



CENTRO STUDI LUCA D'AGLIANO

The Global Operations of European Firms

The second Efige Policy Report

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Summary

This report uses newly collected, comparable cross country data from 15,000 firms in Austria, France, Germany, Hungary, Italy, Spain and the United Kingdom with detailed information on international activities. In line with a large literature, we find that size, productivity, the skill intensity of the workforce and the ability to innovate are positively related to firms' export performance in all countries. The same firm characteristics support more complex internationalization strategies, such as exporting to a larger number of markets, to more distant countries and producing abroad through FDI or international outsourcing. Moreover, these features influence the patterns of internationalization in a remarkably similar way across countries. Consequently, national differences in export performance are mostly related to differences in the industrial structure, in the distribution of firm characteristics, like size and productivity. We also find that firms pursuing comprehensive international strategies have coped with the crisis better. We conclude that structural policies that contribute to firm growth, productivity, accumulation of human capital and innovation are the best way to strengthen the international projection of European firms. Although more difficult to implement, their effects are going to be larger and more long lasting than those of policies directly targeting international activities.

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INTRODUCTION AND EXECUTIVE SUMMARY

The increased world integration of real and financial markets has made a country's overall growth performance more reliant than in the past on its trade competitiveness and, more in general, on its ability to operate on a global scale. This is particularly true for European countries that have gone through a process of internal market integration including, for many of them, the introduction of a single currency. On top of that, the recent crisis has shown that the heterogeneity in trade imbalances (from the German surplus of 6.4 per cent of GDP to the Spanish deficit at 9.7) is among the key causes of macroeconomic instability throughout the region. Therefore, understanding the roots of trade performance and global involvement is an essential policy challenge.¹

Why is there so much variation in trade performance across European Union countries? Germany is by far the most export oriented, with a share of exports to gross domestic product (GDP) of 39.9 percent, followed by Italy (23.4), France (21.3), UK (17.2) and Spain (16.7). Why are there similar, if not larger, differences in terms of foreign direct investment and other forms of production internationalization?²

Some of the variation results, of course, from country-specific features such as macroeconomic policies, market size or infrastructure. Nonetheless, *it is firms that are at the heart of European competitiveness*. Firms carry out global operations, exporting to, importing from and producing in foreign countries. A crucial issue for policymakers is thus to understand *to what extent the global reach and the international performance of European economies are determined by the characteristics of their firms*, independently of other features of national economies. This is especially important because key firms' characteristics and their within-country distributions are every different across European nations.

This report is the first one to explore systematically the interaction between firm and country characteristics, using the newly collected *EU-EFIGE/Bruegel-UniCredit survey* of 15,000 manufacturing companies in seven EU countries (Austria, France, Germany, Hungary, Italy, Spain and the United Kingdom). The survey provides consistent cross-country data on all the international activities of firms, combined with many other firm characteristics. This wide span of information was not available in earlier data sets.

¹ For more detailed information on aggregate trade patterns see Appendix III.

² In this report, we analyse the drivers of international performance and discuss potential policy options to improve it. We do not discuss the issue of the welfare effects of firms internalization strategies, a topic that goes well beyond the scope of our work.

This report finds that *the international performance of European firms is largely explained by firm-specific characteristics, more than by other aggregate country features*. In other words, *companies which internationalise successfully their sales or their production have similar features in all European countries*. *Size, productivity, the skill intensity of the workforce and the ability to innovate are positively related to firms' export performance in all countries*, in terms of both exporter status and export value as a share of firm turnover. The same firm characteristics support more complex internationalization strategies, such as exporting to a larger number of markets, or to more difficult and farther countries, or producing abroad, either through foreign direct investment (FDI) or international outsourcing (IO), i.e. production carried out by a third foreign firm under some sort of arm-length contract³.

Multi-country strategies of international production are essential in fostering exports, particularly to fast growing emerging economies. In those economies entry is harder and more costly than in the European export market. *Whereas more than 90% of European exporters sell their products within the EU, a much smaller fraction reaches distant emerging markets*. The best performing are German firms, 28% of them export in China and India, while only 11% of Spanish firms are active in those markets. Even more importantly, in all countries *the smaller are the firms, the more difficult is to overcome the rising fixed costs of global operations*.

The emphasis on firms size consolidation and growth does not imply that firms should be very large to be successful exporters. Size must be sufficient to undertake complex global operations, including global production, that is undertaken also by many mediums size firms, as shown before.

The report also finds that firms with comprehensive global operations have been more resilient in facing the crisis between 2008 and 2009. The articulate patterns of internationalisation of German firms, for example, partly explain their ability to withstand the crisis better than Italian companies. Aggregate data on trends in exports hide much churning at the firm level. In our sample half of the firms reduced their exports and half of them either increased or stabilised foreign sales.

How can the finding that internationalization patterns are predominantly driven by firm characteristics be reconciled with the evidence that, overall, countries perform very differently in terms of their exports and global production strategies? The main reason is that the within country distribution of these characteristics is very heterogeneous: *industrial structures differ significantly across European countries, in terms of size and sectoral distributions, as well as of innovative capacity and productivity*.

³ Notice that the result that size is an important driving factor, does not imply that SMEs cannot also have a good export performance. In our sample, many small firms display a high degree of international projection in terms of both export and international production. However, on average their contribution to internationalization is substantially lower than that of larger firms. Therefore an industrial structure in which medium to large size firms are well represented can significantly raise to export and FDI.

Moreover, consistently with the results of Pagano and Schivardi (2003), this has little to do with the sectoral distribution of industrial production. Even within narrowly defined industries, differences in size persist (see appendix III), with clear country patterns: for example, German firms tend to be larger and Italian firms smaller than the EU average in all sectors

The fact that firm characteristics are central raises new challenges for policy. . Should policy making work in the direction of fostering those firm specific drivers of internationalization? For example, we find that, *if the industrial structure (in terms of firm size and sectors) of countries like Italy and Spain were to converge to the structure of Germany, the value of Italian and Spanish total exports would rise considerably – by 37% and 24% respectively.* Needless to say, this suggestive counterfactual exercise must be interpreted with a grain of salt, particularly when deriving policy implications.

The importance of firms' characteristics supports the view that *policies focused on improving the general business environment, on reforming institutional, regulatory, infrastructural or other factors that hinder long term investments, innovation capabilities and firms' growth are likely to be more effective in strengthening international competitiveness than targeted interventions, like actions for export promotion.* Yet, observed industrial structures are the endogenous outcome of macro policies and several other country features, and not necessarily of market imperfections. The 'right sort of industrial features' for internationalisation cannot therefore be enforced *In our view there is little scope for policies forcing growth in firms'scale or changes in the sectoral composition of industry. These policies are not necessarily likely to improve global competitiveness.*

This report is, of course, not the first to stress the importance of firm characteristics.⁴ However, this is the first time that country, industry and firm characteristics have been jointly analyzed using fully comparable cross-country data. In addition, and again for the first time, it has been possible to study

⁴ The report contributes to a growing international trade literature on the importance of firm characteristics for international trade performance. Based on the findings that exporters are more productive and bigger (cf. Helpman et al., 2004; Eaton et al., 2004), Melitz (2003) presented the theoretical framework that became the cornerstone of the so called New New Trade Literature: while only the more productive firms export, less productive firms serve only the domestic market, whereas the least productive ones exit. Several theoretical and empirical contributions extended the Melitz model and supported the finding that firm productivity is one of the crucial characteristics affecting trade performance (see e.g. Bernad et al., 2007). Within this area of literature, Mayer and Ottaviano (2007) presented the first policy report comparing firm level characteristics with export performance across countries. Considering Germany, France, the UK, Italy, Hungary, Belgium and Norway, they show that it is the "Happy Few", only a small amount of firms, that account for most aggregate international trade activity. However, due to a lack of data availability at the level of the firm, these studies are not able to base their analysis on comparative data for a bigger set of European economies and to explore several instances of the international performance of firms. While Mayer and Ottaviano (2007) do not use a homogeneous data set, most of the empirical studies even focus on one single economy and thus, are not able to examine the interaction between firm level and country or industry characteristics. The only exception is ISGEP (2008), that investigates the relationship between firm productivity and export performance for 14 economies and shows how country characteristics relate to export premium. ISGEP (2008) use a comparative dataset by collecting firm(plant) level information provided by National sources. Even if this dataset combines a large number of economies and covers the whole firm population (or at least firms exceeding a specific threshold of employees), it does not allow to investigate the different firm internationalization modes and a more comprehensive set of firm level characteristics.

within a unique framework the comprehensive span of global operations available to firms: export, imports, FDI and international outsourcing.

The rest of this work is organized as follows. We first briefly introduce the survey and the basic evidence comparing exporting and non exporting firms. Section 2 is devoted to explaining the decision to export across countries: the share of firms exporting, and for those exporting how much of their turnover gets sold abroad. Section 3 looks at where and to how many markets firms export. Then, section 4 examines patterns of global production, either as foreign direct investments or as international outsourcing. All these sections address the key question of whether country patterns are related to country or firm characteristics. Consequently, section 5 examines how far a change in the industrial structure in terms of size and sectoral composition might affect export performance. Finally, section 6 looks at whether internationalized firms have been better able to weather the international crisis, or rather they have been more exposed to it. Section 8 concludes and sums up the key policy implications.

MAIN MESSAGES OF THE REPORT

<i>Claim 1</i>	<i>In all countries, firms involved in international markets are, in general, larger, more productive, more skill intensive and more innovative.</i>
<i>Claim 2a</i>	<i>The international performance of European firms is largely explained by firm-specific characteristics, more than by country features or the sectoral composition of industry.</i>
<i>Claim 2b</i>	<i>Exports are related to firm characteristics in a remarkably similar way across countries</i>
<i>Claim 3</i>	<i>European firms pursue complex patterns in their global operations which are again mostly related to firm characteristics.</i>
<i>Claim 4a</i>	<i>The majority of European firms use imported inputs. A sizeable share among them produces abroad using foreign affiliates or international outsourcing. Also foreign production is predominantly related to firm-specific characteristics.</i>
<i>Claim 4b</i>	<i>FDI and IO are generally exclusive modes of carrying out international production. FDI are more frequently used by larger firms to support sales in foreign markets. German firms are more likely to choose FDI, Italian and French ones IO.</i>
<i>Claim 4c</i>	<i>Firms often pursue multi-country strategies of international production which, especially in emerging economies, are instrumental in increasing foreign exports.</i>
<i>Claim 5a</i>	<i>Internationalisation patterns of countries differ mainly because nations differ in their industrial structures, i.e in the distributions of their firms' characteristics, like size and productivity</i>
<i>Claim 5b</i>	<i>If the industrial structure of Germany were applied to other European countries, exports of Italy and Spain would grow considerably, mostly because of firm size effects.</i>
<i>Claim 6</i>	<i>The effects of the crisis have been extremely heterogeneous across firms. Larger firms and those exporting out of the EU recorded less dramatic changes in export during the crisis.</i>

1. THE DATA

The firm level data used in this report are drawn from the Efige dataset, collected within the project “*Efige - European Firms in a Global Economy: internal policies for external competitiveness*”. For this report, the Efige data have been complemented by balance sheet data drawn from the database Amadeus managed by Bureau van Dyck. Since the sample design overweighs large firms, we constructed sampling weights in terms of size-sector cells to make the sample representative of the underlying population. All the analysis of the report is based on the weighted sample. In Appendix I we provide a detailed description of the dataset, the questionnaire, the sampling scheme, the weighting procedures. The variables used throughout the report and their acronyms are also described in the Appendix I.

The number of firms that answered the Efige questionnaire is reported in Table 1.1: the sample includes around 3,000 firms for France, Italy and Spain, more than 2,200 for UK and Germany⁵, and 500 for Austria and Hungary. In the Appendix we provide the distribution of the sample by sector and size class for each country.

Table 1.1
Number of sampled firms by country

Country	Number of firms
AUT	492
FRA	2,973
GER	2,202
HUN	488
ITA	3,019
SPA	2,832
UK	2,156
Total	14,162

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

⁵ In the final version of the dataset the German sample will consist of 3,000 firms.

Claim 1 – In all countries, firms involved in international markets are, in general, larger, more productive, more skill intensive and more innovative.

The questionnaire is mainly focused on 2008, with some questions on firms' activity in 2009 and in previous years. It contains a rich section on internationalization. Firms are asked several questions on exports, imports, foreign direct investments (FDI) and international outsourcing (IO), which includes international production carried out under arm-length contracts by third foreign companies. Our data are consistent with a large and recent body of empirical work in international trade with heterogeneous firms (see Bernard, Jensen, Redding, and Schott, 2007 and references therein). In all 7 sampled countries, exporting firms are larger, more productive, have a lower share of blue collar workers and a higher share of college graduates, are more likely to belong to a group or to a foreign owner, are more innovative and invest more in R&D (Table 1.2).

Table 1.2
Descriptive statistics by export status

Variable	AUT ⁽¹⁾		FRA		GER		HUN ⁽¹⁾		ITA		SPA		UK ⁽¹⁾	
	Exp.	Non Exp.	Exp.	Non Exp.	Exp.	Non Exp.	Exp.	Non Exp.	Exp.	Non Exp.	Exp.	Non Exp.	Exp.	Non Exp.
Employment	92	82	108	38	94	47	90	35	48	29	60	32	143	49
Labour Productivity	157	214	125	99	180	111	63	49	159	138	116	82	-	-
Blue-collar share	55.2	64.3	55.9	55.4	56.1	55.7	68.3	63.6	64.4	70.8	72.8	76.1	66.5	68.6
Graduate share	5.3	4.3	10.6	5.0	12.9	9.1	15.9	14.8	7.2	4.5	11.5	9.0	10.4	5.6
Age	44	51	43	33	46	44	19	15	31	26	29	24	38	33
Group	15.6	4.4	14.9	3.4	7.4	1.6	14.9	7.7	3.7	1.2	6.2	1.0	19.6	5.9
Foreign Ownership	15.9	4.3	14.8	4.1	8.7	2.3	24.0	11.3	5.2	1.4	6.6	1.1	16.2	5.3
Product innovation	61.4	50.7	54.0	35.6	59.1	34.9	47.6	34.8	55.4	28.3	52.1	31.9	66.6	37.9
RD share	3.6	2.0	3.9	1.8	5.5	2.1	1.8	0.5	4.5	2.4	3.8	2.3	4.3	1.7
Bank debt share	87.4	85.7	78.4	79.1	82.9	86.0	81.5	86.1	88.4	85.2	86.9	85.7	65.7	64.3
Venture Capital	5.2	0.0	4.6	6.0	5.2	4.5	0.0	0.0	0.4	0.5	3.0	3.1	2.5	2.2

(1) Turnover data are not fully reliable for UK and available only for few Austrian and Hungarian firms.

