The global operations of European firms

The second EFIGE policy report

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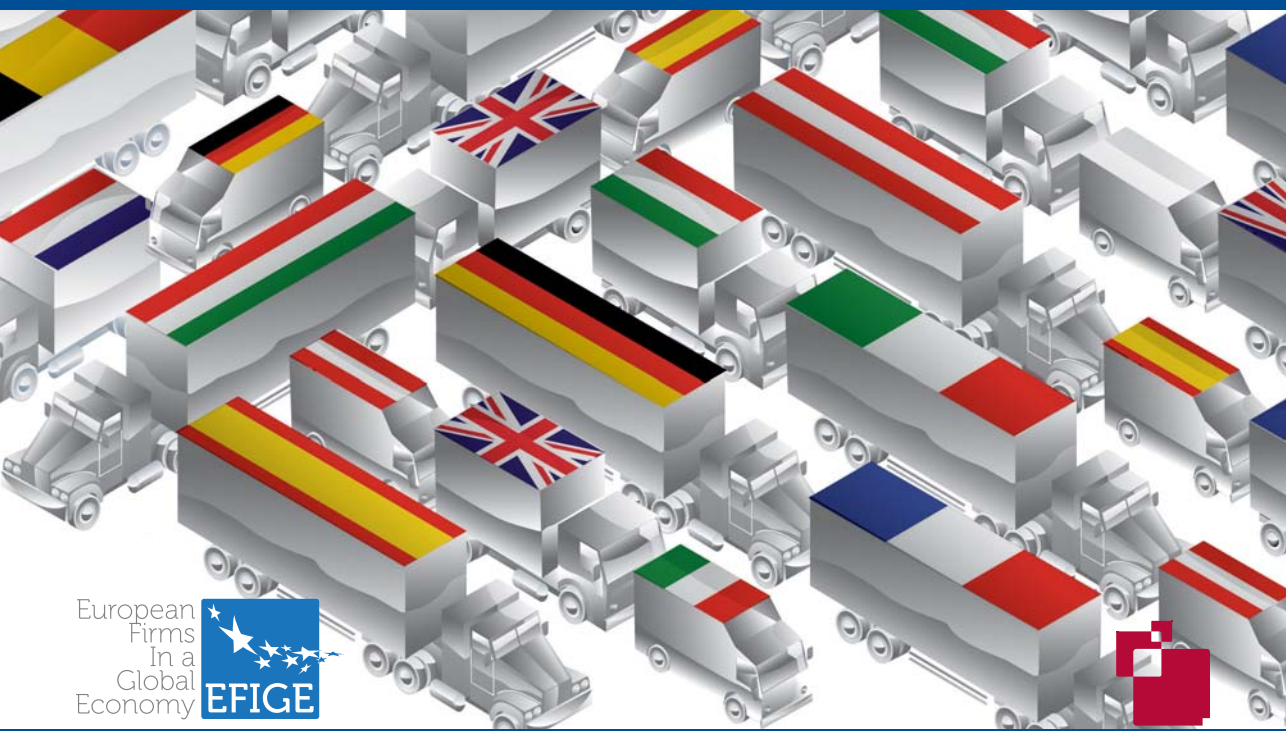

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The global operations of European firms: the second EFIGE policy report

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EFIGE PARTNERS

The leaders of the eight teams are: Gianmarco I.P. Ottaviano, Bocconi University, for Bruegel; Lionel Fontagné, PSE, University of Paris I, for CEPII; Karen Helene Ullveit-Moe, University of Oslo, for CEPR; László Halpern for the Hungarian Academy of Sciences; Giorgio Barba Navaretti, University of Milan, for Ld'A; Claudia Buch, University of Tübingen, for IAW; Andrea Brasili for UniCredit; Klaus Desmet for University Carlos III Madrid. Giorgio Barba Navaretti, Gianmarco I.P. Ottaviano and Thierry Mayer (PSE, CEPII and CEPR) coordinate the teams. Delphine Michel, Bruegel, is the project manager. Centro Studi Luca d'Agliano (Ld'A) was the partner responsible for the preparation of this report.

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Foreword

This is Bruegel's third report on the internationalisation of European firms, and the first one that relies on new, internationally consistent data resulting from the seven-country survey undertaken within the framework of the EFIGE (European Firms in a Global Economy) project.

In the first, 2007 report, *The happy few*, Thierry Mayer and Gianmarco Ottaviano were making the best of patchy, heterogeneous data to show what a better knowledge of firm internationalisation patterns could bring to the understanding of trade performance, revealing things about the behaviour of firms that aggregate trade data simply cannot show. In the second, *Of markets, products and prices*, published in 2009, Lionel Fontagné, Thierry Mayer and Gianmarco Ottaviano were using the same type of data to analyse the effects of the euro on intra-European trade. Again, the approach was promising, but due to data limitations the evidence was partial.

