size differential between the two countries and in particular the difference in the degree of the openness of the two economies. The low proportion of all firms that export is natural because an increasing share of firms produces services, a substantial portion of which cannot be shipped to or consumed from remote locations.

*Table 1A*

**Share of Exporting Firms in Danish Economy - Firms with at least one employee**

Year	Number of exporting firms	Total number of firms	Share of exporting firms
1993	19,366	95,365	20.31
2003	18,769	125,684	14.93

*Table 1B*

**Share of Exporting Firms in Danish Economy - Firms with at least ten employees**

Year	Number of exporting firms	Total number of firms	Share of exporting firms
1993	6,854	15,859	43.22
2003	6,879	23,755	28.96

How does the picture change if we restrict our analysis to the manufacturing sector? This is shown in Table 2. Now, the proportion of exporters is considerably higher: around 38 percent. This compares to 14 percent in the U.S. When we restrict our attention to firms with at least ten employees, the share is much higher: 67-8 percent. It is also interesting to note that these shares are remarkably stable over time.

*Table 2A*

**Share of Exporting Firms in Danish Manufacturing - Firms with at least one employee**

Year	Number of exporting firms	Total number of firms	Share of exporting firms
1993	5,541	14,512	38.18
2003	4,547	11,980	37.95

*Table 2B*

**Share of Exporting Firms in Danish Manufacturing - Firms with at least ten employees**

Year	Number of exporting firms	Total number of firms	Share of exporting firms
1993	3,617	5,330	67.86
2003	3,098	4,655	66.55

Given that a relatively large portion of Danish firms are exporting, does this also imply that exports are comparatively less concentrated on a few superstar firms? Table 3 gives some statistics answering this question. We may first note that the top three largest exporters account for a little over a tenth of aggregate exports and that top 50 (100) exporters share of total exports is almost 40 (50) percent.

*Table 3*

**Concentration of Exports:  
Percentage of Exports Accounted by Top Firms**

	1993	2003
Top 3	12.30	10.10
Top 50	38.30	37.70
Top 100	47.00	47.40

In 2003 (1993), the top 1 and 10 percentiles of Danish exporters accounted for 55 (56) and 90 (90) percent of aggregate exports, respectively. The corresponding figures for the United States are markedly higher: the top percentile accounts for 81 percent and the top 10% for 96 percent (while their shares of employment are 15 and 24%, respectively); see Bernard et al. (2009). When we compare with two other countries<sup>7</sup> for which these numbers have been calculated on exhaustive samples, Norway and Belgium, we find that they are more similar to ours. In fact, for Norway the percentages are very close: 53 and 91, and for Belgium, they are slightly lower: 48 and 84 (Mayer and Ottaviano, 2007). Thus, it seems that trade is considerably less concentrated in smaller open economies.

Still, the distribution of exports on firms is relatively skewed in Denmark, too. There is also a notable skewness in the number of export destinations. While the median firm exports to two countries, the average number of destination countries is considerably higher and has increased from 5 in 1993 to 6.3 in 2003. As can be seen from Table 4, most of the change in the average number of export destinations comes from a decline in the fraction of exporters serving only a few countries and an increase in exporters serving more than ten countries. The share of exporters that export to more than five (ten) countries was 31.4 (16.2) percent in 2003. This is about twice as large as the corresponding proportion for the U.S. (Bernard et al., 2007).

An attractive feature of our dataset is that it contains detailed information about the number of products exported by the firm as well as about the number of countries each firm is exporting to. Table 5 combines this information and shows the importance of multiproduct and multideestination exporters in Denmark in 1993 and 2003.

A first thing to notice is that the two most common patterns are firms producing few products for export to a few countries and firms exporting several products to many countries. In 2003, these two categories make up about 75 percent of all exporting firms.

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<sup>7</sup> Mayer and Ottaviano's (2007) study also contains corresponding evidence from UK, France, Germany, Italy and Hungary. Unfortunately, these analyses are based on highly selected samples including mainly large firms, and the results from these countries are therefore not comparable. As can be seen from Table 1b, restricting the population to include only firms with at least ten employees doubles the fraction of Danish firms that are exporting.