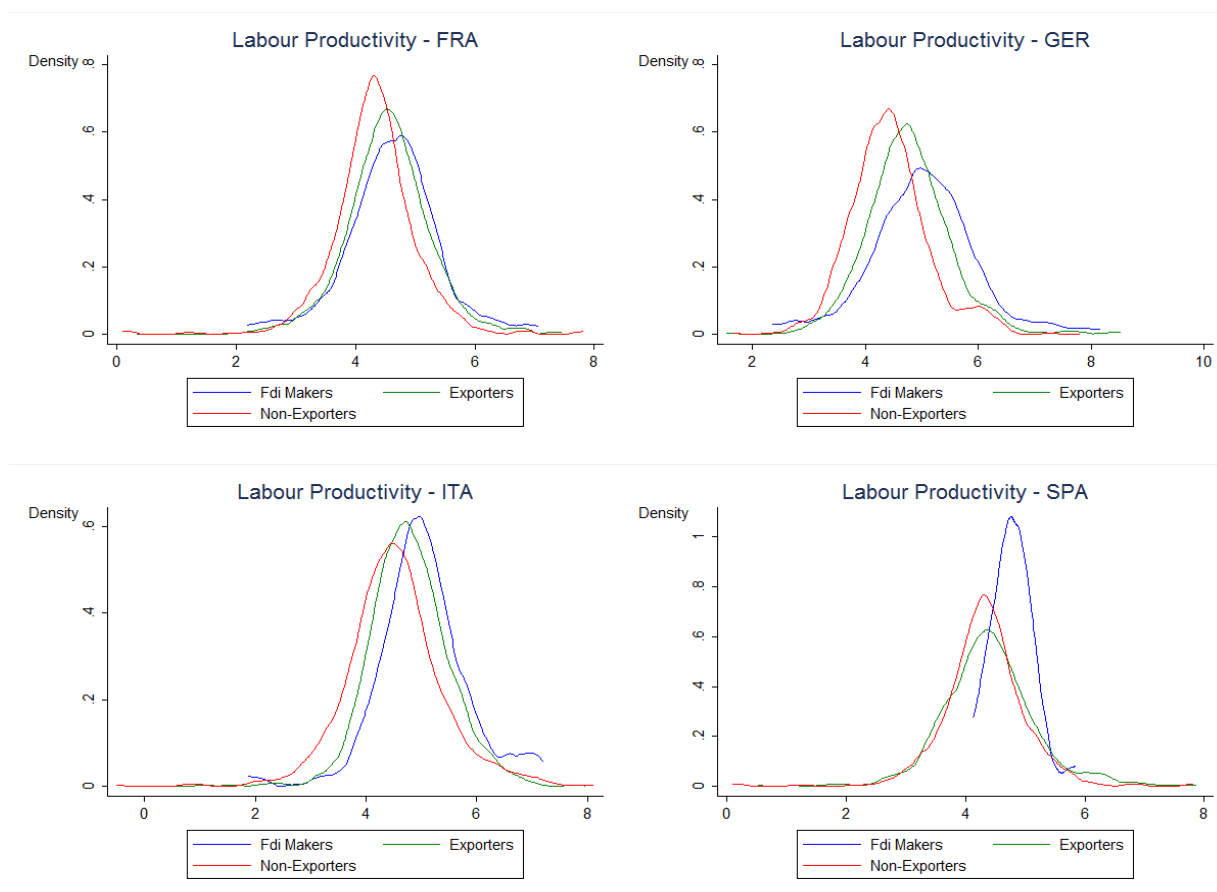
Bank debt share and Venture Capital, computed only for firms with external financing.

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

When we plot kernel densities of labor productivity for non exporters, exporters with no foreign direct investment, and firms with some production abroad we find for all the main 4 continental European countries, the productivity distribution of exporter is rightward-shifted with

respect to that of non exporters, and that of FDI makers is to the right of that of exporters (Figure 1.1). That only more productive firms invest in more complex internationalization strategies is already known from the literature (see e.g. Antras and Helpman, 2004 and Helpman et al., 2004).

Figure 1.1
Kernel density of productivity for non exporters, exporters and FDI makers



Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

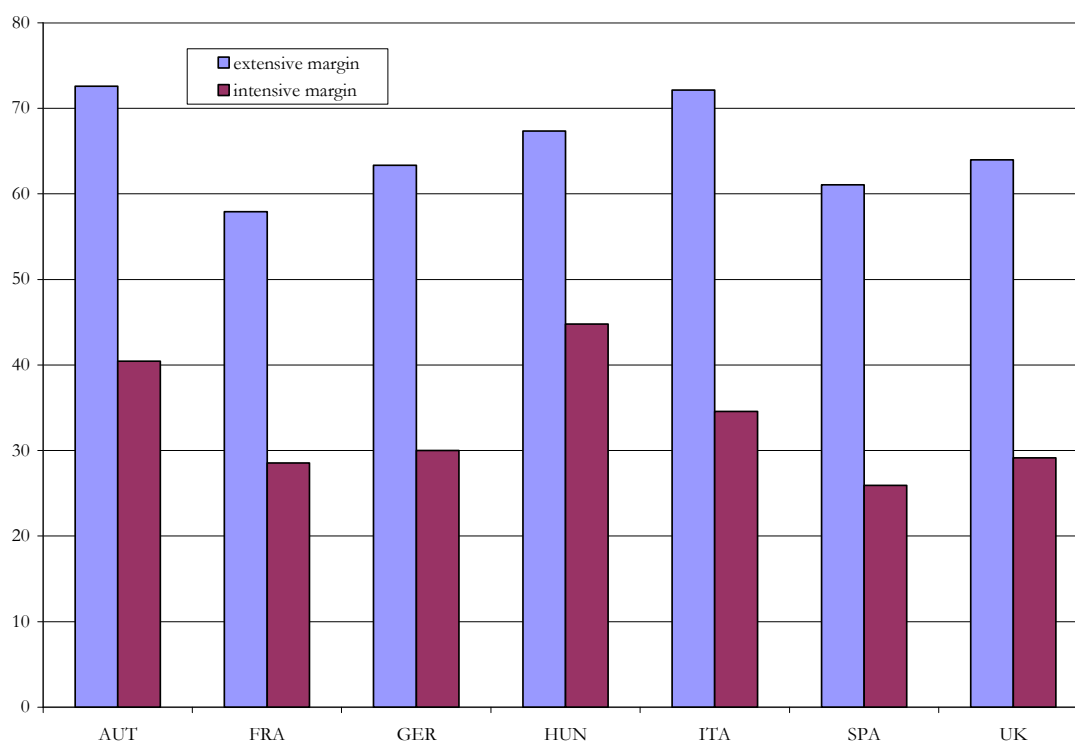
This descriptive evidence confirms the well known fact that exporting firms are “better” than non exporting ones. However, there are noticeable differences across countries in firms characteristics, even within the exporting group. For example, Spanish and especially Italian exporter are substantially smaller than those located in the other countries. This descriptive evidence, therefore, suggests that both firm characteristics and country specificities play a role in determining the internationalization modes of European firms. The main goal of the rest of this report is to try to disentangle these two factors.

2. EXPORTING ACTIVITY

Claim 2a – The international performance of European firms is largely explained by firm-specific characteristics, more than by country features or the sectoral composition.

By using firm-level data it is possible to decompose a country's total exports into two margins: the percentage of firms that export a strictly positive fraction of their sales (the so-called “extensive margin”) and, only for exporters, the share of the export value over total turnover (the so-called “intensive margin”). In Figure 2.1 we report these two figures by country. Both margins vary substantially across countries and, as expected, are larger in the small open economies of Austria and Hungary, and smaller in the large economies of France, Germany and the UK. An interesting and significant exception is Italy that displays one of the highest percentage of exporting firms (72%) and a relatively high intensive margin (35%).

Figure 2.1
Extensive and intensive margin of exports by country
(percentages)



Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

How much of these country differences are truly country specific instead of reflecting different firm characteristics? A preliminary answer to this question is contained in Table 2.1 where the extensive margins of trade are computed by country and firm size classes. For all countries, the share of exporters increases significantly with firm size: the difference in export propensity between the group of firms

with 10-19 employees and the group of firms with at least 250 employees is always above 25 percentage points and almost 40 percentage points for Germany. Differences across countries within the same class size are smaller.

Table 2.1
Extensive margin of exports, by country and firm size class
(percentages)

<i>Size Class</i>	AUT	FRA	GER	HUN	ITA	SPA	UK
10-19	69.8	44.7	45.7	58.0	65.4	51.2	54.9
20-49	63.8	59.1	65.4	64.7	73.3	63.5	62.8
50-249	88.6	75.4	78.2	79.3	86.6	76.2	76.8
more than 249	90.8	87.6	84.0	97.4	92.6	88.0	80.7
Total	72.6	57.9	63.4	67.3	72.2	61.1	64.0

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

A similar result holds for the intensive margin (Table 2.2). In this case, the differences across size classes are less pronounced. This is an expected result. Models with fixed costs of entering the export markets predict that firm characteristics impact the probability of exporting, but, conditional on being an exporter, not the share of export over total sales (Melitz, 2003).

Table 2.2
The intensive margin of exports, by country and firm size class
(percentages)

<i>Size Class</i>	AUT	FRA	GER	HUN	ITA	SPA	UK
10-19	26.2	23.0	25.9	30.2	30.4	21.4	26.2
20-49	33.3	27.0	28.1	43.6	34.2	24.5	27.8
50-249	55.9	33.0	33.9	53.2	42.2	33.3	33.2
more than 249	64.7	41.2	37.8	66.6	52.6	40.6	34.2
Total	40.4	28.5	30.0	44.8	34.6	25.9	29.1

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

It is therefore remarkable that also the intensive margin is strictly related to firm size. One possible explanation is that the fixed cost has to be paid for each destination, and that large firms export to more destinations, something that we will show below to be the case. Another difference with the extensive margin results is that the share of export differs substantially across countries especially in the larger size classes, while in Table 2.1 the cross country differences were more marked for small firms.

Size is not the only relevant firm characteristics for internationalization. As pointed out in many recent papers analyzing the determinants of exporting activity on the basis of firm level data, exporting firms are usually larger, more productive and innovative than average. To go for a more general and systematic approach, we therefore perform a regression analysis of the extensive and intensive margins of trade on country, sector and firm characteristics. In this way, we can assess the relative importance of the different factors and the magnitude of their impact on exports.

Table 2.3 reports the econometric results from a linear probability model for the extensive margin of exports.⁶ In a first specification (column 1) we regress a dummy variable equal to 1 if a firm exports and 0 otherwise only on country dummies. With respect to Germany (the excluded country), the propensity to export is higher in Austria and Italy by about 9 percentage points, and smaller in France and Spain by, respectively, 5.4 and 2.3 percentage points. Hungary and UK are in line with Germany. Overall, the country dummies explain a very low fraction of the total variance: the R^2 is equal to 1.1 per cent. In column 2 we add sector dummies (2 digits of the Nace 2 rev.1 classification): the explanatory power of the regression increases significantly, to 5.4 per cent. Focusing on the country dummies, we see that an unfavourable sectoral specialization absorbs the negative coefficient of Spain, and makes the one of Hungary significantly positive. Sectoral dummies (not reported) point to significant cross sectoral differences. The share of firms engaged in export activity is lowest for the food sector, followed by traditional, low-tech sectors. Chemical and mechanical firms are the most engaged in export activity.

Things interestingly change when we add firm size (column 3). First of all, the probability that a firm exports grows significantly with its size: doubling the number of employees increases the probability by 10 per cent. The most relevant change in the coefficients of the country dummies occurs for Italy: after controlling for an unfavourable size structure of Italian firms, the country factor becomes even larger than before (0.10 versus 0.8). More importantly, the inclusion of a single firm control raises significantly the fraction of variance explained by the regression: now the R^2 is equal to 9 per cent.

It is a well known fact that exporters are on average more productive than non exporters. In column 4 we therefore add labor productivity (we are forced to exclude UK firms for which we have no reliable data on value added). Both firm size and labor productivity are positively and significantly correlated with export propensity. Controlling for the lower than average efficiency of Hungarian firms raises significantly the correspondent country dummy. Again, as pointed out before, the introduction of

⁶ Similar results are obtained with probit regressions. We run OLS regressions because they facilitate the computation of the contribution of each variable to explaining the variability of the dependent variable.

a second firm level characteristics further increases the R^2 of the regression. In the last two columns we include additional firm level controls (in column 5 we exclude Spain, that lacks data on the share of blue-collar workers, and UK, that lacks productivity). Overall, we can confirm evidence that exporters are on average larger, more productive, more innovative and employ more skilled workers. Firms belonging to a foreign group are also more likely to be exporters.

Given an R^2 around 15 per cent, we can approximately estimate that 64% of the total variance explained by the model comes from firm level controls, against 29% from the sectoral composition and only less than 7% by the country dummies.⁷ Some of the latter remain statistically significant, despite the inclusion of a wide set of controls; in particular, with respect to Germany, export propensity is smaller in France, higher in Spain, Hungary, Austria and Italy.

If we repeat the same econometric exercise on the export share (intensive margin) restricting the sample to the exporters, we find similar results (Table 2.4). The export share is higher for larger, more productive and innovative firms, for those that are endowed with a highly skilled workforce. Moreover, being part of a group, and in particular of a foreign group is also positively correlated with the export share. Again, the contribution of the firm characteristics to the explanatory power of the model is the largest (almost 51%, against 34% for sectors and about 15% for the country dummies). The higher export propensity of Austrian, Hungarian and Italian firms is also confirmed.

To sum up, firm characteristics – size, productivity, innovative activity, skill content of the workforce – are the primary determinants of export performance and dominate country effects. Moreover, firm characteristics affect the probability of engaging in exporting and the share of turnover exported in the same direction: larger, more productive, more innovative firms are both more likely to export and tend to export a larger share of their production.

⁷ Because of the correlation existing between country dummies, sector dummies and firm characteristics, the sum of the R^2 obtained when we include only one set of variables does not correspond exactly to the R^2 of the regression including all variables together. Thus, we present only some approximated shares.

Table 2.3
Extensive margin of exports: linear probability model

	(1) Country dummies	(2) Add sector dummies	(3) Add firm size	(4) Add productivity No UK	(5) All controls No UK & SP	(6) All controls
Log(Employment)			0.105*** [0.004]	0.096*** [0.006]	0.075*** [0.006]	0.078*** [0.005]
Log(Age)					0.046*** [0.007]	0.055*** [0.005]
Log(LP)				0.090*** [0.006]	0.083*** [0.007]	
Group					-0.023 [0.034]	0.013 [0.025]
Foreign Own					0.108*** [0.030]	0.118*** [0.023]
Blue-Collar share					0.000 [0.000]	
Graduate share					0.002*** [0.000]	0.003*** [0.000]
Product Innov					0.144*** [0.011]	0.151*** [0.008]
RD share					0.005*** [0.001]	0.005*** [0.001]
Bank Debt share					0.000*** [0.000]	0.000*** [0.000]
AUT	0.092*** [0.027]	0.101*** [0.026]	0.104*** [0.026]	0.113*** [0.031]	0.113*** [0.030]	0.101*** [0.025]
FRA	-0.054*** [0.013]	-0.048*** [0.013]	-0.038*** [0.013]	-0.058*** [0.016]	-0.046*** [0.015]	-0.026** [0.013]
HUN	0.040 [0.025]	0.046* [0.024]	0.045* [0.024]	0.138*** [0.029]	0.142*** [0.030]	0.071*** [0.025]
ITA	0.088*** [0.011]	0.078*** [0.011]	0.104*** [0.010]	0.074*** [0.013]	0.077*** [0.013]	0.119*** [0.011]
SPA	-0.023* [0.013]	-0.021 [0.013]	0.004 [0.013]	-0.002 [0.015]		0.028** [0.013]
UK	0.006 [0.014]	-0.010 [0.014]	-0.004 [0.013]			-0.005 [0.014]
Constant	0.634*** [0.008]	0.473*** [0.012]	0.107*** [0.019]	-0.245*** [0.038]	-0.466*** [0.047]	-0.121*** [0.025]
No. obs.	14162	14162	14162	8313	7111	13345
R-squared	0.011	0.054	0.092	0.110	0.168	0.150

Robust standard errors in brackets . Due to missing observations concerning productivity for UK and blue-collar share for both UK and SPA, SPA has not been included in the regression 5, UK in the column 4 and 5.

***, **, * significant at 1%, 5%, 10%

Columns 2-6 include sector dummies

Table 2.4
Intensive margin of exports (export share), only exporters

	(1) Country dummies	(2) Add sector dummies	(3) Add firm size	(4) Add productivity No UK	(5) All controls No UK & SP	(6) All controls
Log(Employment)			0.049*** [0.003]	0.053*** [0.004]	0.043*** [0.005]	0.042*** [0.003]
Log(Age)					-0.003 [0.006]	0.001 [0.004]
Log(LP)				0.030*** [0.008]	0.030*** [0.009]	
Group					0.009 [0.028]	0.034* [0.020]
Foreign Own					0.129*** [0.028]	0.097*** [0.019]
Blue-Collar share					0.000** [0.000]	
Graduate share					0.001*** [0.000]	0.001*** [0.000]
Product Innov					0.042*** [0.010]	0.038*** [0.007]
RD share					0.004*** [0.001]	0.003*** [0.000]
Bank Debt share					-0.000*** [0.000]	-0.000*** [0.000]
AUT	0.104*** [0.023]	0.112*** [0.022]	0.113*** [0.021]	0.101*** [0.033]	0.091*** [0.032]	0.116*** [0.020]
FRA	-0.015 [0.011]	-0.010 [0.011]	-0.008 [0.011]	-0.006 [0.013]	-0.002 [0.012]	-0.003 [0.011]
HUN	0.148*** [0.025]	0.165*** [0.024]	0.163*** [0.024]	0.191*** [0.031]	0.178*** [0.033]	0.162*** [0.025]
ITA	0.045*** [0.010]	0.048*** [0.010]	0.066*** [0.010]	0.059*** [0.011]	0.080*** [0.011]	0.093*** [0.010]
SPA	-0.041*** [0.011]	-0.032*** [0.011]	-0.018* [0.011]	-0.022 [0.015]		0.003 [0.011]
UK	-0.009 [0.012]	-0.010 [0.011]	-0.003 [0.011]			-0.007 [0.012]
Constant	0.300*** [0.008]	0.202*** [0.013]	0.017 [0.019]	-0.150*** [0.050]	-0.193*** [0.059]	-0.010 [0.024]
No. Obs.	7625	7625	7625	4532	3930	7195
R-squared	0.021	0.069	0.096	0.115	0.158	0.141

Robust standard errors in brackets. Due to missing observations concerning productivity for UK and blue-collar share for both UK and SPA, SPA has not been included in the regression 5, UK in the column 4 and 5.