It was on this basis that Bruegel, together with the Centre for Economic Policy Research (CEPR) and partners from seven countries, undertook to collect comprehensive and consistent firm-level data. Thanks to generous support from the European Union's Seventh Framework Programme, and from UniCredit (which pioneered similar data collection in Italy), the EFIGE project was launched in 2009. This report by Giorgio Barba Navaretti, the project co-leader, and colleagues, offers a first systematic analysis of the rich set of data resulting from the survey. Other reports will follow, and a series of working papers is being published (all the material from the research project is available on www.efige.org).

The findings summarised in this report are reassuring for researchers: the hypotheses they had formed on the basis of theory and partial evidence are by and large confirmed. As the authors emphasise in the report, the most compelling fact that emerges from systematic comparisons is that firms in different countries behave in a strikingly similar way. To put it in simple words, there is no special gene that explains why Germany exports much more than Italy or Spain. In fact, German firms do not differ markedly from similar firms elsewhere in Europe. Rather, the structure of German

industry and especially the density of medium-sized firms go a long way towards explaining macroeconomic differences with neighbouring countries.

It is therefore on the basis of strong evidence that research can deliver messages about policy. The main message is that, at a time when most governments have put competitiveness at the top of their agenda, they should first and foremost focus on firm-level development. The key questions for policymakers looking for ways to increase exports are how they can foster growth in the size of existing small and medium-sized firms, and how they can promote the entry of new firms. In turn, actions to this end will help improve productivity, foster innovation and enrich skills.

True, all that is easier said than done. But at least it is important to set the right agenda and focus on the right priorities. This reports is a contribution to these ends.

Jean Pisani-Ferry, Director, Bruegel
Brussels, July 2011

Executive summary

The increased worldwide integration of real and financial markets has made countries' overall growth performance more reliant than in the past on their trade competitiveness and, more in general, on their 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 percent of gross domestic product to the Spanish deficit of 9.7 percent) is among the key causes of macroeconomic instability throughout Europe. Therefore, understanding the roots of trade performance and global involvement is an essential policy challenge[1].

Why is there so much variation between European Union countries in trade performance? Germany is by far the most export oriented, with a share of exports to GDP of 39.9 percent, followed by Italy (23.4 percent), France (21.3 percent), the United Kingdom (17.2 percent) and Spain (16.7 percent). Why are there similar, if not greater, differences in terms of foreign direct investment and other forms of production internationalisation[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 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*, independent of other features of national economies. This is especially important because the characteristics of key firms and their within-country distributions are very different in different European nations.

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 internalisation strategies, a topic that goes well beyond the scope of our work.

This report is the first 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 UK). 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.

This report finds that *the international performance of European firms is largely independent of the country in which they are located. Companies that 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 internationalisation strategies, such as exporting to a larger number of markets, or to more difficult and distant countries, or producing abroad, either through foreign direct investment (FDI) or international outsourcing (IO), ie production carried out by a foreign third firm under some sort of arms-length contract[3].

Multi-country strategies of international production are essential for 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 percent of European exporters sell their products within the EU, a much smaller proportion sell to distant emerging markets.* Even more importantly, in all countries *the smaller the firms, the more difficult it is to overcome the rising fixed costs of global operations.*

The emphasis on firm 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, which is also undertaken by many medium-sized firms.

This report also finds that firms with comprehensive global operations were more

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 internationalisation is substantially lower than that of larger firms. Therefore an industrial structure in which medium to large firms are well represented can significantly raise to export and FDI.

resilient in the face of the 2008-09 crisis. The highly developed 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 hides 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 internationalisation 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 distribution, and in terms of innovative capacity and productivity.* Moreover, consistent 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 national 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 of central importance raises new challenges for policy. Should policy making aim to foster those firm-specific drivers of internationalisation? For example, we find that, *if the industrial structure (in terms of firm size and sectors) of countries such as Italy and Spain were to converge to the structure of Germany, the value of Italian and Spanish total exports would rise considerably – by 37 percent and 24 percent respectively*. Needless to say, this suggestive counterfactual exercise must be interpreted with caution, particularly when deriving policy recommendations.

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 intervention, such as measures 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 to force firm growth, or to changes 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 analysed using fully comparable cross-country data. In addition, and again for the first time, it has been possible to study within a unique framework the comprehensive range of global operations available to firms: export, imports, FDI and international outsourcing.

The rest of this work is organised 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 exporters, how much of their turnover comes from foreign sales. Section 3 looks at where and to how many markets firms export. Section 4 then examines patterns of global production, either as foreign direct investment 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 if internationalised firms have been better able to weather the international crisis, or if they have been more exposed to it. Section 8 concludes and sums up the key policy recommendations.

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 (see 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 eg Bernard *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. However, though 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 internationalisation modes and a more comprehensive set of firm level characteristics.