*Table 4***Distribution of Firms by Number of Destination Markets**

# Destination Markets	1993		2003	
	N	%	N	%
1	7,130	38.62	6,087	36.43
2	3,228	17.49	2,762	16.53
3	1,873	10.15	1,590	9.52
4	1,220	6.61	1,021	6.11
5	783	4.24	708	4.24
6	640	3.47	528	3.16
7	457	2.48	469	2.81
8	372	2.02	312	1.87
9	327	1.77	289	1.73
10	303	1.64	241	1.44
11+	2,128	11.53	2,702	16.17
Average # of Destination Markets	4.95		6.29	
Median # of Destination Markets	2		2	
Maximum # of Destination Markets	199		138	

Table 5A

**Distribution of Exporters and Export Value by Number of Products and Export Destinations, 1993**

A: Share of Exporting Firms						
Number of products	Number of Countries					All
	1	2	3	4	5+	
1	27.3	3.7	1.2	0.6	1.0	<b>33.7</b>
2	6.1	6.2	1.9	0.9	1.7	<b>16.9</b>
3	2.1	3.0	2.3	0.9	1.8	<b>10.1</b>
4	1.1	1.6	1.4	0.9	1.9	<b>6.9</b>
5+	2.1	2.9	3.3	3.3	20.8	<b>32.4</b>
<b>All</b>	<b>38.6</b>	<b>17.5</b>	<b>10.2</b>	<b>6.6</b>	<b>27.1</b>	<b>100</b>

B: Share of Export Value						
Number of products	Number of Countries					All
	1	2	3	4	5+	
1	0.80	0.32	0.13	0.10	0.48	<b>1.8</b>
2	0.27	0.51	0.27	0.20	1.41	<b>2.7</b>
3	0.15	0.25	0.69	0.16	1.97	<b>3.2</b>
4	0.09	0.17	0.16	0.13	1.70	<b>2.3</b>
5+	0.41	0.83	1.00	1.16	86.65	<b>90.0</b>
<b>All</b>	<b>1.7</b>	<b>2.1</b>	<b>2.3</b>	<b>1.8</b>	<b>92.2</b>	<b>100</b>

C: Share of Employment						
Number of products	Number of Countries					All
	1	2	3	4	5+	
1	7.3	1.0	0.4	0.2	0.5	<b>9.4</b>
2	1.6	2.9	0.8	0.7	1.2	<b>7.2</b>
3	0.7	1.8	1.5	0.4	1.5	<b>5.9</b>
4	0.3	0.8	0.8	0.5	1.6	<b>4.0</b>
5+	0.7	1.6	2.2	2.3	66.7	<b>73.5</b>
<b>All</b>	<b>10.6</b>	<b>8.1</b>	<b>5.7</b>	<b>4.1</b>	<b>71.5</b>	<b>100</b>

Table 5B

**Distribution of Exporters and Export Value by Number of Products and Export Destinations, 2003**

A: Share of Exporting Firms						
Number of products	Number of Countries					All
	1	2	3	4	5+	
1	23.1	2.4	0.7	0.4	0.9	<b>27.5</b>
2	5.7	5.4	1.2	0.6	1.1	<b>14.0</b>
3	2.5	2.9	1.8	0.7	1.5	<b>9.3</b>
4	1.5	1.5	1.3	0.7	1.6	<b>6.7</b>
5+	3.7	4.3	4.5	3.7	26.4	<b>42.5</b>
<b>All</b>	<b>36.4</b>	<b>16.5</b>	<b>1.0</b>	<b>6.1</b>	<b>31.4</b>	<b>100</b>