***, **, * significant at 1%, 5%, 10%

Columns 2-6 include sector dummies.

Claim 2b – Exports are related to firm characteristics in a remarkably similar way across countries

After showing that firm characteristics – size, productivity, innovative activity, skill content of the workforce – are the primary determinants of export performance and dominate country effects, we now ask whether their impact is similar or different across countries.

This can be easily and directly tested within our regression framework by running separate regressions for each country. Due to data limitations, we exclude Austria and Hungary. To keep UK and Spain we choose to work with the specification without labor productivity and share of blue-collar workers. All regressions include sector dummies (not reported). The results for the extensive margin are reported in Table 2.5.

Table 2.5
Extensive margin of exports by country

	(1)	(2)	(3)	(4)	(5)
	FRA	GER	ITA	SPA	UK
Log(Employment)	0.075*** [0.009]	0.092*** [0.010]	0.071*** [0.011]	0.077*** [0.012]	0.056*** [0.012]
Log(Age)	0.088*** [0.010]	0.021* [0.011]	0.073*** [0.011]	0.122*** [0.014]	0.040*** [0.012]
Group	0.023 [0.043]	0.046 [0.063]	-0.068 [0.069]	0.046 [0.080]	0.048 [0.055]
Foreign Own	0.129*** [0.042]	0.084 [0.056]	0.130** [0.058]	0.098 [0.077]	0.072 [0.055]
Graduate share	0.005*** [0.001]	0.002** [0.001]	0.002*** [0.001]	0.001 [0.001]	0.003*** [0.001]
Product Innov	0.123*** [0.017]	0.160*** [0.020]	0.160*** [0.017]	0.131*** [0.019]	0.191*** [0.023]
RD share	0.003** [0.001]	0.006*** [0.001]	0.003*** [0.001]	0.005*** [0.001]	0.004** [0.001]
Bank Debt share	0.000** [0.000]	0.000 [0.000]	0.000** [0.000]	0.000 [0.000]	0.000 [0.000]
Constant	-0.296*** [0.046]	-0.113** [0.053]	0.039 [0.056]	-0.158** [0.062]	-0.022 [0.065]
No. obs.	2926	2144	3002	2521	1827
R-squared	0.197	0.182	0.124	0.137	0.177

Robust standard errors in brackets

***, **, * significant at 1%, 5%, 10%

Regressions include sector summies.

The estimated coefficient of firm size is visibly similar across countries; the same is true for innovation (both the product innovation dummy and the R&D variable) and for graduate employment. A more systematic test run by pooling the data of all countries and adding interaction terms confirms in most cases the conjecture of statistical equality of the coefficients across countries. As to size, only the coefficient of UK turns out to be significantly smaller than the others.

Table 2.6 reports the country regressions on the intensive margin of exports. Some more marked differences across countries emerge. In particular, the estimated impact of firm size is larger in Italy and Spain as compared to Germany, France and UK. This is to say that the differential export share between large and small firms is relatively higher in Italy and Spain than in the other countries.

Table 2.6
Intensive margin of exports by country

	(1)	(2)	(3)	(4)	(5)
	FRA	GER	ITA	SPA	UK
Log(Employment)	0.029*** [0.007]	0.030*** [0.007]	0.053*** [0.008]	0.056*** [0.009]	0.027*** [0.009]
Log(Age)	0.004 [0.009]	0.005 [0.008]	0.005 [0.009]	-0.006 [0.012]	-0.000 [0.010]
Group	0.057 [0.038]	-0.017 [0.044]	0.045 [0.049]	-0.027 [0.057]	0.135*** [0.049]
Foreign Own	0.122*** [0.040]	0.130*** [0.044]	0.067* [0.038]	0.136** [0.058]	-0.032 [0.047]
Graduate share	0.002*** [0.001]	0.001 [0.001]	0.001* [0.001]	0.001* [0.001]	0.004*** [0.001]
Product Innov	0.009 [0.016]	0.051*** [0.015]	0.053*** [0.013]	0.009 [0.016]	0.040** [0.018]
RD share	0.002** [0.001]	0.003*** [0.001]	0.002*** [0.001]	0.003*** [0.001]	0.003*** [0.001]
Bank Debt share	-0.000 [0.000]	-0.000*** [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000* [0.000]
Constant	0.065 [0.048]	0.016 [0.048]	-0.005 [0.043]	0.035 [0.050]	-0.012 [0.052]
No. Obs.	1412	1013	1958	1271	1050
R-squared	0.146	0.165	0.123	0.106	0.168

Robust standard errors in brackets
 ***, **, * significant at 1%, 5%, 10%
 Regressions include sector summies.

3. GLOBAL MARKETS

Claim 3 – European firms pursue complex patterns in their global operations which are again mostly related to firm characteristics.

Export propensities and shares provide just part of the overall picture on the internationalization of firms. The global operations undertaken by European firms are very heterogeneous and entail very complex and different internationalisation patterns. We begin by looking at other dimensions of the exporting activity. In Table 3.1 we show the distribution of exporting firms across geographical markets of destination.

Table 3.1
The geographical distribution of exporters
(percentages)

country	EU15	Other EU	Other Europe	China India	Other Asia	US Canada	Central South America	Others
AUT	94.2	49.9	46.8	16.4	17.7	22.5	7.08	12.4
FRA	92.5	36.8	41.8	22.0	27.0	31.6	14.7	30.6
GER	93.1	47.9	52.7	27.9	25.9	36.8	16.4	16.6
HUN	82.0	50.1	24.1	1.6	5.2	6.9	0.7	4.3
ITA	89.6	41.0	49.7	17.7	23.6	30.5	19.3	24.2
SPA	92.6	27.6	26.6	10.8	14.3	18.4	29.6	24.0
UK	92.3	33.7	33.7	25.9	31.6	44.5	15.0	35.1

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

Almost all exporting firms sell a fraction of their production in the EU15 market, which is the closest proxy to a domestic market, but much fewer go to farther destinations like the US and the fast growing markets of China, India or Latin America. This pattern is invariant in all sample countries. These distant destinations are more costly to reach and often involve higher risks and other barriers than closer EU markets. Moreover, when we move to more distant destinations, more marked country differences seem to emerge. For example, in India and China, two markets where most of exporters still have to make their entry move, German firms have gained a competitive : the share of German firms exporting there is 5 percentage points higher than that of France, 10 points than in Italy and almost 20 points than in Spain. Expectedly, Spanish firms are more likely to export o Central and South America.

So the question becomes again: is it due to firm characteristics or to some country effect that benefits all German exporters? To answer it, we rely on the regression analysis where the dependent

variable is a dummy of export activity in China and India. The analysis concerns only exporting firms.⁸ The empirical specification is identical to the one used in the previous section. The results are shown in Table 3.2.

First of all, as it can be inferred from the R^2 of the different regressions, again firm characteristics explain overall more than country features. Quantitatively, their explanatory power amounts to almost 32% of the total variance explained against a lower 25% for the country dummies. Interestingly, the sectoral patterns, that now contributes for 43%, seems to be more important than for total exports. As to the firm characteristics, the usual suspects matter: the probability of exporting to China and India is positively correlated with firm size, productivity, innovation and human capital. Older firms and those belonging to a group are also more capable of reaching the farthest, largest and dynamic markets in Asia.

The country dummies, that now matter slightly more than for exporting activity *tout court*, tell also a story which is interestingly different from what we have seen in the previous section. The stronger (than Germany) export propensity of Austria, Hungarian and Italian firms is not anymore true when focusing on export to China and India, where instead the German predominance emerges quite clearly with respect to all the other sampled countries excluding UK. The gap in terms of share of exporting firms able to sell their products in China and India is particularly relevant even for large economies like Spain and Italy: it amounts to 17 and 10 percentage points in the regressions without any other control. Interestingly, Italy's gap closes down to 4 percentage point, only a bit larger than France's, when we control for firm characteristics. In other words, it is the industrial structure that limits Italy's ability to get access to those markets.

A different indicator on the complexity of exporting activity is given by the number of destination markets at the firm level. Eaton, Kortum and Kramarz (2004) found that the number of French exporters dramatically reduce with the increase in the number of destination countries.⁹ Figure 3.1. shows that this is the case also in our sample. In all countries, only a small share of firms export to more than 20 destinations. Anyway, we can notice some differences across countries. For each number

⁸ We restrict the sample to exporters only because we are interested in the complexity of firms' internationalization strategies and we want to investigate whether firms involved in simple strategies (i.e., exporting to the EU) are different from the ones involved in more sophisticated internationalization activities. Anyway, the main results do not change when the analysis covers the whole population.

⁹ Examining French firm level data, they show that firms differ substantially in export participation: While most firms serve only the domestic market, exporting firms are more productive and bigger in firm size. With respect to internationalization complexity, the number of firms selling to multiple markets falls with the number of destination areas. Using more recent data (2000-2006), also Fontagnè and Gaulier (2008) show that the great part of French exporters are involved in only one foreign market. In addition, they display that the number of served countries is increasing with firm size and productivity.

of destination countries, Hungary has always a smaller share of exporters, while Germany and UK present the highest ones.

Table 3.2
Extensive margin of exports in China and India (only exporters)

	(1) Country dummies	(2) Add sector dummies	(3) Add firm size	(4) Add productivity No UK	(5) All controls No UK & SP	(6) All controls
Log(Employment)			0.057*** [0.005]	0.057*** [0.006]	0.056*** [0.007]	0.052*** [0.005]
Log(Age)					0.026*** [0.008]	0.029*** [0.006]
Log(LP)				0.036*** [0.007]	0.034*** [0.008]	
Group					0.072** [0.035]	0.043* [0.024]
Foreign Own					-0.036 [0.031]	-0.015 [0.023]
Blue-Collar share					-0.001*** [0.000]	
Graduate share					0.001** [0.001]	0.003*** [0.000]
Product Innov					0.026* [0.013]	0.029*** [0.010]
RD share					0.003*** [0.001]	0.002*** [0.001]
Bank Debt share					-0.000* [0.000]	-0.000 [0.000]
AUT	-0.114*** [0.030]	-0.098*** [0.030]	-0.096*** [0.030]	-0.084** [0.034]	-0.082** [0.035]	-0.064** [0.030]
FRA	-0.058*** [0.016]	-0.053*** [0.016]	-0.050*** [0.016]	-0.029 [0.019]	-0.021 [0.020]	-0.039** [0.016]
HUN	-0.262*** [0.030]	-0.234*** [0.029]	-0.235*** [0.029]	-0.180*** [0.035]	-0.133*** [0.038]	-0.208*** [0.030]
ITA	-0.101*** [0.012]	-0.094*** [0.012]	-0.073*** [0.012]	-0.068*** [0.014]	-0.032** [0.015]	-0.042*** [0.013]
SPA	-0.171*** [0.016]	-0.158*** [0.015]	-0.142*** [0.015]	-0.120*** [0.019]		-0.123*** [0.016]
UK	-0.020 [0.016]	-0.018 [0.016]	-0.010 [0.015]			0.008 [0.017]
Constant	0.279*** [0.010]	0.191*** [0.016]	-0.026 [0.024]	-0.215*** [0.046]	-0.290*** [0.063]	-0.172*** [0.031]
No. obs.	7653	7653	7653	4537	3930	7221
R-squared	0.026	0.070	0.088	0.094	0.110	0.102

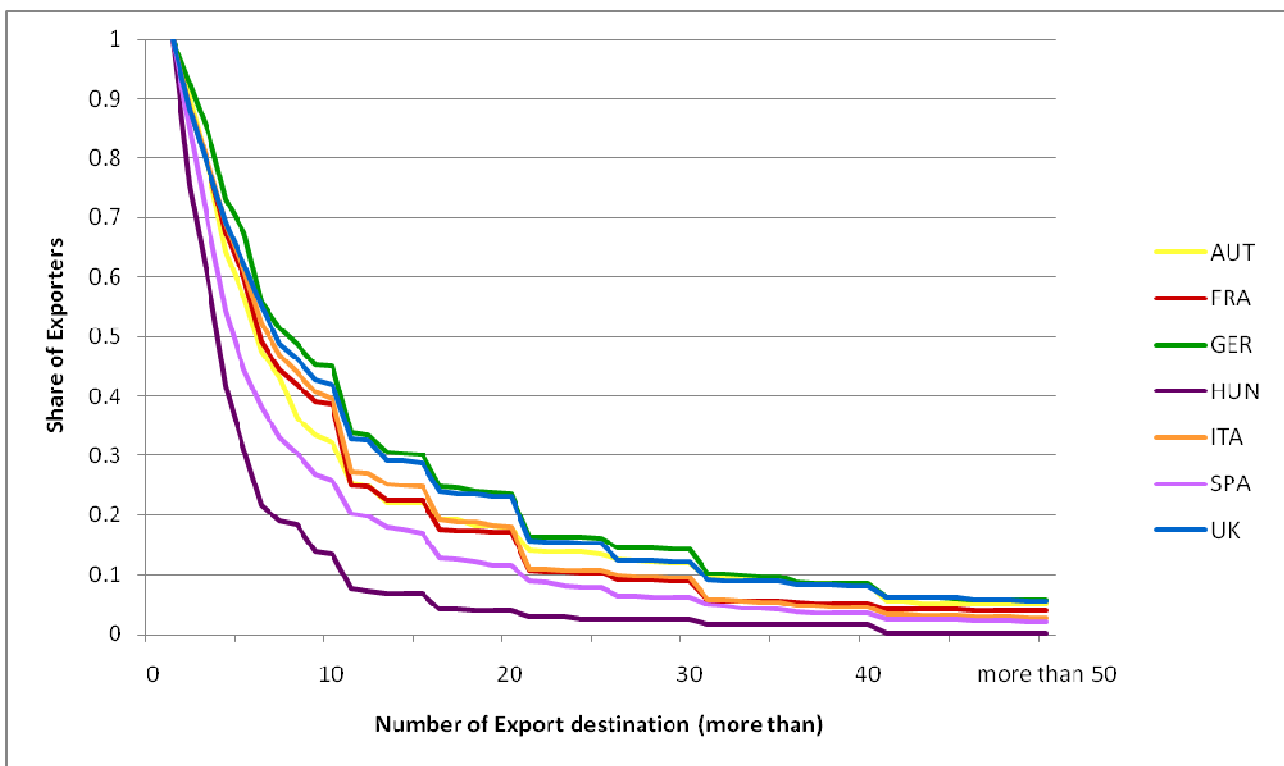
Robust standard errors in brackets. Due to missing observations concerning productivity for UK and blue-collar share for both UK and SPA, SPA has not been included in the regression 5, UK in the column 4 and 5.

***, **, * significant at 1%, 5%, 10%

Columns 2-6 include sector dummies.

Table 3.3 shows the distribution of the number of export destinations by country and firm size class. For the total sample, German firms perform better than those in other countries. We have already argued that a larger share of these firms export to fast growing emerging countries. On average, German firms export to 3 countries more than Italian and French firms. Yet, when we take into account firm size classes, the number of markets invariably rises with size in all countries. In Germany, for example, it jumps from 7 destination markets for the smallest firms to almost 30 for the largest ones. Moreover, given the size class, cross country differences are smaller. Again, this suggests that a large part of the highest export propensity of German firms is due to the industrial (size) structure.