MAIN MESSAGES OF THE REPORT

Fact 1	In all countries, firms involved in international markets are, in general, larger, more productive, more skill intensive and more innovative.
Fact 2a	The international performance of European firms is primarily explained by firm-specific characteristics. Country or sector features play a secondary role.
Fact 2b	Exports are related to firm characteristics in a remarkably similar way across countries.
Fact 3	Most firms export to a few nearby countries only. Their geographical reach primarily depends on firm characteristics, primarily size.
Fact 4a	The majority of European firms use imported inputs. Between five and ten percent of firms in each sample country produce abroad using foreign affiliates or international outsourcing.
Fact 4b	FDI and IO are generally exclusive modes of carrying out international production. FDI is more frequently used by larger firms to support sales in foreign markets. German firms are more likely to choose FDI, Italian and French firms IO.
Fact 4c	Multi-country strategies of international production are instrumental in increasing foreign exports, especially to emerging economies.
Fact 5a	Internationalisation patterns of countries differ mainly because nations differ in their internal industrial structures, ie in the distribution of their firms' characteristics, such as size and productivity.
Fact 5b	If Italy and Spain had the industrial structure of Germany their exports would grow considerably, mostly because of firm-size effects.
Fact 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 their exports during the crisis.

1 The source of information: new and unique data

This report is the first research output based on the the EFIGE dataset, collected within the project '*EFIGE – European Firms in a Global Economy: internal policies for external competitiveness*'. This data set is unique in that it provides for the first time comparable and consistent cross-country information on many characteristics of European firms, with a strong focus on internationalisation. The EFIGE data have been complemented by balance-sheet data drawn from the Amadeus database managed by Bureau van Dyck. Since the sample design over-represents 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 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 Germany and the UK[5], and 500 for Austria and Hungary. In the appendix we detail the distribution of the sample by sector and size class for each country.

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

Table 1.1: Number of sampled firms by country

Country	Number of firms
Austria	492
France	2,973
Germany	2,202
Hungary	488
Italy	3,019
Spain	2,832
UK	2,156
Total	14,162

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

Fact 1 – Firms involved in international markets are larger, more productive, more skill intensive and more innovative in all countries.

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 internationalisation. Firms were 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, *et al*, 2007 and references therein). In all seven 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).

When we plot distributions (Kernel densities) of labour productivity for non exporters, exporters with no foreign direct investment, and firms with some production abroad we find for all the main four continental European countries, the productivity distribution of exporters is rightward-shifted with respect to that of non exporters, and that of foreign direct investors is to the right of that of exporters (Figure 1.1). That only more productive firms invest in more complex internationalisation strategies is already known from the literature (see eg Antras and Helpman, 2004, and Helpman *et al*, 2004).

This descriptive evidence confirms the well known fact that exporting firms are 'better' than non-exporting ones. However, there are noticeable differences across countries

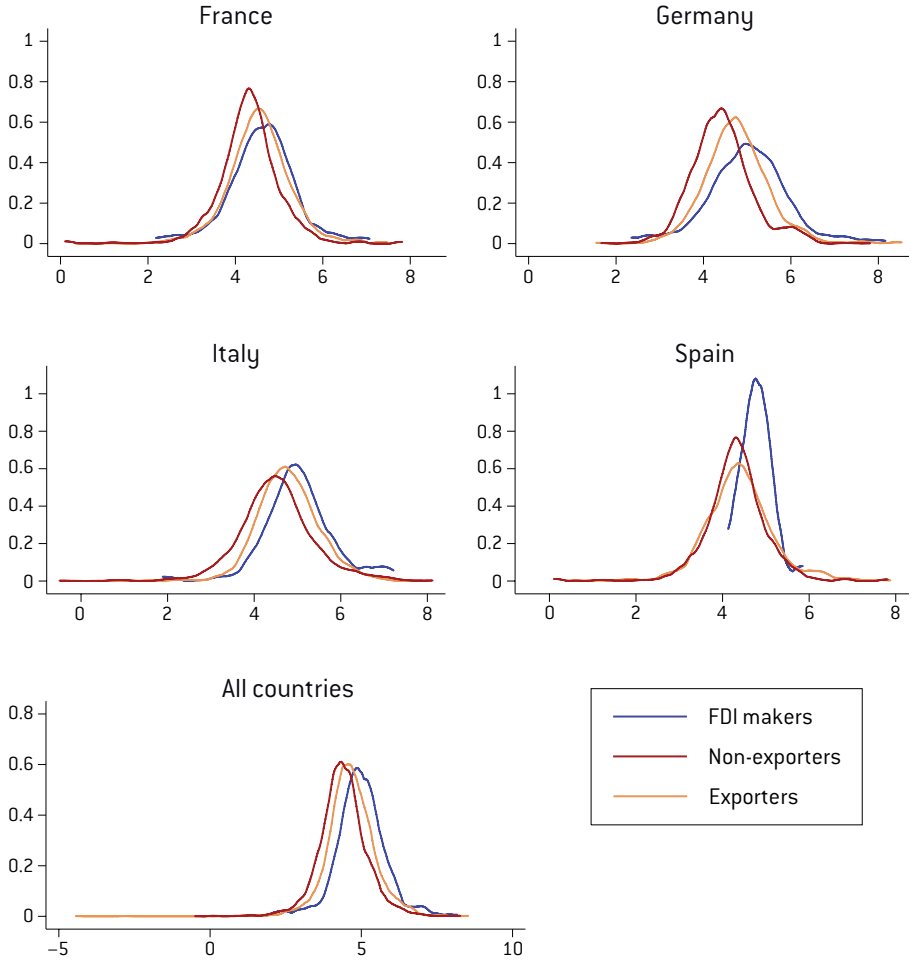
in firms' characteristics, even within the exporting group. For example, Spanish and especially Italian exporters are substantially smaller than those located in the other countries. This descriptive evidence, therefore, suggests that both firm characteristics and country specificities play a role in determining the internationalisation modes of European firms. The main goal of the rest of this report is to try to disentangle these two factors.