B: Share of Export Value						
Number of products	Number of Countries					All
	1	2	3	4	5+	
1	0.81	0.91	0.12	0.55	2.50	<b>4.9</b>
2	0.15	0.28	0.19	0.33	0.91	<b>1.9</b>
3	0.11	0.22	0.15	0.24	1.73	<b>2.5</b>
4	0.18	0.09	0.08	0.09	1.76	<b>2.2</b>
5+	0.49	0.63	0.81	1.04	85.63	<b>88.6</b>
<b>All</b>	<b>1.7</b>	<b>2.1</b>	<b>1.4</b>	<b>2.3</b>	<b>92.5</b>	<b>100</b>

C: Share of Employment						
Number of products	Number of Countries					All
	1	2	3	4	5+	
1	8.6	0.7	0.2	0.1	0.3	<b>9.9</b>
2	2.6	7.0	1.1	0.4	0.5	<b>11.5</b>
3	0.7	4.9	1.3	0.2	0.6	<b>7.7</b>
4	0.2	0.4	0.5	0.8	1.1	<b>3.0</b>
5+	0.7	1.4	5.7	4.4	55.7	<b>67.8</b>
<b>All</b>	<b>12.7</b>	<b>14.4</b>	<b>8.8</b>	<b>6.0</b>	<b>58.2</b>	<b>100</b>

Most of the firms that export a single product (27.5 percent of all exporting firms) are serving only one country. 42.5 percent of the exporters are exporting five or more products.<sup>8</sup> These firms' exports markets are likely to be located in several countries; almost two thirds consist of five or more destination countries. The quarter of firms that export to five or more countries account for 92 percent of aggregate export value. Due to the large overlap of multiproduct and multicountry exporters, 90 percent of the export value goes to firms that export five or more products. These multicountry and multiproduct exporters' shares of employment in the exports sector are much lower, though: 42.5 and 31.4 percent, respectively. These numbers suggest that differences in efficiency are driving the concentration of trade.

The firms that export five or more products employ seven times more people than firms that export a single product, but their export values are 18 times larger. Thus, exports per worker are 2.5 times greater in multiproduct firms. Firms that export to five or more destinations have employment levels which are 4.5 times larger than firms exporting to single destinations. But their export values are over fifty times larger and their exports per worker ratio about 12 times higher.

In comparison with the corresponding numbers for the U.S. presented in Bernard et al. (2009) the proportion of Danish firms that export a single product is much lower (27.5 vs 38 percent) and conversely the fraction exporting five or more products significantly higher (42.5 vs 29.6). However, the share of export value for firms exporting five or more products (a single product) is substantially higher (lower) for the U.S.: 96.7 (0.7) percent compared to 88.6 (4.9) percent for Denmark.

As for changes over time, we may note that not only has there been an increase in the share of exporters that export to five or more countries but also a considerable increase in the share of multiproduct exporters.

Which countries are the main trading partners in Denmark? Table 6 shows that the share of the top 25 partners is around 90%. Not surprisingly, the neighboring countries, Germany, Sweden and Norway, are among the most important partners, accounting for around 40% of total trade.

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<sup>8</sup> In Swedish manufacturing the proportion exporting to five or more countries is higher: 38 %, while the share exporting five or more products is the same as in Denmark (Andersson et al., 2007).

Table 6

**Evolution of the Share of Trade Partners - Top 25 Trade Partners in 2003**

Trade Partners	Exports		Trade Partners	Imports	
	1993	2003		1993	2003
Germany	25.17	18.73	Germany	23.86	21.98
Sweden	10.05	12.15	Sweden	10.73	12.41
UK	9.28	8.03	UK	7.96	6.72
US	4.54	6.23	Netherlands	6.93	6.64
Norway	6.18	5.54	Norway	4.75	4.98
France	5.32	5.31	France	5.42	4.78
Netherlands	4.69	4.66	China	1.85	4.04
Italy	3.88	3.39	Italy	4.09	3.79
Spain	1.71	3.25	US	4.58	3.56
Japan	3.9	3.16	Belgium	3.69	3.39
Finland	1.89	3.14	Finland	2.76	2.30
Belgium	1.96	1.85	Poland	1.49	2.02
Poland	1.31	1.6	Spain	1.17	1.72
Ireland	0.59	1.48	South Korea	0.43	1.27
Russia	0.75	1.36	Switzerland	2.18	1.25
China	0.36	1.19	Austria	1.15	1.23
Switzerland	1.82	1.15	Russia	1.15	1.19
Austria	1.06	1.04	Ireland	0.62	1.15
Hong Kong	0.67	0.94	Turkey	0.25	1.01
Canada	0.46	0.84	Japan	3.36	0.94
Greece	0.81	0.77	Singapore	0.23	0.94
Australia	0.53	0.76	Taiwan	0.78	0.79
South Korea	0.53	0.57	Lithuania	0.15	0.63
Saudi Arabia	0.72	0.52	Argentina	0.49	0.60
Portugal	0.51	0.49	India	0.37	0.59