Figure 3.1
Number of export Destinations for Exporters, by Country



Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

Table 3.3
Average number of export destinations of exporting firms by country and size class

Size Class	AUT	FRA	GER	HUN	ITA	SPA	UK
10-19	5	7	7	3	8	5	9
20-49	8	9	12	4	10	8	12
50-249	18	14	18	6	17	12	18
more than 249	32	24	28	14	29	23	27
Total Sample	12	11	14	5	11	8	13

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

Table 3.4
Number of export destinations (only exporters)

	(1) Country dummies	(2) Add sector dummies	(3) Add firm size	(4) Add productivity No UK	(5) All controls No UK & SP	(6) All controls
Log(Employment)			0.379*** [0.012]	0.374*** [0.016]	0.344*** [0.018]	0.328*** [0.013]
Log(Age)					0.155*** [0.020]	0.174*** [0.015]
Log(LP)				0.201*** [0.019]	0.204*** [0.020]	
Group					-0.014 [0.084]	0.035 [0.062]
Foreign Own					0.109 [0.075]	0.151*** [0.057]
Blue-Collar share					-0.004*** [0.001]	
Graduate share					0.003** [0.001]	0.009*** [0.001]
Product Innov					0.391*** [0.032]	0.382*** [0.024]
RD share					0.007*** [0.002]	0.003** [0.001]
Bank Debt share					-0.001 [0.000]	-0.000 [0.000]
AUT	-0.226*** [0.084]	-0.195** [0.082]	-0.176** [0.077]	-0.188** [0.088]	-0.185** [0.087]	-0.098 [0.076]
FRA	-0.230*** [0.045]	-0.228*** [0.044]	-0.208*** [0.042]	-0.170*** [0.050]	-0.140*** [0.048]	-0.182*** [0.041]
HUN	-0.879*** [0.080]	-0.818*** [0.078]	-0.829*** [0.074]	-0.466*** [0.089]	-0.273*** [0.090]	-0.705*** [0.075]
ITA	-0.196*** [0.034]	-0.187*** [0.033]	-0.047 [0.032]	-0.060 [0.037]	0.050 [0.038]	0.050 [0.032]
SPA	-0.502*** [0.043]	-0.487*** [0.042]	-0.384*** [0.040]	-0.394*** [0.048]		-0.295*** [0.041]
UK	-0.107** [0.044]	-0.130*** [0.043]	-0.075* [0.041]			-0.076* [0.043]
Constant	2.012*** [0.027]	1.772*** [0.045]	0.338*** [0.063]	-0.672*** [0.120]	-1.263*** [0.154]	-0.450*** [0.079]
No. obs.	7597	7597	7597	4530	3928	7178
R-squared	0.029	0.077	0.179	0.212	0.271	0.238

Robust standard errors in brackets. ***, **, * significant at 1%, 5%, 10%
Columns 2-6 include sector dummies.

This pattern persists in the econometric analysis (Table 3.4): firms that are larger, more productive and innovative, older and endowed with more skilled labor, export to many more markets.

Again almost 70% of the total variance explained is due to firm characteristics; only 12 and 20% to country and sector factors, respectively. As for China and India, Germany present a clear competitive advantage which however decreases substantially after controlling for a full set of firm characteristics.

4. GLOBAL PRODUCTION

Claim 4a – The majority of European firms use imported inputs. A sizeable share among them produces abroad using foreign affiliates or international outsourcing. Also foreign production is predominantly related to firm-specific characteristics.

Having looked at export patterns, we now focus on global production. The internationalisation of production is important because it helps firms reducing production costs, tapping foreign technologies and fostering sales in foreign markets. This can take place through different modalities which are analysed in our survey. The simplest one is by purchasing foreign inputs and components through imports for use in domestic production. The larger the share of imported materials, the lower the value added produced at home. This is the simplest way of internationalising production. The second modality is international outsourcing (IO), which implies setting up specific arm-length agreements with companies in foreign markets, for example for the production of finished goods under licensing or the production of specific components. The third modality, which generally involves higher investment and fixed costs, is carrying out own production through FDI. Whereas all imports are made of inputs purchased for home production, FDI and IO are also used to produce items (components or finished products) for sale in the host market or to third countries.¹⁰

We find that in all the countries more than half of the firms are involved in at least one mode of global production (Table 4.1, first column). This is consistent with the general evidence that a large share of world trade is in parts and components or it is intra-firm. Imports is the most frequent modality of internationalising production, given that it is also the least costly one. The share of firms doing FDI or IO is much lower, varying between around 4 % for Spain and Hungary, up to almost 11% for Austria.

Therefore, country patterns differ when we consider specific modalities of internationalising production. Germany has a lower share of firms producing abroad than the other countries when we consider all three modalities. This is driven by the fact that a lower share of German firms use imported inputs, partly because in this country firms are much more vertically integrated (use less purchased inputs than elsewhere). The picture changes completely if we only focus on IO and FDI. Here German firms are more likely to pursue these strategies than firms in other countries (excluding Austria), followed by France and Italy.

¹⁰ A big and growing strand of the literature investigates the different strategies that firms use in order to internationally organize their production. For the basic framework, see e.g. Antràs (2003) and Antràs and Helpman (2004). They investigated the link between firm productivity and the sourcing mode and thus are able to differentiate between international outsourcing and FDI activities. They showed theoretically that, in headquarter intensive sectors, least productive firms exit the market. With increasing productivity firms start to outsource to the domestic market, vertically integrate at home, outsource to the foreign market, and finally, engage in FDI. Thus, only the most productive firms are able to investigate in more complex internationalization strategies. An excellent overview of this kind of literature can be found in Helpman (2006).

Table 4.1
Extensive margins: share of firms involved in global production

Country	Import, FDI, IO	FDI, IO only
AUT	61.1	11.1
FRA	62.9	8.2
GER	45.1	9.2
HUN	57.2	4.0
ITA	50.3	6.2
SPA	53.5	4.2
UK	58.0	8.7

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

Even though the extensive margin of imports is larger than for IO and FDI, the ranking is opposite when we consider the intensive margins, i.e. the conditional share of the value of imports over turnover is much lower than the conditional share of turnover from FDI and IO on total firms' turnover (see table 4.2). In other words, fewer firms enter into FDI or IO (extensive margin), but then these modes imply a much larger share of (or shift to) foreign production for firms that do it.

Table 4.2
Intensive margins:
Average Share of Firm Turnover from Imports, IO, and FDI (% of Firm Turnover)

country	Imports	FDI and IO
AUT	8.9	28.4
FRA	12.9	31.7
GER	8.3	31.1
HUN	16.7	34.0
ITA	10.8	29.7
SPA	9.9	33.6
UK	11.6	45.4

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

In what follows we focus our discussion on IO and FDI. First, we look at the geographical distribution of firms carrying out foreign production, either through IO or FDI (Table 4.3): where do these firms carry out foreign production? In contrast to exports, notice that one firm out of two among those producing abroad has no production facilities in the EU15. This supports the view that the EU market can easily be supplied through exports, given the low barriers within the single market. We also

notice that for all the sample countries China and India are the most frequent production locations outside Europe. A very sizeable share of firms is more likely to invest there than in the US, even though the US are still the most important non European export market. Producing in China is important, both to overcome sizeable trade barriers, and in order to benefit from lower production costs there.

Table 4.3
The geographical distribution of firms producing abroad
through IO and/or FDI
(percentages)

country	EU15	Other EU	Other Europe	China India	Other Asia	USA CAN	Central South America	Others
AUT	62.6	53.7	20.0	17.4	7.1	5.9	4.6	7.1
FRA	53.4	23.3	13.2	35.0	13.1	14.7	5.1	30.4
GER	55.4	42.2	22.5	34.1	12.7	20.1	8.9	8.1
HUN	46.0	51.9	28.2	0.0	0.0	0.0	0.0	5.9
ITA	47.4	31.5	18.3	32.7	13.3	6.2	6.1	15.2
SPA	62.9	13.7	4.0	41.1	5.5	9.2	5.6	16.9
UK	52.7	19.2	10.9	42.9	22.1	21.6	4.1	17.3

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

The share of firms producing in China and India is very close in three major EU exporting economies (France, Italy and Germany), although this picture hides a composition effect. In fact Germany has a higher share of FDI, whereas Italy and France a higher share of IO. We will come back to this issue later in this section.

Now, as we did for exports, we want to understand how far the share of firms doing FDI and IO can be related to country characteristics or rather to firm specific factors. As a first pass on the data, note from Table 4.4 that also in this case the share of foreign producers rises with size, and in all countries it is especially high for firms with more than 250 employees. There are of course differences in the average share across countries, with once more Germany having the highest share (after Austria), but these appear second order compared to dissimilarities according to size.

Table 4.4
Percentage share of firms doing FDI and/or IO by country and size class

Size Class	AUT	FRA	GER	HUN	ITA	SPA	UK
10-19	5.9	5.3	3.5	4.7	3.6	2.0	5.7
20-49	5.6	5.7	7.6	3.0	5.8	3.8	6.7
50-249	22.1	13.6	13.0	2.8	12.9	8.3	14.2
more than 249	40.9	30.8	38.4	12.7	32.4	25.7	23.3
Total	11.1	8.2	9.2	4.0	6.2	4.2	8.7

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

This pattern persists if we carry out our usual econometric exercise and we test the linear probability of doing foreign production either through IO or FDI (Table 4.5). Country dummies are significant and persistently negative for Italy, Hungary and Spain. This is consistent with the average shares of Table 4.4. Firm characteristics are once more very important in explaining this dimension of internationalisation: size, productivity and human capital are always significant and with the expected sign.¹¹

¹¹ Concerning empirical evidence on the Global Sourcing model of Antras and Helpman, Nunn and Trefler (2008) use data for the US economy (covering the years 2000 and 2005) in order to investigate the intra-firm share of imports. Overall, they support the findings of the Antras and Helpman models and thus show that as productivity increases, firms start first to outsource and then to serve the foreign market via FDI. In a recent discussion paper, Kohler and Smolka (2009) investigate the impact of productivity on the sourcing mode for Spanish firms. They also found support for the predictions of the Antras and Helpman (2004) framework. Defever and Toubal (2007) examine the internationalization mode of France firms. However, their analysis does not directly support the picture drawn above. Since their results show that more productive firms engage in outsourcing instead of FDI, they rearranged the theoretical framework by assuming higher fixed costs under outsourcing than with FDI. Andersson et al. (2008) present evidence for the selection of more productive firms in more complex internationalization modes for the Swedish economy. Federico (2009) supports the increasing complexity of internationalization modes with firm productivity for the Italian economy. For additional empirical evidence concerning the link between productivity and internationalization modes, see e.g. Fryges and Wagner (2008) examining a huge data set for Germany, or Serti and Tomasi (2008) for additional evidence on Italy, Fontagnè and Gaulier (2008). Wagner (2007) gave a review of this literature.

Table 4.5
Extensive of foreign production (FDI and/or IO): linear probability model

	(1) Country dummies	(2) Add sector dummies	(3) Add firm size	(4) Add productivity No UK	(5) All controls No UK & SP	(6) All controls
Log(Employment)			0.059*** [0.002]	0.058*** [0.003]	0.060*** [0.004]	0.050*** [0.003]
Log(Age)					0.003 [0.004]	0.006** [0.003]
Log(LP)				0.035*** [0.003]	0.028*** [0.004]	
Group					0.003 [0.020]	0.028** [0.014]
Foreign Own					0.034* [0.018]	0.045*** [0.013]
Blue-Collar share					-0.001*** [0.000]	
Graduate share					0.001*** [0.000]	0.002*** [0.000]
Product Innov					0.032*** [0.006]	0.030*** [0.005]
RD share					-0.000 [0.000]	0.000 [0.000]
Bank Debt share					0.000** [0.000]	0.000** [0.000]
Venture capital					0.277*** [0.049]	0.161*** [0.031]
AUT	0.019 [0.015]	0.022 [0.014]	0.023 [0.014]	0.039** [0.017]	0.050*** [0.018]	0.030** [0.014]
FRA	-0.010 [0.007]	-0.009 [0.007]	-0.004 [0.007]	0.001 [0.009]	0.002 [0.009]	0.000 [0.007]
HUN	-0.052*** [0.014]	-0.052*** [0.013]	-0.052*** [0.013]	-0.019 [0.016]	-0.026 [0.018]	-0.059*** [0.014]
ITA	-0.030*** [0.006]	-0.035*** [0.006]	-0.021*** [0.006]	-0.023*** [0.007]	-0.011 [0.008]	-0.013** [0.006]
SPA	-0.050*** [0.007]	-0.052*** [0.007]	-0.038*** [0.007]	-0.039*** [0.008]		-0.039*** [0.007]
UK	-0.004 [0.008]	-0.012 [0.008]	-0.009 [0.007]			-0.013* [0.008]
Constant	0.092*** [0.004]	0.041*** [0.007]	-0.162*** [0.011]	-0.321*** [0.021]	-0.294*** [0.027]	-0.193*** [0.014]
No. obs.	14161	14161	14161	8313	7110	13326
R-squared	0.005	0.022	0.061	0.077	0.106	0.080

Robust standard errors in brackets.

***, **, * significant at 1%, 5%, 10%

Columns 2-6 include sector dummies.

Claim 4b – FDI and IO are mostly mutually exclusive modes of carrying out international production. FDI are more frequently used by larger firms to support sales in foreign markets. German firms are more likely to choose FDI, Italian and French ones IO.

Up to here we have considered jointly all firms producing abroad, without distinguishing between FDI and IO. We now examine if there are different patterns in these two modalities of internationalising production. The theoretical literature has very clear predictions on the conditions under which it is more effective to carry out international production within the boundaries of the firm or through arm-length agreements¹². These choices are both related to the characteristics of the activities to be carried out abroad (knowledge content, relevance for the overall activities of the firm) and to the ability of the firms to overcome the fixed costs involved in pursuing each modality. In this respect, we would predict that the modes of internationalising production are generally mutually exclusive and that if, as expected, FDI involves larger fixed costs, the more efficient firms, other things equal, choose this modality. Consistently with these predictions we notice in fact that choices are in most cases exclusive, in that only a minority of firms engage in both modes (Table 4.6). Note also that these patterns vary across countries: German and Spanish firms are more likely to do FDI than IO, in contrast to French and Italian firms.