Table 1.2: **Descriptive statistics by export status**

	Austria		France		Germany		Hungary		Italy		Spain		UK		ALL	
Variable	Exp.	Non Exp.	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	82	40
Labour productivity	157	214	125	99	180	111	63	49	159	138	116	82	-	-	151	110
Blue-collar share	55.21	64.29	55.88	55.38	56.12	55.69	68.27	63.57	64.42	70.79	72.80	76.05	66.51	68.61	61.98	63.59
Graduate share	5.30	4.28	10.59	4.97	12.91	9.08	15.90	14.81	7.20	4.50	11.51	8.99	10.36	5.47	10.21	6.96
Age	44	51	43	33	46	44	19	15	31	26	29	24	38	33	37	33
Group	15.60	4.41	14.94	3.41	7.40	1.55	14.94	7.69	3.66	1.15	6.19	0.95	19.55	5.89	0.09	0.02
Foreign ownership	15.92	4.35	14.81	4.07	8.68	2.25	24.04	11.31	5.21	1.38	6.60	1.14	16.23	5.28	0.09	0.03
Product innovation	61.43	50.69	53.99	35.57	59.08	34.91	47.59	34.79	55.35	28.33	52.14	31.94	66.58	37.91	0.57	0.34
RD share	3.55	1.96	3.88	1.77	5.48	2.05	1.84	0.54	4.53	2.39	3.84	2.29	4.33	1.74	4.47	2.04
Bank debt share	87.35	85.74	78.41	79.06	82.87	86.00	81.53	86.05	88.35	85.18	86.85	85.73	65.69	64.34	83.83	82.27
Venture capital	5.22	0.00	4.58	5.99	5.17	4.53	0.00	0.00	0.35	0.52	2.97	3.06	2.45	2.18	0.02	0.03

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' calculations from EU-EFIGE/Bruegel-UniCredit dataset.

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



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

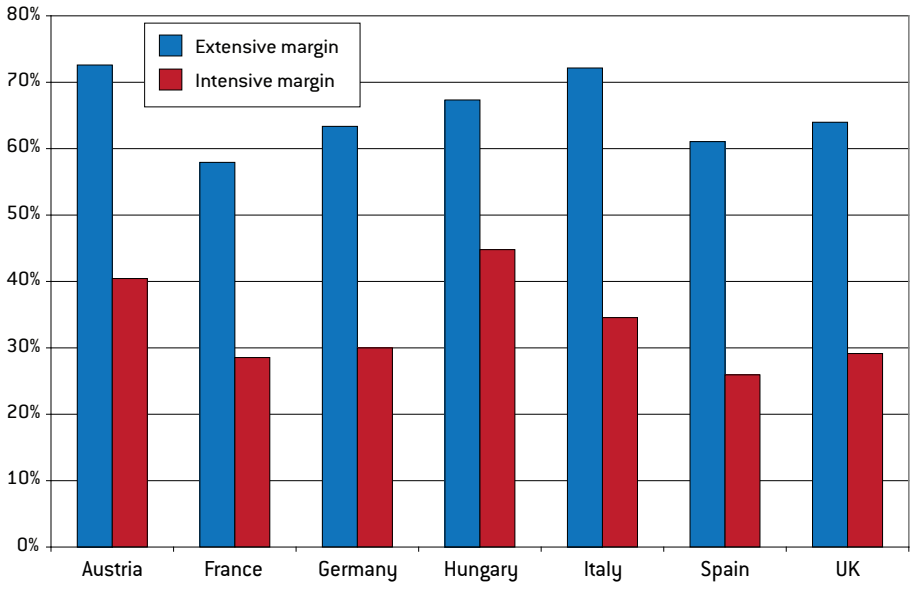
2 Exporting activity

Fact 2a – The international performance of European firms is primarily explained by firm-specific characteristics. Country or sector features play a secondary role.

By using firm-level data it is possible to decompose a country's manufacturing exports into two margins: the percentage of firms in manufacturing that export a 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')[6]. 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 percent) and a relatively high intensive margin (35 percent).