Looking at the evolution between 1993 and 2003, we can see that the share of Germany and the UK in both import and export markets has declined, while the share of Sweden has increased. In terms of exports, the share of countries like the US, Finland, Spain, Ireland, Russia or China has increased; regarding imports, the share of Japan has declined dramatically, while China has become a major partner, as well as South Korea, albeit to a lesser extent. The share of EU countries has slightly increased, but mostly due to the new members.

#### ***4.2 Exporter premia***

As already noted, earlier studies from other countries have found that exporting firms perform better than non-exporters on a number of counts. Table 7 collects several performance measures some of which are comparable to those presented in Bernard et al. (2007) and Mayer and Ottaviano (2007). The premia have been computed from a series of regressions estimated for years 1993 and 2003. The first column reports the estimates from simple bivariate regressions, in the next column we add industry fixed effects, and finally in the last column firm size is also controlled for. As all explanatory variables are in logs (save skills) the estimates can be interpreted as percentages.

A first dimension according to which exporters differ from non-exporters is expectedly firm size. Thus, within industry the exporter is 115-122 percent larger than the non-exporting firm.<sup>9</sup> Even after controlling for size and industry, shipments are 30-50 per cent larger from exporters. As can be seen from the rows below, this reflects differences in labour productivity, capital intensity, and especially in total factor productivity.<sup>10</sup> The difference between exporters and non-exporters in labour productivity has declined since the early nineties at the same time as differences in total factor productivity has increased.

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<sup>9</sup> It should be pointed out that this number is understating the difference as firm size only refers to the firm's number of employees in Denmark.

<sup>10</sup> The literature suggests two hypotheses for the higher productivity: more productive firms are selected to become exporters and exporters learn from exporting and hence become more productive. Most of the evidence for developed economies supports the former.

Table 7A

**Exporter Premia in the Danish Economy, 1993**

	<i>Exporter premia</i>		
	(1)	(2)	(3)
log employment	1.37	1.15	
log shipments	3.31	2.98	0.47
log output per worker	0.33	0.28	0.40
log value added per worker	1.57	1.33	0.29
log TFP	0.30	0.59	0.59
log wage	0.17	0.09	0.08
log capital per worker	0.31	0.10	0.36
share of college educated workers	0.10	0.10	0.01*
Additional covariates	None	Industry fixed effects	Industry fixed effects, log employment

Table 7B

**Exporter Premia in the Danish Economy, 2003**

	<i>Exporter premia</i>		
	(1)	(2)	(3)
log employment	1.30	1.22	
log shipments	2.61	1.89	0.33
log output per worker	0.41	0.17	0.30
log value added per worker	1.57	1.21	0.12
log TFP	2.09	0.72	0.73
log wage	0.06	0.05	0.06
log capital per worker	0.33	0.09	0.44
share of college educated workers	0.31	0.25	0.05
Additional covariates	None	Industry fixed effects	Industry fixed effects, log employment

Note: The procedure is exactly similar to Bernard et al., except that log TFP is computed using firm specific revenue shares; we also replace "log skill per worker" by the share of college-educated workers. All results are significant at 1% except those noted with (b).