Table 4.6
Choice between FDI and IO
(% of Firms engaging in at least one of the two types of foreign production)

Country	Only FDI	Only IO	Both FDI and IO
AUT	53.0	34.0	12.9
FRA	33.5	54.7	11.8
GER	57.0	35.1	7.9
HUN	49.4	50.6	0.0
ITA	34.0	60.5	5.6
SPA	61.0	34.8	4.2
UK	49.9	37.6	12.6

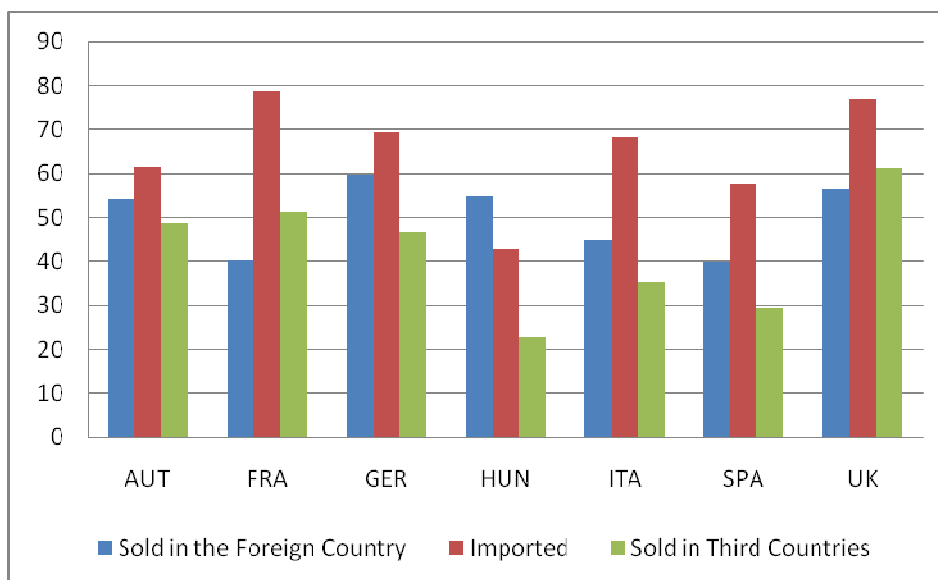
Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

This difference is important because it suggests that the two modes are frequently used to pursue different purposes. FDI seems to be predominantly used for sales in foreign countries, either the ones where affiliates are based or other foreign markets, whereas offshoring to de-localise production both of parts and components and finished products (Figures 4.1 and 4.2). Note that this pattern is pretty consistent across countries: in all the largest countries analysed almost 80% of firms doing IO declare that they re-import at home the goods produced abroad. These goods are either finished products or components. The shares of FDI makers that import goods back home is also

¹² Refer back to footnote 8 for a discussion of this literature

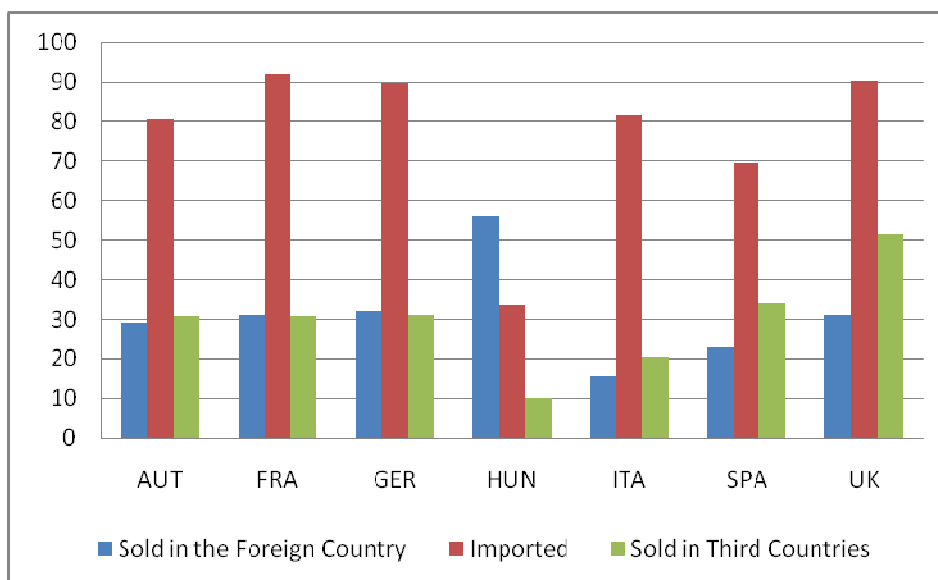
sizeable, but lower than for IO. For most countries a large share of firms investing abroad use foreign affiliates for sales to the host or to third foreign countries. This share is especially high in Germany (60%).

Figure 4.1
Main Destinations of FDI production



Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

Figure 4.2
Main Destinations of IO production



Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

Table 4.7
Choice between FDI and IO: linear probability model

	(1) Country dummies	(2) Add sector dummies	(3) Add firm size	(4) Add productivity No UK	(5) All controls No UK & SP	(6) All controls
Log(Employment)			0.126*** [0.010]	0.129*** [0.014]	0.100*** [0.016]	0.108*** [0.012]
Re-Import					-0.175*** [0.047]	-0.123*** [0.033]
Log(Age)					0.035 [0.024]	0.038** [0.017]
Log(LP)				0.022 [0.022]	0.013 [0.024]	
Group					0.062 [0.087]	0.013 [0.058]
Foreign Own					0.075 [0.083]	0.097* [0.056]
Blue-collar share					0.000 [0.001]	
Graduate share					-0.001 [0.001]	0.000 [0.001]
Product Innov					0.042 [0.041]	0.034 [0.030]
RD share					0.001 [0.002]	0.003* [0.002]
Bank Debt share					-0.000 [0.000]	-0.000 [0.000]
Venture capital					0.306** [0.129]	0.222** [0.104]
AUT	0.011 [0.078]	0.035 [0.076]	0.018 [0.072]	-0.067 [0.083]	-0.069 [0.084]	0.016 [0.073]
FRA	-0.196*** [0.044]	-0.179*** [0.044]	-0.160*** [0.041]	-0.150*** [0.052]	-0.128** [0.052]	-0.133*** [0.042]
HUN	-0.155 [0.115]	-0.127 [0.114]	-0.064 [0.108]	-0.117 [0.146]	-0.196 [0.158]	-0.081 [0.113]
ITA	-0.254*** [0.038]	-0.194*** [0.038]	-0.143*** [0.036]	-0.140*** [0.044]	-0.133*** [0.048]	-0.115*** [0.040]
SPA	0.003 [0.055]	0.021 [0.054]	0.056 [0.051]	0.079 [0.075]		0.095* [0.056]
UK	-0.024 [0.045]	0.009 [0.045]	0.043 [0.042]			0.016 [0.048]
Constant	0.649*** [0.025]	0.723*** [0.069]	0.160** [0.080]	-0.133 [0.171]	0.009 [0.205]	0.134 [0.104]
No. obs.	1180	1180	1180	671	617	1091
R-squared	0.051	0.093	0.193	0.197	0.230	0.221

Robust standard errors in brackets. ***, **, * significant at 1%, 5%, 10%
Columns 2-6 include sector dummies.

To corroborate this evidence, in the econometric analysis of table 4.7 we test the linear probability that firms carrying foreign production choose FDI instead of IO. The dependent variable is one if the firm chooses FDI and zero otherwise. We keep exactly the same set of explanatory variables we have used in all other regressions, except for a dummy that controls for the destinations of the goods produced and which is one if these goods are re-imported back into the home country.

The following results emerge. The country dummy for Italy and France is persistently significant and negative, confirming that even when we control for firm characteristics these countries are less likely to do FDI than Germany. Nonetheless, the increase in the explanatory power of the regressions when we include firm characteristics confirms that also for the choice between IO and FDI these are the prevailing factors. Among firm level features, size is by far the dominant explanatory factor.

Interestingly, productivity is never significant. This shows that economies of scales are very significant when firms undertake FDI instead of IO. Finally, the production of foreign affiliates is less likely to be imported back into the home country, as shown by the negative and significant sign of the Re-import dummy. This confirms the average patterns reported in Figures 4.1 and 4.2.

Claim 4c – Firms often pursue multi-country strategies of international production which, especially in emerging economies, are instrumental in increasing foreign exports.

The survey shows that foreign production is an extremely important component of firms' global strategies. To strengthen this point even further, it is useful to look at whether firms pursue multi-country geographical strategies in internationalizing production and how far these are related to export patterns. Let us focus on China and India the two fastest growing and arguably most difficult markets. In Table 4.8 we report, only for those firms that do FDI in China and India, the share of them that also have foreign plants in other regions. This table shows clearly that German and French firms pursue more comprehensive and diversified geographical strategies than firms from other countries. For example, 40% of the French firms and 35.4% of the German firms investing in China also invest in the US. This share is much lower for Spanish and Italian firms. Their firms investing in China are always less likely to invest in any other geographical area.

Table 4.8
The geographical distribution of FDI, conditional on doing FDI in China and India
(percentages)

country	EU15	Other EU	Other Europe	Other Asia	USA CAN	Central South America	Others
AUT	90.6	86.2	36.8	38.4	24.6	36.8	35.4
FRA	57.0	32.6	23.0	24.1	39.9	11.2	19.3
GER	54.2	39.2	37.6	25.5	35.4	14.5	8.3
ITA	32.8	10.0	7.6	7.3	4.2	7.3	13.0
SPA	35.3	16.4	0.0	3.7	8.7	0.0	5.6
UK	37.5	24.1	7.8	20.1	29.5	4.1	14.2

No Hungarian firm invests in China and India.

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

This comprehensive geographical pattern of foreign production is also linked to export patterns, particularly in fast growing emerging economies. As shown in table 4.9, the share of total country exports to India and China of firms that also have a foreign plant in those countries is over one quarter for France, Germany and Italy. This is partly due to the fact that FDI makers are large, but also that FDI fosters exports to emerging economies. The higher propensity of German firms to carry foreign production and the ability of its firms to pursue multi country production strategies especially in FDI is therefore a key competitive tool to foster also exports.

Table 4.9
Exports of firms with FDI to China and India
over total country exports to China and India

Country	Export of firms with FDI to China and India over total exports
FRA	28.3
GER	25.1
ITA	28.2

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

5. RECONCILING AGGREGATE AND FIRM-LEVEL EVIDENCE: THE ROLE OF INDUSTRIAL STRUCTURES

Claim 5a – Internationalisation patterns differ mainly because countries differ in their industrial structures, i.e in the distributions of their firms' characteristics like size and productivity

How can we reconcile the findings that internationalisation patterns are predominantly driven by firm characteristics and that their impact is similar across countries, with the evidence that, overall, countries perform very differently in terms of their exports and global production strategies? This apparent inconsistency can easily be reconciled if we consider the overall industrial structure of the countries analysed, as reported in tables Tables A5 and A6 in Appendix III and as discussed in the introduction. If we just focus on size and sectoral compositions, we immediately see that firms characteristics are indeed distributed very differently in each of our countries. And of course these differences are also mirrored in our representative samples.

The claim that firm characteristics play a predominant role is supported by our regressions, particularly in section 2, where we show that in all countries the share of exporting firms (the extensive margin) and the share of export per exporting firm (the intensive margin) both increase with size and other firms' characteristics. When we control for these features and for the sectoral structure of industry, country differences loose explanatory power of the export performance. Of course, differences still persist: we have argued for example that Italian firms, independently of their characteristics, have a higher export propensity than others, and that German firms show a lower export propensity, possibly induced by the large size of their domestic market. However, these are second order explanatory factors relatively to the industrial structure and the characteristics of the firms.

This finding is also consistent with the statistics on the share of total exports per percentile of exporter, up to the second top decile, reported in table 5.1. For all our countries the top 20% of exporters, ranked in terms of export size account for over 85% of exports. This was also the central result of Mayer and Ottaviano (2007), who showed that in all European economies exports were very concentrated among the largest 'happy few' firms.

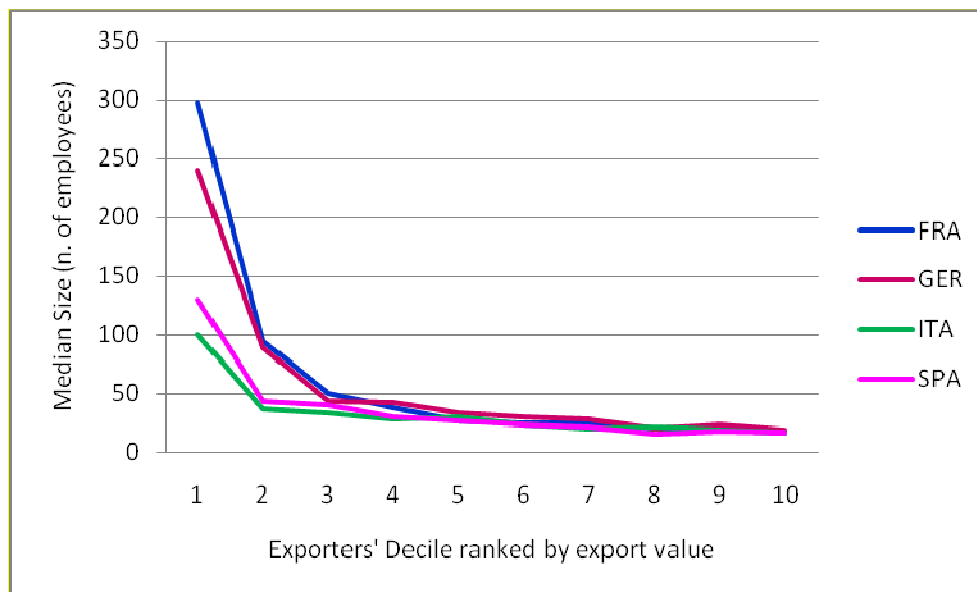
Table 5.1
Share of Total exports of Top Exporters

Country	Top 1%	Top 5%	Top 10%	Top 20%
FRA	48.9	75.8	85.7	93.1
GER	22.9	52.8	68.8	82.9
ITA	50.4	69.7	78.1	86.8
SPA	27.1	65.2	78.5	89.0

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

Given this concentration of exports, the size and the characteristics of the top exporters are key in determining the overall aggregate export performance of countries. Consistently with population distributions in Appendix III, these are indeed different across countries in our sample too. This is immediately apparent if we compare the size of exporters in the largest continental EU economies. Figure 5.1 shows the median size (number of employees) of exporting firms in these countries, according to the value of firms' exports (with 1 being the decile of the largest exporters and 10 the decile of the smallest exporters). Size distributions are different across countries. First the median size of the top 10% of exporters is larger in France and Germany (298 and 240 employees, respectively) than in Spain (130) and Italy (100). Second, French and German firms also tend to be larger when we move down the ladder of exporters, almost to the sixth decile. In other words, second tier exporters are on average larger in France and Germany than in Italy and Spain.

Figure 5.1
Median Size by Exporters' Decile



Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

An interesting point emerging from these descriptive statistics, is that, even if exports are very concentrated, medium sized firms contribute importantly to aggregate exports. Notice from table 5.1. that German exports are less concentrated than the exports of other European countries. This implies that in Germany also medium sized firms, which in the case of this country are second tier exporters, contribute considerably to total exports. Also the top tier exporters in Italy and Spain are in fact medium sized firms (their median size is 100 and 130 respectively).

The emphasis on firms size consolidation and growth does not imply that firms should be very large to be successful exporters. Size must be sufficient to undertake complex global operations, including global production, that is undertaken also by many mediums size firms, as shown before. Still, countries like Italy and Spain would benefit from a larger population of medium and large firms. This is our next point.

Claim 5b – If the industrial structure of Germany were applied to other European countries, exports of Italy and Spain would grow considerably, mostly because of firm size effects.

We have established that country effects are less important than firm characteristics in determining internationalization patterns. In particular, each country's export performance is explained mostly by its industrial structure – specifically, firm size distribution and specialization pattern -- rather than by some other aggregate country effect. To further corroborate this point, we ask what the export performance of each country would be if they had a different industrial structure, keeping its firms' export propensity fixed. For example, we have seen that Italian firms have a high export propensity controlling for size, but at the same time the small average size limits the overall export performance. It is then natural to ask how Italian exports would change if Italy had a firm size distribution similar to that of France or Germany. A similar reasoning can be applied to any country. This counterfactual experiment requires to choose a common industrial structure to be applied to all countries. In theory, we could choose, as a benchmark, any of the European countries in our dataset, or the average structure across countries. In practice, since we want to highlight the role of firm size, it is more convenient to use the industrial structure of Germany, that we have shown to be populated by a higher share of medium and large firms.

Three remarks are needed before proceeding. First, we define industrial structures in terms not only of firm size but also of sector specialization to take into account, and thus not attribute to firm size, an effect due to different export propensity across sectors. Second, due to limitations in the census data, we cannot consider firms' productivity as a third trait of industrial structures: as a consequence, the contribution of size to export performance might be overestimated to the extent that size and productivity are positively related. Thirdly – and we will come back on this in the policy conclusions –,

the choice of Germany as a benchmark country does not have to be interpreted as a prescription to the other European countries to become more “German”, but rather simply as an alternative and realistic firm size distribution.

As a first exercise, we recomputed the share of firms that engage in export activity and the share of export over total sales using a weighting scheme that replicates the German industrial structure by size and sector. That is, we use the same firm observations at the country level but we apply a different weighting scheme, assuming that the firms we observe are drawn from the German population. We explain in Appendix II how we construct these weighting schemes.

Table 5.2 reports the results for the extensive margin in the first three columns. The first column reports the actual country shares of exporters, the second one what the shares would be with German weights, and the third one the difference between the two. With the exception of Hungary, in all countries the share of exporting firms increases. The effect is maximum in Italy and Spain, where it increases by 2.5 and 4.3 percentage points respectively. The same occurs for the share of export over turnover (intensive margins), reported in the remaining three columns of Table 5.2. These increase on average by slightly more than one percentage points, again reaching a maximum for Spain (2.7).