6. For each country, the extensive margin is computed as follows $EM = \frac{N^{EX}}{N^{TOT}} \times 100$, where $\mathrm{N^{EX}}$ is the total number of exporters in the country and $\mathrm{N^{TOT}}$ is the total number of firms. The intensive margin is instead computed as $IM = \frac{1}{N^{EX}} \sum_{i=1}^{N^{EX}} \frac{EXP_i}{TURN_i} \times 100$, where $\mathrm{EXP_j}$ is the firm i's value of exports, $\mathrm{TURN_i}$ is its turnover and $\mathrm{N^{EX}}$ is the number of exporters in the country.

Figure 2.1: Extensive and intensive margin of exports by country



Source: Authors' calculations 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)

Size class	Austria	France	Germany	Hungary	Italy	Spain	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' calculations 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)

Size class	Austria	France	Germany	Hungary	Italy	Spain	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' calculations 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 exports 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 characteristic for internationalisation. As pointed out in many recent papers analysing the determinants of exporting activity on the basis of firm-level data, exporting firms are usually larger, more productive and innovative than average. In other words, several firm characteristics, often but not always

correlated to size, are also expected to affect patterns of internationalisation. Equally, country and industry features are related to internationalisation patterns. We therefore now follow a more general and systematic approach, encompassing the interplay of several contributing factors. We perform a regression analysis of the extensive (if firms do export or not) and intensive margins (how much firms export) 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.

As a first step we analyse the decision to export, the extensive margin of export. Results are reported in Table 2.3[7]. Specifically we estimate a linear probability model where the dependent variable is a dummy which is equal to 1 if a firm exports and 0 otherwise[8]. The first set of estimates has only country dummies as regressors (column 1). With respect to Germany (the benchmark 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 percent. 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 percent. Focusing on the country dummies, we see that an unfavourable sectoral specialisation absorbs the negative coefficient of Spain, and makes Hungary's 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.

Interestingly, things 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 percent. 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 percent.

It is a well known fact that exporters are on average more productive than non

7. Robust standard errors have been computed in each regression, but for the sake of brevity we do not show them in tables.
8. 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.

Table 2.3: Exporting or not (the extensive margin); a linear probability model of the decision to export

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:				Add	All	
Firm probability of exporting	Country dummies	Add sector dummies	Add firm size	productivity no UK	controls no UK & SP	All controls
Log(Employment)			0.105***	0.096***	0.075***	0.078***
Log(Age)					0.046***	0.055***
Log(LP)				0.090***	0.083***	
Group					-0.023	0.013
Foreign own					0.108***	0.118***
Blue-collar share					0.000	
Graduate share					0.002***	0.003***
Product Innov					0.144***	0.151***
RD share					0.005***	0.005***
Bank debt share					0.000***	0.000***
Austria	0.092***	0.101***	0.104***	0.113***	0.113***	0.101***
France	-0.054***	-0.048***	-0.038***	-0.058***	-0.046***	-0.026**
Hungary	0.04	0.046*	0.045*	0.138***	0.142***	0.071***
Italy	0.088***	0.078***	0.104***	0.074***	0.077***	0.119***
Spain	-0.023*	-0.021	0.004	-0.002		0.028**
UK	0.006	-0.010	-0.004			-0.005
Constant	0.634***	0.473***	0.107***	-0.245***	-0.466***	-0.121***
No. obs.	14162	14162	14162	8313	7111	13345
R-squared	0.011	0.054	0.092	0.110	0.168	0.150

Due to missing observations concerning productivity for UK and blue-collar share for both UK and Spain, Spain has not been included in regression 5, UK in columns 4 and 5. ***, **, * significant at 1 percent, 5 percent, 10 percent. Robust standard errors have been computed but not shown for sake of brevity. Columns 2-6 include sector dummies.

exporters[9]. In column 4 we therefore add labour productivity (we are forced to exclude UK firms for which we have no reliable data on added value). Both firm size and labour 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 a second firm-level characteristic 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, which lacks data on the share of blue-collar workers, and the UK, which lacks productivity). Overall, we can confirm that exporters are on average larger, more productive, more innovative and employ more skilled workers, as pointed out by many scholars using different country datasets (Bernard and Jensen, 1995, 1999, 2004a, 2004b, and ISGEP, 2008). Firms belonging to a foreign group are also more likely to be exporters[10].

Given an R^2 of around 15 percent, we can approximately estimate that 64 percent of the total variance explained by the model comes from firm-level controls, against 29 percent from the sectoral composition and only less than 7 percent from the country dummies[11]. 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 Austria, Hungary, Italy and Spain.

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 percent, against 34 percent for sectors and about 15 percent for the country dummies). The higher export propensity of Austrian, Hungarian and Italian firms is also confirmed.