Exporters pay their employees more than non-exporters. The differential which has declined over time remains also after catering for industry and firm size. The remaining difference could reflect differences in the skill structure of the workforces between exporting and non-exporting firms. The bottom rows in Table 7 shows that the share of university educated employees is higher in exporting firms, also within industries, but the difference shrinks substantially when firm size is controlled for. Furthermore, there is a change over time; the difference between exporters and non-exporters with respect to the educational level of the workforces was significantly smaller in the beginning of the nineties. Provided that the characteristics of the products exported reflect the inputs used in producing them, the observation that exporters use capital and skilled labour more intensively is of course consistent with traditional trade theory emphasizing the role of comparative advantage.

Benchmarking the Danish exporter premia on those for the U.S. (Bernard et al. (2007)) we note some interesting differences. Danish exporters are larger relative to non-exporters than corresponding U.S. firms with respect to both employment and shipments. Moreover, they are more capital intensive, have higher total factor productivity than firms producing for domestic customers only than is the case in North America. The exporter wage premia are quite similar in the two countries which may be somewhat surprising in view of how compressed the Danish wage structure is compared to that in the U.S. Thus, except for wages, exporter premia appear to be higher in the small open economy, Denmark. A possible explanation for this observation is that competition in the domestic markets in the U.S. is much stronger, partly due to differences in the size of markets, partly because many product markets are more regulated in Denmark.

### ***4.3 Changes***

The time period covered by the data set involves at least two potentially major changes in the trading environment of Danish firms. First, in the nineties the EU's Single Market Program led to the removal of most trade barriers between member states. Second, the introduction of the common currency for most EU member states in 1998, a project that Denmark chose not to join (nor did some of its major trading partners like U.K. and Sweden). Although it is beyond the scope of the

current paper to examine how these two changes have affected Danish firms engaged in international trade, some interesting observations can be made.

The standard prediction from models studying reductions in trade barriers and common currency areas is that both favour trade. Yet, the current consensus among economists is that the single currency has not resulted in a large boost of trade flows. Rather, the increases have been assessed to lie somewhere in an interval of 2 and 5 percent (see e.g., Baldwin, 2006). The same is largely true also for the Single Market project of the early nineties. However, these conclusions are based on changes observed in aggregate data under which some microeconomic gains may be hidden. One is that the changes may have helped new firms to enter exports markets and existing exporters to increase their number of products and the number of destinations for their exports. Another is increased price compression within EU owing to increased competition and lower transactions costs.

What we observe in the Danish case is that the share of exporting firms declined during the nineties – this is mainly due a drop in the number of exporting firms, and not because of the growth in the total number of firms – and has been stable during the current decade. Developments in the nineties clearly do not indicate that the Single Market gave rise to more Danish firms engaging in exporting activities.<sup>11</sup> However, for incumbent exporters both the number and the average value of export transactions increased during the nineties. In the beginning of the new millennium the number of export transactions also grew, whereas their average value fell. The share of firms that export several products has increased compared to 1993 as has the proportion of firms exporting to several countries (whether these changes occurred within or outside EU, we have not looked at). Thus, a tentative conclusion would be that the changes in the European trade environment have had some impact on the intensive margin of exports, that is, existing exporters' trade. However, it is more difficult to trace effects on the extensive margin.<sup>12</sup> Clearly, this is an interesting area for further research.

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<sup>11</sup> As we will see in the next section the inflow into the stock of exporters has been very stable during the period.

<sup>12</sup> Fontagné, Mayer and Ottaviano (2009) found using similar data sets from Belgium, France and Hungary that the euro has had a tiny positive effect on trade via an increase in the number of products exported and a larger effect via the value of exports per product and firm.