Table 5.2
Counterfactual exercises: share of firms exporting and export share
(percentages)

<i>Country</i>	Share of firms exporting			Share of export over turnover		
	Weights		Difference	Weights		Difference
	Own	German		Own	German	
AUT	51.8	53.1	1.3	40.4	41.5	1.0
FRA	44.4	46.7	2.3	28.5	29.8	1.3
GER	44.0	44.0	0.0	30.0	30.0	0.0
HUN	49.1	48.5	-0.6	44.8	46.1	1.3
ITA	63.5	66.0	2.5	34.5	35.7	1.2
SPA	47.9	52.2	4.3	25.9	28.6	2.7
UK	55.7	56.2	0.6	29.1	29.6	0.4

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

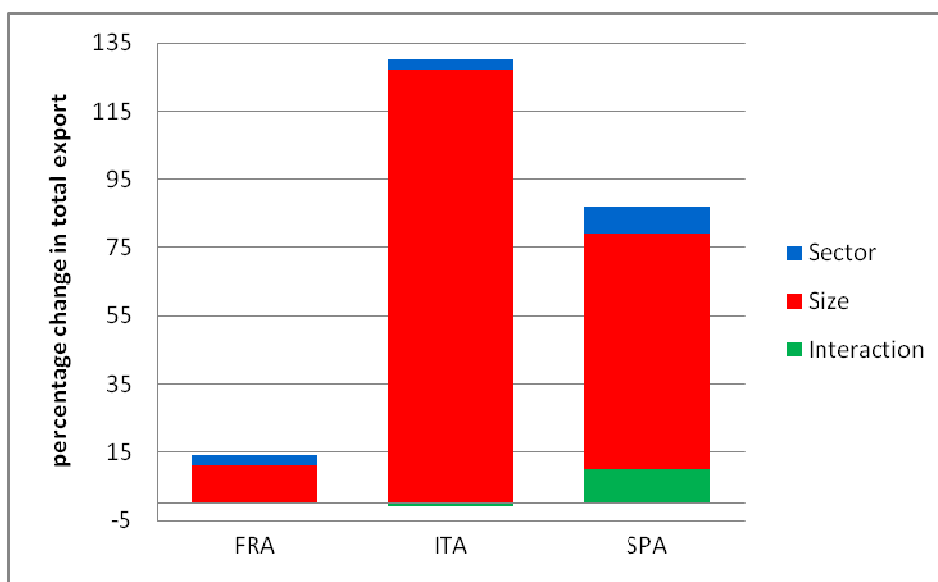
These effects can be explained by the fact that in the German industrial structure there are larger firms that, as we have seen, are more export oriented. Still, the increases we observe are modest. However, one should keep in mind that these are *average* values. In computing the average export propensity, for example, the share of one small firm will contribute to the mean in the same way as that

of one large firm. Given that small firms are the vast majority of the firm population in all countries, such average shares are mostly dictated by small firms.

The picture changes substantially if we consider the total value of export. In this case, we have shown earlier that large exporters play a crucial role in determining the overall exports of a country. Therefore, changes in the share of large firms change total export considerably. To show this result, we repeat the previous exercise in terms of total export. Due to data limitations, we perform this exercise only for France, which has a industrial structure fairly similar to Germany, and for Italy and Spain, that instead are more dissimilar. We compute the total export in each country under the own distribution and under the German distribution and then compute the percentage change in export.¹³

We find that total export increases by 14 percent for France, 87 for Spain and 129 Italy (Figure 5.2). For the two latter countries, therefore, changing the industrial structure to replicate the German one (keeping the number of firms fixed) would basically double export. A decomposition exercise shows that most of the change comes from the size structure and not from the sectoral component. The effect on French export is much more limited, as the industrial structure of France and Germany are rather similar.

Figure 5.2
Percentage change in the value of export using the German size-sector firm distribution



Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

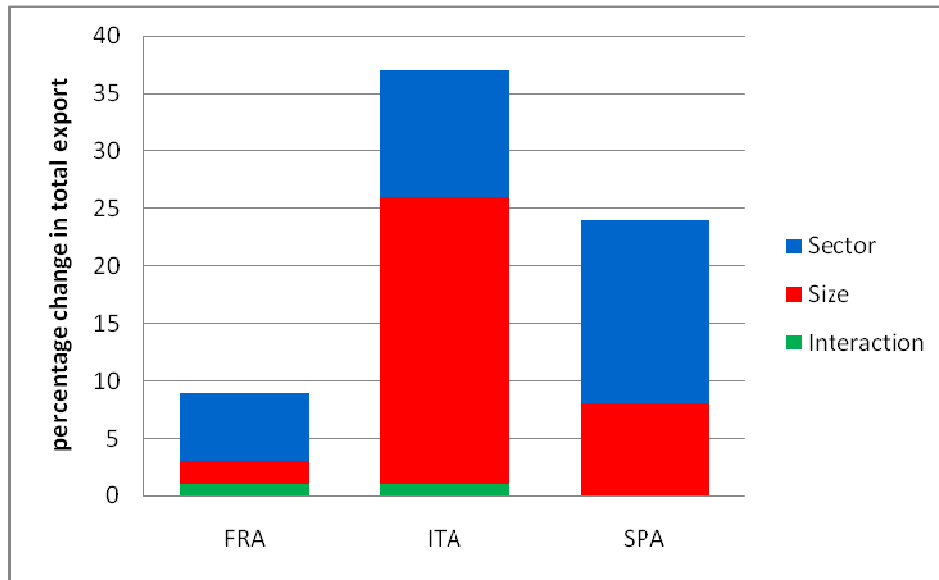
¹³ Due to data limitations, we cannot directly compare total export across countries.

One important caveat is that in the previous exercise we are keeping fixed the number of firms and changing their size, so that we modify the total size of the manufacturing sector. For example, Italy has a large firm population, but with a small average size. Making the average size the same as the German one, keeping the number of firms fixed, increases the industrial sector substantially. It is therefore interesting to repeat the exercise using employment based weights. In this case, we keep total employment fixed at the country level (rather than the total number of firms), but redistribute it across size-sector classes according to the German distribution of employment. By doing this, we keep the size of the manufacturing sector fixed in terms total employment, but reshuffle workers so as to replicate the German distribution and implicitly change the number of firms.

When we perform this experiment, effects are smaller but still very sizable: total export would increase by 24% for Spain and 37 for Italy (Figure 5.3). For France, the increase is a more modest 9 per cent, in line with the fact that its industrial structure is more similar to the German one.

Note that these changes occur while keeping the total employment fixed, and only derives from shifting employment in the size-sector distribution to replicate the German distribution. In this case the sectoral component also plays an important role, particularly for Spain and France. This is due to three reasons. *First*, in Italy the sector effect is small, because a large share of its exports are in traditional industries which are no longer competitive in other countries like Germany. And the size effect is large even though Italian firms have overall a high export propensity, because, as shown in Section 2, exports increase with size faster in this country than elsewhere. *Second*, compared to the previous case, by keeping overall employment constant we are limiting the effects of firm size, that was dominant in the previous table. *Third*, our size component only captures a within-sector size effect. The sector component could also involve an additional size effect. For example, shifting employment from the textile sector to the chemical sector implies also an increase in average firm size, as chemical firms are on average larger than textile firms. We choose a decomposition scheme that attributed all this factor to the sectoral component, constraining size effects to occur only within sector. This seems a more reasonable decomposition than the alternative one that would attribute to the size effect also the across sectoral changes. If we were to apply this decomposition we would find that the size component becomes predominant in all countries (see the Appendix II for details).

Figure 5.3
Percentage change in the value of export using the German size-sector employment distribution with constant total employment



Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

All in all, the evidence indicates that the main differences across countries are dictated by the industrial structure. Similar firms behave similarly across countries, but Germany has a structure which favors the internationalization of its economy much more than Spain and Italy: in particular, the larger presence of medium and large size firms dictates higher involvement in international activities.

6. THE ECONOMIC CRISIS AND THE GLOBAL OPERATIONS OF EUROPEAN FIRMS

In this section we depart from the structural analysis of global operations of European firms, which has been based on 2008 data, and move to the recent international economic crisis. Thanks to some questions added to the questionnaires and aiming at assessing how the crisis hit the single firm, we can not provide, again for the first time, a description of the effects of the crisis from a perspective that is both comparative and at firm level. Just to keep a link with the previous sections, we separately address the effects on the extensive and intensive margins of trade.

Claim 6 – The effects of the crisis have been extremely heterogeneous across firms. Larger firms and those exporting out of the EU recorded less dramatic changes in export during the crisis.

According to our sample of 7,536 exporting firms, in 2009 the crisis has caused a reduction of the value of export for slightly more than half of the firms (51.5%); 29.8% of firms did not vary their export values, while 18.7% increased them (Table 6.1). Only 3.8% of sampled firms report having stopped exporting altogether.¹⁴ The share of firms that managed to expand their exports during the crisis is pretty sizeable, considered the magnitude of the systemic effect.

Table 6.1
Exporters and the crisis (2009 vs. 2008)

	N. of firms	%
N. of firms increasing export	1,449	18.7
N. of firms reducing export	3,983	51.5
- of which stopped exporting *	(151)	(3.8)
No changes	2,104	29.8
Total	7,536	100.0

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

Given the high heterogeneity in the effects of the downturn in world demand, it is interesting to look for detectable factors, in terms of country of origin and firm characteristics, that explain the observed patterns. In Table 6.2 we can see that, out of the 3,983 firms reporting a reduction in export volumes, German (and Austrian) firms have been relatively less hit, with 45.4% of firms affected (vs. a sample average of 51.5). Also, a relatively large share of them managed to increase exports (only the UK did better on this front). This is a first indication that the comprehensive global strategy pursued by

¹⁴ Also Fontagnè et al. (2009) find that exit from exporting has been relatively small for French firms in 2009.

German firms also made them more resilient to the effects of the crisis. On the other side, France, Hungary, Italy and Spain have recorded an higher than average percentage of firms with an export reduction.

In terms of size, medium to large exporters have on average suffered marginally more, with around 54% of large exporting firms reporting a reduction in exports compared to 50% within the small exporters group. Moreover, firms exporting beyond the EU market have been more frequently hit by the compression in their export volumes, with 52.5% of ‘global’ firms reporting a fall in export vs. 47.7% of those exporting only to the ‘domestic’ EU market. This result is not surprising, because these firms are more exposed to changes in global demand.

Table 6.2
Percentage of exporting firms changing export volumes (2009 vs. 2008)

		Reducing export	Increasing export
	All firms	51.5	18.7
By country	AUT	43.8	17.5
	FRA	58.8	17.1
	GER	45.4	20.1
	HUN	58.7	12.0
	ITA	54.5	13.5
	SPA	53.1	22.6
	UK	45.2	29.6
	By firms' size	10-19	50.0
20-49		51.2	18.5
50-249		53.4	19.4
250 or more		54.0	19.6
By destination	Exporters only to EU	47.7	17.6
	Global exporters	52.5	19.1

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

However, focusing only on the share of firms that increased or decreased their exports does not say much on the real effects of the crisis. To be more precise, it is useful to focus on how large the latter decreases or increases have been by looking at the impact on firms' export volumes. To this extent, the survey also asked firms to report the change in exports experienced during 2009 in percentage of total export volumes in 2008 (Table 6.3). Restricting to the subsample of exporting firm which experienced in 2009 a reduction in exports, the average reduction in export volumes has been very large, in line with aggregate data (30.7%). At the same time, though, the 18.7% of exporters that increased their exports did it by a significant amount (24.9%). This is to say that the crisis has been extremely selective and that average figures hide a lot of interesting heterogeneity at the firm level.

Table 6.3
Changes in exporters' export volumes (2009 vs. 2008)

		Avg. decrease	Avg. increase
By country	All firms	30.7	24.9
	AUT	27.6	23.2
	FRA	31.6	34.0
	GER	27.8	22.4
	HUN	39.2	28.4
	ITA	30.2	23.2
	SPA	34.5	29.0
	UK	29.3	21.5
By firms' size	10-19	34.1	27.1
	20-49	30.5	26.9
	50-249	28.2	20.5
	250 or more	24.6	14.4
By destination	Exporters only to EU	37.7	30.9
	Global exporters	28.7	23.2

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

At the country level, the data confirm that German firms have been faring better than others during the crisis, with an average reduction in export volumes of less than 28%. Hungarian and Spanish recorded instead a very large drop in export volumes, 39.2 and 34.5%, respectively. Exporters that are bigger and capable of reaching markets outside EU suffered less the impact of the crisis than firms that export only within the EU and are smaller in size. The same pattern emerge when focusing on the groups of firms that have been able to expand their export volumes in 2009.

Thus, even though a larger share of large and global exporters have been negatively hit by the crisis, these firms faced a lower reduction in volumes, and particularly a lower volatility in their exports, both upward and downward. This is probably due to the fact that their export strategies were more diversified and that demand in the emerging economies both declined less and recovered more quickly than that in advanced countries. To corroborate this evidence, we run a simple econometric regression to test if the just described relationship between the variation of export volumes, firm size and the type of export destinations holds when we control for other firm characteristics. Results are reported in table 6.4, separately for firms that declared to have increased export volumes and those that have reduced them.

The results confirm by and large our findings. When we focus on firms that reduced their export volumes and control for industry and country characteristics, we find that an increase of one standard deviation in firm size is on average associated to a 2.4% smaller reduction in exports; for

global exporters the reduction has been 7% smaller than for firms exporting only to the EU. In the group of firms that were able to increase their exports, the increase has been smaller for larger and global exporters. This is to say that size and global exporting seemed to have acted as ‘buffers’ for the volatility of the export intensive margins, for both upward and downward changes.

Table 6.4
Change of export volumes, size of exporting firms and export destinations

		All exporters
Reduction	Empl	-2.42 ***
	EU_dest	7.32 ***
Increase	Empl	-3.76 ***
	EU_dest	7.00 ***

Source: Authors’ elaborations from EU-EFIGE/Bruegel-UniCredit dataset. Country and industry dummies included but not reported
***, **, * significant at 1%, 5%, 10%

To better appreciate how important is the use of firm level statistics, let us compare Germany and Italy, the two leaders in European manufacturing exports. As shown in Table 6.4, behind similar aggregate developments (-18.4% for Germany and -21.4% for Italy), there are many interesting differences. In Germany the percentage of firms that say a reduction in their export volumes has been significantly smaller than in Italy (45.3% against 54.4%), especially among large firms (49.2% against 61.1%). The average reduction in export volumes has been on average smaller in Germany (27.8%) than in Italy (30.2%), even if larger firms suffered slightly more in Germany (24.6% against 23.8 in Italy). Similar patterns, again more favourable to Germany, emerge when focusing on firms that increased or did not change their export volumes.

So how is it then that the aggregate performance of Germany has not been considerably better than that of Italy? This has to do with the distribution of exporting firms by size. In particular, given that large firms had more similar performances in the two countries and that these firms typically account for most of a country’s aggregate exports, at the end Italy and Germany performed similarly. On the other side, though, aggregate statistics mask the fact that Italian firms suffered much more during the crisis. With their smaller size and relatively less sophisticated export strategies they were clearly more exposed to the crisis than their German counterparts.

Table 6.5
Decomposing aggregate exports' statistics
(Italy and Germany; 2009 vs. 2008)

	Italy	Germany
% of firms reducing export	54.4	45.3
<i>- of which large firms</i>	<i>(61.1)</i>	<i>(49.2)</i>
average export reduction (%)	-30.2	-27.8
<i>- of which large firms</i>	<i>(-23.8)</i>	<i>(-24.6)</i>
% of firms increasing export	13.5	20.1
<i>- of which large firms</i>	<i>(14.3)</i>	<i>(20.2)</i>
average export increase (%)	+23.2	+22.4
<i>- of which large firms</i>	<i>(+15.0)</i>	<i>(+13.9)</i>
% of firms not changing export	32.1	34.6
<i>Aggregate export change</i>	<i>-21.4</i>	<i>-18.4</i>

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

7. CONCLUSIONS AND POLICY CHALLENGES

The findings of the study, ‘The Global Operations of European Firms’, raise potentially significant policy challenges. While the exploitation of this new data is only beginning, our findings so far already suggest several areas worth deeper investigation.