9. Recent models in the international trade literature with heterogeneous firms (Bernard, *et al*, 2003; Melitz, 2003; Metliz and Ottaviano 2008) argue that, due to the presence of fixed costs of exporting, only more productive firms are able to pay such costs and start exporting. A number of empirical studies have confirmed this results using firm-level datasets from various countries (see the seminal papers by Bernard and Jensen (1995) and Bernard and Wagner (1997); Wagner (2007) and ISGEP (2008) provide a comprehensive survey of the related literature and a cross-country comparison).
10. Firms belonging to a foreign group and localised in different countries are more likely to exchange intermediate inputs and other goods.
11. 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.

To sum up, firm characteristics – size, productivity, innovative activity, skill content of the workforce – are the primary determinants of export performance and outweigh 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.

Table 2.4: How much to export (the intensive margin) estimates of export shares, only exporters

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Firm export share	Country dummies	Add sector dummies	Add firm size	Add productivity no UK	All controls no UK & SP	All controls
Log(Employment)			0.049***	0.053***	0.043***	0.042***
Log(Age)					-0.003	0.001
Log(LP)				0.030***	0.030***	
Group					0.009	0.034*
Foreign own					0.129***	0.097***
Blue-Collar share					0.000**	
Graduate share					0.001***	0.001***
Product innov					0.042***	0.038***
RD share					0.004***	0.003***
Bank debt share					-0.000***	-0.000***
Austria	0.104***	0.112***	0.113***	0.101***	0.091***	0.116***
France	-0.015	-0.010	-0.008	-0.006	-0.002	-0.003
Hungary	0.148***	0.165***	0.163***	0.191***	0.178***	0.162***
Italy	0.045***	0.048***	0.066***	0.059***	0.080***	0.093***
Spain	-0.041***	-0.032***	-0.018*	-0.022		0.003
UK	-0.009	-0.010	-0.003			-0.007
Constant	0.300***	0.202***	0.017	-0.150***	-0.193***	-0.010

Due to missing observations concerning productivity for UK and blue-collar share for both UK and Spain, Spain has not been included in regression 5, UK in columns 4 and 5. ***, **, * significant at 1 percent, 5 percent, 10 percent. Robust standard errors have been computed but not shown for sake of brevity. Columns 2-6 include sector dummies.

Fact 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 outweigh 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 Spain and the UK we choose to work with the specification without labour 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: Exporting or not (the extensive margin)

A linear probability model of the decision to export					
By country					
Dependent variable: Firm probability of exporting	France	Germany	Italy	Spain	UK
Log(Employment)	0.075***	0.092***	0.071***	0.077***	0.056***
Log(Age)	0.088***	0.021*	0.073***	0.122***	0.040***
Group	0.023	0.046	-0.068	0.046	0.048
Foreign own	0.129***	0.084	0.130**	0.098	0.072
Graduate share	0.005***	0.002**	0.002***	0.001	0.003***
Product innov	0.123***	0.160***	0.160***	0.131***	0.191***
RD share	0.003**	0.006***	0.003***	0.005***	0.004**
Bank debt share	0.000**	0.000	0.000**	0.000	0.000
Constant	-0.296***	-0.113**	0.039	-0.158**	-0.022
No. obs.	2926	2144	3002	2521	1827
R-squared	0.197	0.182	0.124	0.137	0.177

***, **, * significant at 1 percent, 5 percent, 10 percent. Robust standard errors have been computed but not shown for sake of brevity. Regressions include sector dummies.

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 for 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 compared to Germany, France and the 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: How much to export (the intensive margin)

Estimates of export shares, only exporters					
By country					
Dependent variable: firm export share	France	Germany	Italy	Spain	UK
Log(Employment)	0.029***	0.030***	0.053***	0.056***	0.027***
Log(Age)	0.004	0.005	0.005	-0.006	0.000
Group	0.057	-0.017	0.045	-0.027	0.135***
Foreign own	0.122***	0.130***	0.067*	0.136**	-0.032
Graduate share	0.002***	0.001	0.001*	0.001*	0.004***
Product innov	0.009	0.051***	0.053***	0.009	0.040**
RD share	0.002**	0.003***	0.002***	0.003***	0.003***
Bank debt share	0.000	-0.000***	0.000	0.000	-0.000*
Constant	0.065	0.016	-0.005	0.035	-0.012
No. obs.	1412	1013	1958	1271	1050
R-squared	0.146	0.165	0.123	0.106	0.168

***, **, * significant at 1 percent, 5 percent, 10 percent. Robust standard errors have been computed but not shown for sake of brevity. Regressions include sector dummies.

3 Global markets

Fact 3 – Most firms export to a few nearby countries only. Their geographical reach primarily depends on firm characteristics, primarily size.

Export propensities and shares provide just part of the overall picture of the internationalisation 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: Where do exporters go?