*Table  
8A*

**The Evolution of the Number of Exporting Firms**

Year	<i>Number of exporting firms</i>	<i>Firms continuing exporting</i>	<i>Firms starting exporting</i>	<i>Firms stopping exporting</i>	<i>New firms starting exporting</i>	<i>Firms that were exporting but exited</i>
1993	17,412					
1994	17,077	12,961	3,281	3,280	835	946
1995	15,382	12,093	2,565	4,074	672	725
1996	15,069	11,771	2,757	2,721	490	643
1997	14,456	11,310	2,540	3,033	549	559
1998	14,562	11,379	2,675	2,336	462	584
1999	14,610	11,488	2,631	2,431	443	548
2000	14,172	11,097	2,323	1,932	623	1,412
2001	14,645	11,371	2,687	2,008	458	713
2002	15,519	11,997	2,894	1,770	514	807
2003	15,840	12,530	2,630	2,042	533	947

*Table  
8B*

**The Evolution of the Number of Importing Firms**

Year	<i>Number of importing firms</i>	<i>Firms continuing importing</i>	<i>Firms starting importing</i>	<i>Firms stopping importing</i>	<i>New firms starting importing</i>	<i>Firms that were importing but exited</i>
1993	22,738					
1994	21,645	16,632	3,676	4,421	1,337	1,373
1995	18,800	15,079	2,691	5,317	951	1,030
1996	18,350	14,659	2,700	3,118	899	831
1997	17,284	13,617	2,645	3,729	881	793
1998	17,314	13,528	2,844	2,736	852	838
1999	17,767	13,811	3,004	2,622	861	795
2000	16,881	13,189	2,458	2,010	1,103	2,261
2001	17,230	13,439	2,842	2,260	748	1,038
2002	19,947	14,447	4,375	1,537	874	1,126
2003	20,886	15,825	3,633	2,665	1,092	1,457

## 5 Exporter and importer dynamics

In this section, we apply the standard techniques used in industrial organization to describe the entry into and the exit from exporting. Table 8 shows the evolution of firms that enter into exporting, continue exporting, or stop exporting. The bulk of export activity is actually concentrated in firms that continue exporting: 96% of exports in a typical year are sold by firms that were already exporting the year before. Thus, the vast majority of entrants and exiting firms are small and probably relatively young in the exports markets.<sup>13</sup> Moreover, a closer inspection of Table 8A reveals that the changes in the number of exporting firms are chiefly driven by the exit rate which displays more year-to-year variation<sup>14</sup>, whereas the inflow into the stock of exporters is remarkably stable. Notably, there is no sign of a trend in the entry rate into exporting.

When we look at the cohort of firms entering into exporting in 1994 we can observe that a large majority of firms (61%) export a single product and 75% export to only one country (almost all of them (99%) to less than 10 destinations). A similar pattern is found for the other cohorts.

We next estimate a probit model for entry into exporting to test whether there is a relationship between the lagged level of productivity and entry into exporting. The results shown below are the estimated marginal effects:

$$\begin{aligned} \text{Entry into exporting} = & 0.013*** \text{ Lagged productivity} + 0.012*** \text{ Lagged employment} \\ & + \text{Year dummies} \quad (***) \text{ indicates statistical significance at the 1\% level} \end{aligned}$$

We find evidence in favour of the selection hypothesis suggesting that more efficient firms are more likely to enter into exporting. We have also run a probit regression to check if exiting the market is less likely if the firm is an exporter. We find that exporters are 27% less likely to exit than non-exporters. In other words, being involved in international trade is associated with a higher level of efficiency and facilitates survival.

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<sup>13</sup> The share of new exporters in each year varies between 17 to 19 percent. This is a substantially lower number than the share of almost fifty percent found by Eaton et al. (2007) for Columbia.

<sup>14</sup> As can be seen from the last column in Table 8A, a considerable proportion of the firms that stop exporting are simultaneously exiting the data set. That does not necessarily mean that these firms stop their operations. One important reason for their exit could for instance be that they are acquired by/merged with another firm.