First, it is clear that firm characteristics are key in determining the global operations of European firms. The aggregate performance of countries is different mostly because their industrial structures are different. Thus, the superior performance of Germany in the export market has much to do with the characteristics of its firms, rather than with its macro policy and the orientation of its aggregate demand.

Second, much of these characteristics are correlated to and can be summarised by size. This is reasonable because there are economies of scales in global operations. Entry barriers have been rising with the toughening of competition in the global markets and with the shift of market dynamism towards the emerging economies. To operate in the global markets firms need innovative technologies, brand recognition, complex organisation and governance structures, capable managers. These are more difficult to accumulate for small firms.

Third, firm size is not the whole story. There are many features that are not always correlated to size and which are also important. This report has given a very cursory look at them. Much more research is needed to understand features of successful globalisers that can be carried through also to other firms.

Fourth, firm growth and consolidation could therefore generate a considerable increase in the value of European exports. Of course, SME play a fundamental role in the European economy. However, as shown by Bartelsman, Scarpetta and Schivardi (2005), European firms tend to grow less than US firms. This suggests the existence of barriers to firm growth that prevent firms from fully exploiting their growth potential. Identifying such barriers is a key issue for both research and policy making. Structural reforms that make it easier for firms to grow and to move towards more sophisticated forms of management, organisation and innovation, could be extremely effective for strengthening the competitiveness of the region. Also measures of support for small firms should be clearly and explicitly targeted to their growth.

Fifth, structural reforms may be required in several areas, such as labour regulation, taxation, bureaucracy and many other domains. The global projection of European firms starts however in the single market, as this is the quintessential quasi-domestic space where firms initially grow and reinforce their competitiveness. The coordination of structural policies at the European level, that has been lagging behind compare to aggregate demand policies, would also contribute to strengthening European firms.

Sixth, policies forcing firms' growth and a sectoral allocation of industrial activities would not necessarily strengthen international competitiveness. The key policy argument of this report is that country should favour growth and industrial reallocation simply by improving the business environment, not by forcing the right features for exporting.

Seventh, the report finds that global production is fundamental for global sales, particularly in emerging markets. Through foreign production firms can often reduce production costs and also enter more easily into distant markets. In fact, China and India are the countries where European firms are more likely to have production facilities outside the EU, even more than in the US, which is the main export destination. Measures that restrict the ability of firms to transfer production abroad could severely hinder export growth, particularly in difficult markets. At the same time such measures would weaken the global competitiveness of national firms, with long-term negative effects on domestic employment.

Eighth, and finally, measures directly targeted at supporting exports can be helpful at reducing the entry cost into exporting, particularly for complex global operations. However, they cannot substitute for more difficult, but also more rewarding, structural policies that would strengthen European firms.

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APPENDIX

Appendix I. Sample Description

The present report uses the final version of the firm level EU-Efige/Bruegel-UniCredit dataset (only for Germany we use an intermediate release). The data have been collected within the project Efige - European Firms in a Global Economy: internal policies for external competitiveness - supported by the Directorate General Research of the European Commission through its FP7 program. GFK Eurisko dealt with the collection of data via CATI (Computer Assisted Telephone Interview) and CAWI (Computer Assisted Web Interview). The sample includes around 3,000 firms for France, Italy and Spain, more than 2,200 firms for UK and Germany¹⁵, and 500 firms for Austria and Hungary.

GFK Eurisko has adopted a sampling design following a stratification by sector and firm size. Since this sampling design oversamples large firms, we have applied a weighting procedure described below in order to guarantee the representativeness. The distribution by sectors and firm size for the sample and the reference population are shown for each country in tables A2.

The survey questionnaire contains both qualitative and quantitative data on firms' characteristics and activities, split into six sections providing different pieces of information: Structure of the Firm; Workforce; Investment, Technological Innovation and R&D; Internationalization; Finance; Market and Pricing.¹⁶ All questions concern the year 2008, with some questions asking information in 2009 and previous years in order to have a picture of the crisis effects and the dynamic evolution of firms' activity.

Data from the Survey have then been matched with balance sheets information from Amadeus. The Efige research team is still working on the data collection concerning turnover data. Only for France, Germany, Italy and Spain we still have a fairly large number of observations when we focus on turnover data. We will therefore limit the analysis requiring balance sheet data to these countries.

The main focus of the report is on the firms' internationalization strategies. In order to identify these modes of internationalization, we use the following information from the survey. To classify the firm as an exporter, we combine the following two questions: Firms replying "yes, directly from the home country" to "Has the firm sold abroad some or all of its own products / services in 2008?" and

¹⁵ The German sample will consist of 3,000 firms in the final version.

¹⁶ The complete questionnaire is available on the Efige web page.

firms replying “regularly/always” or “sometimes” to “Before 2008, has the firm exported any of its products?”. In fact, using only the 2008 exporters might miss temporary exporters, which might be more likely not to export in 2008, a year of strong contraction in international trade. Concerning imports, we follow the same procedure, taking into account materials and service imports as well. Therefore, we combine the following questions: Firms replying “yes, from abroad” to “In 2008 has the firm purchased any materials (services) for its domestic production?” and firms replying “regularly/always” or “sometimes” to “Before 2008, did the firm purchase any materials (services) from abroad?”. With respect to FDI and IO, we refer to the question “Does the firm currently run at least part of its production activity in another country?”. Firms replying “yes, through direct investment (i.e. foreign affiliates/controlled firms)” are considered as FDI makers, firms replying “Yes, through contracts and arms length agreements with local firms” are considered as International Outsourcers. The questionnaire provides a variety of other information about the geographical destinations and the type of goods and services involved in the internationalization strategies.

In Table A4 we report the mean and standard deviation of some key variables by country. Average size is substantially smaller in Italy and Spain, who also have a higher share of blue collar workers. Innovation indicators are low in Hungary and highest in Austria and UK. Corporate finance indicators also point to a more similar structure for Italian and Spanish firms, with low role of groups and foreign ownership and role of bank debt.

Table A1
Sector Definition

NACE Rev 1.1	DESCRIPTION
DA	Food products, beverages and tobacco
DB	Textiles and textile products
DC	Leather and leather products
DD	Wood and wood products
DE	Pulp, paper and paper products, publishing and printing
DF	Coke, refined petroleum products and nuclear fuel
DG	Chemicals, chemical products and man-made fibres
DH	Rubber and plastic products
DI	Other non metallic mineral products
DJ	Basic metals and fabricated metal products
DK	Machine and equipment n.e.c.
DL	Electrical and optical equipment
DM	Transport equipment
DN	n.e.c.

Table A2
Distribution by Size and Sector, Sample/Reference Population

AUSTRIA

Nace Rev 1.1	Firm Size						Total	
	Between 10 and 49		Between 50 and 249		More than 250			
	Sample	Pop.	Sample	Pop.	Sample	Pop.	Sample	Pop.
DA	39	1,239	7	217	4	39	50	1,495
DB	16	179	5	57	1	12	22	248
DC	3	20	0	10	1	3	4	33
DD	29	479	7	93	0	23	36	595
DE	38	404	12	131	8	31	58	566
DF+DG	8	115	4	55	0	24	12	194
DH	16	186	3	90	3	29	22	305
DI	18	257	6	98	1	22	25	377
DJ	71	963	17	258	9	80	97	1,301
DK	29	534	22	244	7	85	58	863
DL	31	394	16	136	9	58	56	588
DM	10	95	1	48	2	32	13	175
DN	31	703	7	87	1	21	39	811
Total	339	5,568	107	1,524	46	459	492	7,551

FRANCE

Nace Rev 1.1	Firm Size						Total	
	Between 10 and 49		Between 50 and 249		More than 250			
	Sample	Pop.	Sample	Pop.	Sample	Pop.	Sample	Pop.
DA	142	6,166	45	1,091	27	328	214	7,585
DB	134	1,766	37	429	6	62	177	2,257
DC	21	259	12	105	0	11	33	375
DD	77	1,622	13	214	6	24	96	1,860
DE	181	2,939	42	626	10	165	233	3,730
DF+DG	48	794	38	448	21	255	107	1,497
DH	172	1,553	49	617	15	141	236	2,311
DI	117	1,141	30	272	8	86	155	1,499
DJ	754	7,486	160	1,421	29	237	943	9,144
DK	193	2,848	65	719	23	187	281	3,754
DL	216	2,664	77	759	38	239	331	3,662
DM	54	806	21	288	26	171	101	1,265
DN	42	1,975	19	376	5	80	66	2,431
Total	2,151	32,019	608	7,365	214	1,986	2,973	41,370

GERMANY

Nace Rev 1.1	Firm Size						Total	
	Between 10 and 49		Between 50 and 249		More than 250			
	Sample	Pop.	Sample	Pop.	Sample	Pop.	Sample	Pop.
DA	150	11,889	61	2,226	25	526	236	14,641
DB	43	1,459	35	560	2	88	80	2,107
DC	8	304	0	84	1	27	9	415
DD	58	2,734	17	364	2	62	77	3,160
DE	139	4,731	56	1,457	9	335	204	6,523
DF+DG	33	1,061	28	713	14	321	75	2,095
DH	82	2,319	52	1,361	11	272	145	3,952
DI	38	2,065	19	675	4	165	61	2,905
DJ	281	12,887	143	3,207	24	624	448	16,718
DK	221	7,281	145	2,897	27	756	393	10,934
DL	163	8,350	82	2,082	27	590	272	11,022
DM	19	935	17	632	7	342	43	1,909
DN	97	2,748	55	763	7	128	159	3,639
Total	1,332	58,763	710	17,021	160	4,236	2,202	80,020

HUNGARY

Nace Rev 1.1	Firm Size						Total	
	Between 10 and 49		Between 50 and 249		More than 250			
	Sample	Pop.	Sample	Pop.	Sample	Pop.	Sample	Pop.
DA	43	1,176	15	336	5	75	63	1,587
DB	15	497	6	165	4	30	25	692
DC	3	106	0	47	1	15	4	168
DD	12	434	5	64	0	4	17	502
DE	32	527	11	127	0	27	43	681
DF+DG	17	140	1	59	2	17	20	216
DH	25	440	10	147	5	29	40	616
DI	22	232	3	65	5	25	30	322
DJ	73	1,327	29	293	6	27	108	1,647
DK	41	575	22	202	5	41	68	818
DL	18	510	10	202	6	101	34	813
DM	7	120	2	74	5	59	14	253
DN	17	421	4	93	1	10	22	524
Total	325	6,505	118	1,874	45	460	488	8,839

ITALY

Nace Rev 1.1	Firm Size						Total	
	Between 10 and 49		Between 50 and 249		More than 250			
	Sample	Pop.	Sample	Pop.	Sample	Pop.	Sample	Pop.
DA	196	6,680	35	773	7	122	238	7,575
DB	256	9,005	37	954	12	127	305	10,086
DC	96	3,988	17	365	2	25	115	4,378
DD	83	3,329	4	212	1	15	88	3,556
DE	146	4,254	20	527	10	73	176	4,854
DF+DG	67	1,650	35	536	14	150	116	2,336
DH	133	3,663	24	612	12	71	169	4,346
DI	141	4,143	21	551	5	86	167	4,780
DJ	571	18,679	95	1,876	20	168	686	20,723
DK	295	8,211	60	1,599	25	242	380	10,052
DL	215	5,808	42	943	15	137	272	6,888
DM	53	1,775	13	435	14	137	80	2,347
DN	193	5,907	26	679	8	55	227	6,641
Total	2,445	77,092	429	10,062	145	1,408	3,019	88,562

SPAIN

Nace Rev 1.1	Firm Size						Total	
	Between 10 and 49		Between 50 and 249		More than 250			
	Sample	Pop.	Sample	Pop.	Sample	Pop.	Sample	Pop.
DA	377	5,287	61	991	25	199	463	6,477
DB	84	3,018	9	359	3	34	96	3,411
DC	42	1,336	5	96	0	9	47	1,441
DD	197	2,082	11	173	4	16	212	2,271
DE	100	2,947	15	531	12	66	127	3,544
DF+DG	85	1,125	24	361	12	120	121	1,606
DH	114	1,709	30	383	4	46	148	2,138
DI	114	3,071	44	627	5	81	163	3,779
DJ	537	8,492	86	1,104	25	127	648	9,723
DK	253	2,830	40	509	12	70	305	3,409
DL	82	1,646	17	358	17	92	116	2,096
DM	63	1,086	23	361	20	115	106	1,562
DN	232	3,487	41	388	7	35	280	3,910
Total	2,280	38,116	406	6,241	146	1,010	2,832	45,367

UK

Nace Rev 1.1	Firm Size						Total	
	Between 10 and 49		Between 50 and 249		More than 250			
	Sample	Pop.	Sample	Pop.	Sample	Pop.	Sample	Pop.
DA	102	1,883	50	802	14	354	166	3,039
DB	78	1,390	18	336	4	44	100	1,770
DC	6	112	4	33	0	4	10	149
DD	78	1,494	14	225	2	28	94	1,747
DE	185	3,831	61	886	20	187	266	4,904
DF+DG	76	776	28	455	9	167	113	1,398
DH	86	1,911	32	704	7	117	125	2,732
DI	42	960	17	295	2	65	61	1,320
DJ	258	5,909	92	1,275	14	137	364	7,321
DK	146	2,817	50	832	17	175	213	3,824
DL	216	2,718	79	992	14	203	309	3,913
DM	29	962	28	446	1	203	58	1,611
DN	213	2,424	56	513	8	74	277	3,011
Total	1,515	27,187	529	7,794	112	1,758	2,156	36,739

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset and Eurostat SBS 2007. For missing data in some cells for the population (due to confidential reasons), we made some hypothesis looking at the distributions in previous years or sectors with similar technology intensity.

Table A3
Description of the variables used in the report

Variable	Description
Employment	Number of employees in 2008
Labour Productivity (LP)	Labour Productivity in 2008, in € thousands, calculated as Value Added per employee
Blue-collar share	Share of blue collars in 2008
Graduate share	Share of employment with an university degree in 2008
Age	Firm's age
Group	Dummy Variable: 1 if the firm belong to a group, and 0 otherwise
Foreign Ownership	Dummy Variable: 1 if the firm is foreign-owned (with at least 50% of its capital owned by foreign shareholders) , and 0 otherwise
Product Innovation	Dummy Variable: 1 if the firm has carried out some product innovation, and 0 otherwise
RD share	R&D expenses as percentage of the firm total turnover in 2008
Bank Debt share	Share of bank debt over the total external financing
Venture capital	Dummy Variable: 1 if the firm has increased its external financing through venture capital, and 0 otherwise
Re-Import	Dummy Variable: 1 if the firm re-imports materials/services/products produced abroad, and 0 otherwise

Table A4
Descriptive Statistics for the Whole Sample

Variable	AUT	FRA	GER	HUN	ITA	SPA	UK
	mean (<i>sd</i>)	mean (<i>sd</i>)	mean (<i>sd</i>)	mean (<i>sd</i>)	mean (<i>sd</i>)	mean (<i>sd</i>)	mean (<i>sd</i>)
Employment	90 <i>413</i>	79 <i>473</i>	77 <i>247</i>	72 <i>179</i>	42 <i>126</i>	49 <i>178</i>	109 <i>915</i>
LP	170 ^(a) <i>328^(a)</i>	114 <i>146</i>	156 <i>291</i>	59 ^(a) <i>106^(a)</i>	153 <i>176</i>	102 <i>141</i>	- -
Blue-collar share	57.7 <i>27.5</i>	55.7 <i>29.7</i>	56.0 <i>28.6</i>	66.7 <i>23.9</i>	66.2 <i>18.6</i>	74.1 <i>14.4</i>	67.2 <i>18.7</i>
Graduate share	5.0 <i>9.9</i>	8.2 <i>12.4</i>	11.5 <i>15.3</i>	15.5 <i>18.8</i>	6.5 <i>10.3</i>	10.5 <i>13.0</i>	8.6 <i>14.6</i>
Age	46 <i>39</i>	39 <i>33</i>	45 <i>39</i>	17 <i>14</i>	30 <i>20</i>	27 <i>20</i>	36 <i>33</i>
Group	12.5 <i>33.1</i>	10.1 <i>30.1</i>	5.3 <i>22.3</i>	12.6 <i>33.2</i>	3.0 <i>17.0</i>	4.2 <i>20.0</i>	14.6 <i>35.4</i>
Foreign Own	12.8 <i>33.4</i>	10.3 <i>30.4</i>	6.3 <i>24.3</i>	19.8 <i>39.9</i>	4.1 <i>19.9</i>	4.5 <i>20.8</i>	12.2 <i>32.8</i>
Product Innov	58.5 <i>49.3</i>	46.2 <i>49.9</i>	50.2 <i>50.0</i>	43.4 <i>49.6</i>	47.8 <i>50.0</i>	44.3 <i>49.7</i>	56.3 <i>49.6</i>
RD share	3.1 <i>7.9</i>	3.0 <i>7.6</i>	4.2 <i>8.3</i>	1.4 <i>6.2</i>	3.9 <i>7.5</i>	3.2 <i>7.3</i>	3.4 <i>8.2</i>
Bank Debt share	87.0 <i>29.5</i>	78.7 <i>34.7</i>	83.9 <i>30.6</i>	82.9 <i>35.4</i>	87.5 <i>28.0</i>	86.4 <i>27.9</i>	65.2 <i>43.1</i>
Venture capital	2.2 <i>14.8</i>	1.9 <i>13.6</i>	1.3 <i>11.4</i>	0.9 <i>9.3</i>	0.5 <i>7.2</i>	1.0 <i>10.2</i>	5.7 <i>23.2</i>

^(a)As shown in table 1.1 we have at our disposal a restrict sample of Austrian and Hungarian firms providing turnover data. Anyway these observations have also been used in the regressions.