The distribution of exporting firms across markets of destination *(percentage of exporters exporting to)*								
Country	EU15	Other EU	Other Europe	China India	Other Asia	US Canada	Central South America	Others
Austria	94.2	49.9	46.8	16.4	17.7	22.5	7.08	12.4
France	92.5	36.8	41.8	22.0	27.0	31.6	14.7	30.6
Germany	93.1	47.9	52.7	27.9	25.9	36.8	16.4	16.6
Hungary	82.0	50.1	24.1	1.6	5.2	6.9	0.7	4.3
Italy	89.6	41.0	49.7	17.7	23.6	30.5	19.3	24.2
Spain	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' calculations 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 more distant destinations such as the US and the fast-growing markets of China, India or Latin

America. This pattern is invariant in all sample countries. These extra-European destinations are more costly to reach and often involve higher risks and other barriers than EU markets. Moreover, when we move to more distant destinations, more marked country differences seem to emerge. For example, in China and India, two markets where most of exporters still have to make their entry move, German firms have gained a competitive edge: the share of German firms exporting there is 5 percentage points higher than that of France, 10 points higher than Italy and almost 20 points higher than Spain. Surprisingly, Spanish firms are more likely to export to 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[12]. 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 percent of the total variance explained against 25 percent for the country dummies. Interestingly, the sectoral patterns, that now contribute 43 percent of the total variance, 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.

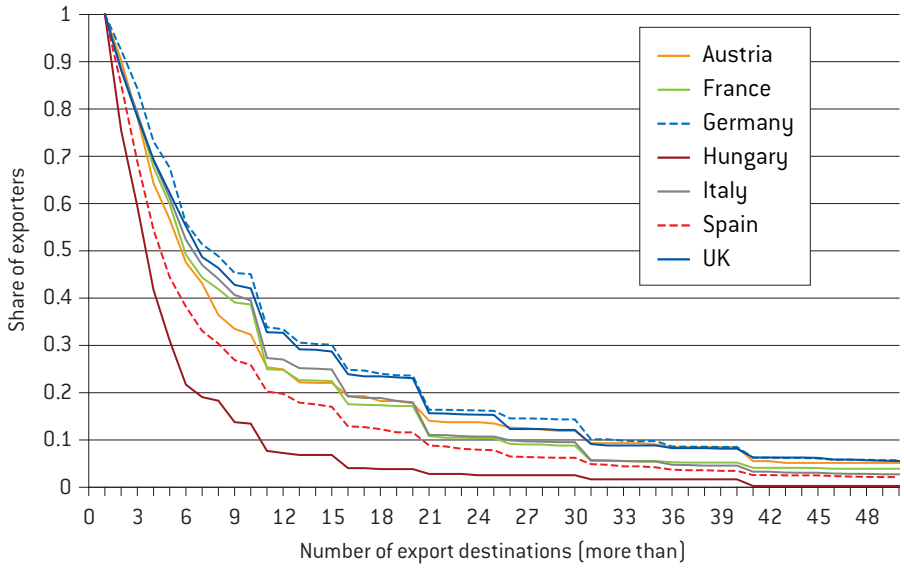
The country dummies, which now matter slightly more than for exporting activity *tout court*, also tell a story which is interestingly different from what we have seen in the previous section. The stronger (than Germany) export propensity of Austrian, Hungarian and Italian firms is no longer the case when focusing on exports to China and India, where instead the German predominance emerges quite clearly with respect to all the other sampled countries excluding the UK. The gap in terms of share of exporting firms able to sell their products in China and India is relevant even for large economies such as Spain and Italy: it amounts to 17 and 10 percentage points in the regressions without any other control. Interestingly, however, Italy's gap

12. We restrict the sample to exporters only because we are interested in the complexity of firms' internationalisation strategies and we want to investigate if firms involved in simple strategies (ie, exporting to the EU) are different from those involved in more sophisticated internationalisation activities. In any case, the main results do not change when the analysis covers the whole population.

reduces to 4 percentage points, 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 of the complexity of exporting activity is 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[13]. 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 see some differences across countries. For each number of destination countries, Hungary has always a smaller share of exporters, while Germany and UK have the highest.

Figure 3.1: Number of export destinations for exporters, by country



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

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

Table 3.2: Exporting or not to China and India (the extensive margin)

Linear probability model of exporting to China and India, only exporters						
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Firm probability of exporting to China and India	Country dummies	Add sector dummies	Add firm size	Add productivity No UK	All controls No UK & SP	All controls
Log(Employment)			0.057***	0.057***	0.056***	0.052***
Log(Age)					0.026***	0.029***
Log(LP)				0.036***	0.034***	
Group					0.072**	0.043*
Foreign owned					-0.036	-0.015
Blue-collar share					-0.001***	
Graduate share					0.001**	0.003***
Product innov					0.026*	0.029***
RD share					0.003***	0.002***
Bank debt share					-0.000*	0.000
Austria	-0.114***	-0.098***	-0.096***	-0.084**	-0.082**	-0.064**
France	-0.058***	-0.053***	-0.050***	-0.029	-0.021	-0.039**
Hungary	-0.262***	-0.234***	-0.235***	-0.180***	-0.133***	-0.208***
Italy	-0.101***	-0.094***	-0.073***	-0.068***	-0.032**	-0.042***
Spain	-0.171***	-0.158***	-0.142***	-0.120***		-0.123***
UK	-0.020	-0.018	-0.01			0.008
Constant	0.279***	0.191***	-0.026	-0.215***	-0.290***	-0.172***
No. obs.	7653	7653	7653	4537	3930	7221
R-squared	0.026	0.07	0.088	0.094	0.11	0.102