We have carried out a similar analysis for entry into and exit from importing; see Table 8B. Importing is more common than exporting, and the annual fluctuations in the number of importers are larger. This is driven both by variations in entry and exit rates, although the latter is more important. However, as in the case of exports, firms that continue importing account for around 97% of total imports. We also ran a probit equation to check if entry into importing is associated with high performance in the past. As can be seen from the estimates, we find this is indeed to be the case.

$$\text{Entry into importing} = 0.010^{***} \text{ Lagged productivity} + 0.012^{***} \text{ Lagged employment} + \text{year dummies}$$

Table 9

**Relationship between Labor Productivity and Trade**

Dep. Var: log (labor productivity)	Labor Productivity and International Trade	Labor Productivity and International Trade - Decomposing imports
Size	-0.242*** (0.001)	-0.244*** (0.001)
Size <sup>2</sup>	0.036*** (0.0003)	0.037*** (0.0003)
Import share	1.716*** (0.006)	
Imports of intermediate inputs/Sales		1.810*** (0.007)
Imports of final goods/Sales		0.438*** (0.023)
Export share	0.448*** (0.007)	0.529*** (0.007)
Year dummies	Yes	yes
Adj. R <sup>2</sup>	0.10	0.11
N	1,096,849	1,096,849

## 6 Exporters, Importers and Productivity

A large numbers of papers in the international trade literature have shown that exporting firms are generally more productive than non exporting firms. Some argue that this is a result of selection: more productive firms are those that are able to enter export markets thanks to their competitive advantage. Others argue that firms learn from exporting and therefore become increasingly more productive as they acquire experience of producing for exports. We analyze the case of Denmark over the last decade, during which firms have become more open to international trade.

Table 9 gives some evidence regarding the correlation between labor productivity and firm-level trade. We may note that both measures of trade are positively associated with labor productivity, but the relationship with imports is stronger.

However, imports can represent two different things: either intermediate inputs or goods that were outsourced and then imported back to be sold in Denmark. As a next step, we distinguish between these two sources of imports. We can observe that imports of intermediate products are more strongly related with labor productivity, suggesting that getting your inputs from abroad is associated with improved efficiency. But both exports and imports of final goods are also positively associated with labor productivity. This suggests that all three different types of international trade activities are associated with better performance. These results were robust when we looked at a subsample of larger firms, when we looked at manufacturing firms, and also when we entered the firm's capital-labour ratio as an additional control variable.<sup>15</sup>

## 7 Discussion and concluding remarks

This paper has explored a newly available dataset disaggregating Danish firms' import and export decisions by product and by origin/destination over more than a decade. Such datasets provide a better understanding of the microeconomics of the balance trade, and opens up new exciting avenues for future research. This paper has, however, the modest aim of providing some key elements to a picture describing Danish firms that trade. Some of our findings are quite similar to

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<sup>15</sup> Furthermore, see Warzynski, (2009) for a more structural analysis and a discussion of the causality of the relationships.

what has been documented in the international literature, some are different and, we think, more representative for small open economies of the European variety.

Summing up, we find (i) that firms engaged in exporting make up a fairly small fraction of the total, but that this fraction is higher than in e.g., the U.S.; implying that, the share of exporters may be positively related to the openness of the economy; (ii) that firms engaged in exporting have the same positive performance characteristics – firm size, capital and skilled labour intensity, labour as well as total factor productivity, and wages – found in also in previous studies. Also here do we find a notable difference vis-à-vis the U.S.: most exporter premia are significantly larger in Denmark; (iii) that there are little traces of the two major changes in the European trade environment during the period under study (1993-2003): the European Union's Single Market - the purpose of which was to remove remaining trade barriers between EU member states - and the adoption the Euro in 1998. We observe no impact of these on the number of exporters, but some signs of impacts on the number of products and export destination countries; (iv) that trade is positively related to productivity of firms. In particular is there a strong association between productivity and the firm's imports of intermediate goods.

Although in small open economies like Denmark there are relatively more exporting firms, also here are the talents for exporting a scarce resource. From a Danish policy perspective a worrying result of our analysis is that the number of firms that export did not change during the 1990s despite the reduction in obstacles to trade. The inflow into the stock of exporters has remained remarkable stable during the period. One possibility is that policies promoting trade have been focused too much on the top performers. Another possibility is that despite trade liberalization, small fixed trade costs continue to exist but do not catch the interest policymakers and public discussion.

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