Source: Authors' elaborations from EU-EFIGE/Bruegel-UniCredit dataset

Appendix II. Weighting Scheme and Counterfactual Exercise

A. Weighting Scheme

Since we are working with a survey we need to construct and use sample weights in order to correct for some imperfections between the sample at our disposal and the reference population¹⁷, and make sure that data are representative of firm population.

All the analyses in the report are prepared using the following weighting scheme. We build two types of weights, relative and absolute weights, splitting the sample in 30 cells by sector/size. We define 3 firm size classes (10-49 employees, 50-249 employees, more than 249 employees) and 10 Nace sector groups (Nace Rev1.1 Sections: DA, DB+DE, DC+DI+DL, DD, DF, DG, DJ, DK, DM, DN).

For each country, the relative weight (*rw*) for firms in sector *k* and size class *s* is built as follows:

$$rw_{ks} = \frac{P_{firms_{ks}} / P_{firms}}{S_{firms_{ks}} / S_{firms}}$$

we define $P_{firms_{ks}}$ as the number of firms in sector *k* and size class *s* for the population in a given country¹⁸, $S_{firms_{ks}}$ as the number of firms in sector *k* and size class *s* in the sample, P_{firms} and S_{firms} as the total number of firms in the population and sample respectively. These weights have the property that their sum over the firms is equal to the total number of firms in the sample by country.

Absolute weight (*w*) for the firms in sector *k* and size class *s* is built as follows:

$$w_{ks} = \frac{P_{firms_{ks}} / P_{firms}}{S_{firms_{ks}} / S_{firms}} \times \frac{P_{firms}}{S_{firms}} = \frac{P_{firms_{ks}}}{P_{firms}} \times \frac{P_{firms}}{S_{firms_{ks}}}, \text{ that is } w_{ks} = \frac{P_{firms_{ks}}}{S_{firms_{ks}}}$$

These weights have the property that their sum over the firms is equal to the total number of firms in the reference population by country. Firms belonging to the same sector/size cell share the same weight.

¹⁷ GFK Eurisko collected the data making use of a sampling design that oversamples large firms, in order to capture the higher variability characterizing this part of firm population.

¹⁸ As reference population we use firms with more than 10 employees, as defined in the survey.

Data about the firm distribution by size/sector have been retrieved from Eurostat - Structural Business Statistics (year 2007). In order to correct for the missing values for turnover data (Amadeus), we have also built another set of weights when our elaborations involved the use of this variable.

B. Counterfactual Exercise and Decomposition

As Eurostat data shows, the structure of manufacturing by firm size and sector specialization is different across countries. We implement a counterfactual exercises hypothesizing that the other countries' manufacturing has the same size/sector structure than Germany. Thus, we compare different export performance indicators (extensive margin, intensive margin and the total export value) computed making use of National weights - capturing the domestic size/sector manufacturing structure - with the ones obtained making use of German weights. The sub-section A of this Appendix has shown that National weights are defined by the equation¹⁹:

$$w_i = \frac{P_{firms_i}}{S_{firms_i}}$$

The counterfactuals are computed assuming that firms are drawn from the German population. The weights are then redefined accordingly as:

$$w_i^{GER} = \frac{P_{firms_i}^{GER}}{P_{firms}^{GER}} \times \frac{P_{firms}}{S_{firms_i}}$$

where $P_{firms_i}^{GER}$ is the number of firms in cell i for the German population, thus the term $P_{firms_i}^{GER}/P_{firms}^{GER}$ represents the share of cell i in the German manufacturing sector and the term P_{firms}/S_{firms_i} allows to report the sample to the national firm universe.

Making use of these new weights we compute some export performance indicators. Thus, for example, total export under the own distribution and the German one are:

$$TotExport = \sum_j (Export_j \times w_{i(j)})$$

$$TotExport^{GER} = \sum_j (Export_j \times w_{i(j)}^{GER})$$

¹⁹ The cell i consists of the intersection between the sector k and size class s , thus $w_i = w_{ks}$

where $Export_j$ is the value of export of firm j and $w_{i(j)}$ and $w_{i(j)}^{GER}$ are the weights defined above for class i , to which firm j belongs.

Then, for each country, we decompose the difference between the export performance indicators we obtain when we use German weights and the ones obtained using National weights. Define $Pfirms_k$ ($Sfirms_k$) the number of firms in sector k in the population (sample), $Pfirms_s$ ($Sfirms_s$) the number of firms in size class s in the population (sample), $Pfirms_{ks}$ ($Sfirms_{ks}$) the number of firms in sector k and size class s in the population (sample). The absolute weight can be written as the product between the share of the cell (sector k and size s) in the population ($Pfirms_{ks}/Pfirms$) and the ratio between the number of firms in the population and the number of firms in the cell for the sample ($Pfirms/Sfirms_{ks}$). The first component, the cell share in the population, can be expressed as the product of two terms: (i) the within-sector size share, and (ii) the sector share in the population, as follows:

$$w_{js} = \left(\frac{Pfirms_{ks}}{Pfirms_k} \times \frac{Pfirms_k}{Pfirms} \right) \times \frac{Pfirms}{Sfirms_{ks}}$$

Being interested in how export indicators change when we use different weights, we focus on the difference in the weights, $w_{ks}^{GER} - w_{ks}$, that is what drives the change in our export performance indicators and we use the following decomposition:

$$\begin{aligned} w_{ks}^{GER} - w_{ks} = & \left[\left(\frac{Pfirms_{ks}^{GER}}{Pfirms_k^{GER}} - \frac{Pfirms_{ks}}{Pfirms_k} \right) \times \frac{Pfirms_k}{Pfirms} + \frac{Pfirms_{ks}}{Pfirms_k} \times \left(\frac{Pfirms_k^{GER}}{Pfirms^{GER}} - \frac{Pfirms_k}{Pfirms} \right) \right] + \\ & + \left(\frac{Pfirms_{ks}^{GER}}{Pfirms_k^{GER}} - \frac{Pfirms_{ks}}{Pfirms_k} \right) \times \left(\frac{Pfirms_k^{GER}}{Pfirms^{GER}} - \frac{Pfirms_k}{Pfirms} \right) \times \frac{Pfirms}{Sfirms_{ks}} \end{aligned}$$

The first component of the decomposition captures the effect of the change in the size composition within sector; the second term shows the effect of the change in the sector composition of the population and, finally, the last term represent the interaction between the previous two changes.

The same procedure is applied when we use employment weights, in order to keep fixed the size of manufacturing sector in terms of total number of employees. In this case, the weights do not refer to the firm but to the employees instead. The employment-based weights for firm j are defined as:

$$e_j = \frac{P_{employment}_i}{S_{employment}_i} \quad \text{with firm } j \in \text{cell } i^{20}$$

where $P_{employment}_i$ is employment in the population in cell i and $S_{employment}_i$ is employment in the cell i in the sample. These weights have the property that the sum of firm level employment with this weighting scheme is equal to the total employment in the population. To compute the counterfactuals, we use:

$$e_j^{GER} = \frac{P_{employment}_i^{GER}}{P_{employment}_i} \times \frac{P_{employment}_i}{S_{employment}_i}$$

For the decomposition, the procedure is the same as shown above ($P_{employment}$ instead of P_{firms}).

Appendix III. Industrial Structures

Table A5
Distributions of firms by sector and by country

	DE	ES	FR	IT
Food, beverages and tobacco	15,8	13,2	27,1	14,0
Manufacture of textiles	1,9	3,8	1,9	4,4
Manufacture of wearing apparel; dressing; dyeing of fur	1,2	5,5	4,6	7,1
Tanning, dressing of leather; manufacture of luggage	0,5	2,6	0,8	3,7
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	6,5	7,1	4,2	7,9
Manufacture of pulp, paper and paper products	0,8	1,0	0,6	0,8
Publishing, printing, reproduction of recorded media	9,2	11,0	12,7	5,2
Manufacture of coke, refined petroleum products and nuclear fuel	0,0	0,0	0,0	0,1
Manufacture of chemicals and chemical products	1,7	1,9	1,5	1,1
Manufacture of rubber and plastic products	3,4	2,6	2,0	2,4
Manufacture of other non-metallic mineral products	4,6	5,4	3,6	5,0
Manufacture of basic metals	1,1	0,7	0,4	0,7
Manufacture of fabricated metal products, except machinery and equipment	18,9	20,2	11,7	19,0
Manufacture of machinery and equipment n.e.c.	10,4	6,8	6,2	8,1
Manufacture of office machinery and computers	0,7	0,5	0,2	0,4
Manufacture of electrical machinery and apparatus n.e.c.	2,9	1,3	1,6	3,4
Manufacture of radio, television and communication equipment and apparatus	1,3	0,4	0,9	1,4
Manufacture of medical, precision and optical instruments, watches and clocks	8,2	2,5	4,6	4,1
Manufacture of motor vehicles, trailers and semi-trailers	1,2	1,0	0,8	0,4

²⁰ This weight refers to each employee in the firm j .

Manufacture of other transport equipment	0,6	1,3	1,3	1,1
Manufacture of furniture; manufacturing n.e.c.	8,7	11,3	13,0	9,7
Total manufacturing	100,0	100,0	100,0	100,0

Source: Eurostat, Structural Business Statistics

Table A6
Average firm size, by country and sector
(in percentage of the sectoral average of the five countries)

	DE	ES	FR	IT	UK
Food, beverages and tobacco	110,6	57,7	38,6	26,8	266,4
Manufacture of textiles	169,8	60,6	96,6	67,4	105,6
Manufacture of wearing apparel; dressing; dyeing of fur	213,7	73,5	54,9	67,9	90,0
Tanning, dressing of leather; manufacture of luggage	156,2	68,7	107,3	69,2	98,7
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	142,2	80,1	97,4	52,5	127,8
Manufacture of pulp, paper and paper products	204,5	59,7	114,1	43,4	78,4
Publishing, printing, reproduction of recorded media	197,4	63,7	58,1	61,3	119,7
Manufacture of coke, refined petroleum products and nuclear fuel	115,8	239,0	89,6	17,2	38,4
Manufacture of chemicals and chemical products	202,2	52,2	108,2	53,6	83,9
Manufacture of rubber and plastic products	168,8	65,3	131,1	49,7	85,0
Manufacture of other non-metallic mineral products	141,4	92,6	79,3	51,6	135,2
Manufacture of basic metals	170,8	73,8	131,3	57,7	66,4
Manufacture of fabricated metal products, except machinery and equipment	170,6	67,6	108,7	59,3	93,8
Manufacture of machinery and equipment n.e.c.	217,9	53,7	80,4	57,4	90,6
Manufacture of office machinery and computers	213,5	31,8	89,9	55,0	109,8
Manufacture of electrical machinery and apparatus n.e.c.	223,8	83,7	99,2	29,5	63,7
Manufacture of radio, television and communication equipment and apparatus	186,5	76,9	132,3	34,0	70,3
Manufacture of medical, precision and optical instruments, watches and clocks	154,8	51,1	87,3	48,1	158,6
Manufacture of motor vehicles, trailers and semi-trailers	254,5	54,4	88,7	61,7	40,8
Manufacture of other transport equipment	218,8	42,2	81,8	39,0	118,2
Manufacture of furniture; manufacturing n.e.c.	171,7	78,5	54,7	71,5	123,6
Total manufacturing	196,8	64,5	75,9	49,5	113,3

Source: Eurostat

Appendix IV. International Trade Statistics: Aggregate Data

Aggregate statistics show that there are huge country differences in export performance. The WTO (2009) report “International Trade Statistics” e.g. provides extensive evidence of export and

import statistics for all WTO member states. Concerning merchandise exports, Europe accounts in 2008 for 41% of world's total merchandise exports. Within Europe, there are still large differences between the single economies. While Germany accounts for 9.3% of the world's merchandise exports, France accounts for 3.9, Italy for 3.4 and the UK for 2.9. The shares of imports are quite similar, even when not showing such strong differences. Germany e.g. accounts for 7.5% of world's merchandise imports, France for 4.4, the UK for 3.9 and Italy for 3.4. In the same year, according UNCTAD, the share of exports over GDP was 39.9% for Germany, 23.5% for Italy, 21.6% for France, 16.7% for Spain, 43.3 for Austria and 69.3 for Hungary. With respect to the current account position in 2008, the IMF (2009) shows that in 2008, Germany had a surplus of 6.4% of GDP, Austria 2.9%, France a deficit of -1.6% of GDP, Italy -3.2%, and Spain -9.6%.

Concerning the value in USD, Germany was exporting merchandise products for 1,461.9 Billion USD in 2008, France 605.4 Billion USD, Italy 538.0 Billion USD, the UK 458.6 Billion USD, Spain 268.3 Billion USD, Austria 181.0 Billion USD, and Hungary 107.7 Billion USD. With respect to merchandise imports, Germany imported in 2008 1,203.8 Billion USD, France 705.6 Billion USD, the UK 632.0 Billion USD, Italy 554.9 Billion USD, Spain 401.4 Billion USD, Austria 183.4 Billion USD, and Hungary 107.9 Billion USD. As these figures suggest, Germany is the world's leading exporter in 2008, followed by China, the US, and Japan. France is ranked at number 6, Italy rank 7, the UK rank 10, Spain 17, Austria 25, and Hungary rank 36.

However, with respect to the export participation rate (percentage of exporting firms), Germany is not as outstanding: A study by the International Study Group on Exports and Productivity (2008) shows that in 2004, distinguishing between East and West Germany, West Germany has 69.3% of firms that export, whereas East Germany has only 50.9%. For France this work shows an extensive margin of 74.8, for the UK a rate of 69.5, and Italy of 69.3%. Sweden is leading the European countries with an export participation rate of 83.0%.

Moving on outward FDI, the FDI Stat database from UNCTAD reports that France in 2008 has a share of 49.5% of outward FDI to GDP, Austria of 36.6%, Germany of 39.7%, Hungary 9.1%, Italy 22.7%, Spain 37.5% and UK 57%. Concerning the value of sales by foreign affiliates, Germany is leading with 400.1 Billion USD in 2004, French foreign affiliates sold goods with a value of 145.6 Billion USD in 2003, and Italian ones 115.3 Billion USD.

Looking at the competitiveness of European countries in China, Germany accounts for the largest share of total world exports to China when compared with other economies in 2008: 4.6% for Germany, 1.4% for France, 1.2% for Italy, 0.3% for Spain, and 1.3% for UK.

For a huge amount of additional statistics concerning country differences in international trade structures, also e.g. the contribution of exports to the countries' growth rate, see e.g. IMF (2005).