Due to missing observations concerning productivity for the UK and blue-collar share for both the UK and Spain, Spain has not been included in regression 5, UK in columns 4 and 5. Columns 2-6 include sector dummies. ***, **, * significant at 1 percent, 5 percent, 10 percent. Robust standard errors have been computed but not shown for sake of brevity.

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 exports to fast-growing emerging countries. On average, German firms export to three 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 seven 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 higher export propensity of German firms is due to the industrial (size) structure.

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

Size Class	Austria	France	Germany	Hungary	Italy	Spain	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' calculations from EU-EFIGE/Bruegel-UniCredit dataset.

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

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

Table 3.4: Number of export destinations (only exporters)

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Log(number of firm export destinations)	Country dummies	Add sector dummies	Add firm size	Add productivity No UK	All controls No UK & SP	All controls
Log(Employment)			0.379***	0.374***	0.344***	0.328***
Log(Age)					0.155***	0.174***
Log(LP)				0.201***	0.204***	
Group					-0.014	0.035
Foreign own					0.109	0.151***
Blue-collar share					-0.004***	
Graduate share					0.003**	0.009***
Product innov					0.391***	0.382***
RD share					0.007***	0.003**
Bank debt share					-0.001	0.000
Austria	-0.226***	-0.195**	-0.176**	-0.188**	-0.185**	-0.098
France	-0.230***	-0.228***	-0.208***	-0.170***	-0.140***	-0.182***
Hungary	-0.879***	-0.818***	-0.829***	-0.466***	-0.273***	-0.705***
Italy	-0.196***	-0.187***	-0.047	-0.060	0.050	0.050
Spain	-0.502***	-0.487***	-0.384***	-0.394***		-0.295***
UK	-0.107**	-0.130***	-0.075*			-0.076*
Constant	2.012***	1.772***	0.338***	-0.672***	-1.263***	-0.450***
No. obs.	7597	7597	7597	4530	3928	7178
R-squared	0.029	0.077	0.179	0.212	0.271	0.238

***, **, * significant at 1 percent, 5 percent, 10 percent. Robust standard errors have been computed but not shown for sake of brevity. Columns 2-6 include sector dummies.

4 Global production

Fact 4a – The majority of European firms use imported inputs. Between five and ten percent of firms in each sample country produces abroad using foreign affiliates or international outsourcing.

Having looked at export patterns, we now focus on global production. The internationalisation of production is important because it helps firms to reduce 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 importing foreign inputs and components for use in domestic production. The larger the share of imported materials, the lower the added value produced at home. This is the simplest way of internationalising production. The second modality is international outsourcing (IO), which implies setting up specific arms-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[14].

We find that in all the EFIGE survey 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. Importing is the most common way of internationalising production,

14. A big and growing strand of the literature investigates the different strategies that firms use in order to internationally organise their production. For the basic framework, see eg 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 intensive sectors the 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 internationalisation strategies. An excellent overview of this kind of literature can be found in Helpman (2006).

given that it is also the least costly one. The share of firms doing FDI or IO is much lower, varying from around four percent for Spain and Hungary, up to almost 11 percent for Austria.

Table 4.1: Share of firms involved in global production

Country	Import, FDI, IO	FDI, IO only
Austria	61.1	11.1
France	62.9	8.2
Germany	45.1	9.2
Hungary	57.2	4.0
Italy	50.3	6.2
Spain	53.5	4.2
UK	58.0	8.7

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

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, possibly because in this country a large share of firms are vertically integrated (use fewer purchased inputs than elsewhere). This finding is apparently at odds with the larger aggregate German share of imports of goods relative to GDP compared to the other large continental countries, but it can likely be driven by the larger size of German firms. The picture in fact 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.

Even though the extensive margin of imports is larger than for IO and FDI, the ranking is reversed when we consider the intensive margins, ie 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: Average share of firm turnover from imports, IO, and FDI (percentage of firm turnover)

Country	Imports	FDI and IO
Austria	8.9	28.4
France	12.9	31.7
Germany	8.3	31.1
Hungary	16.7	34.0
Italy	10.8	29.7
Spain	9.9	33.6
UK	11.6	45.4

Source: Authors' calculations 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 is 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.

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

			Other	China	Other	USA	Central South	
Country	EU15	Other EU	Europe	India	Asia	CAN	America	Others
Austria	62.6	53.7	20.0	17.4	7.1	5.9	4.6	7.1
France	53.4	23.3	13.2	35.0	13.1	14.7	5.1	30.4
Germany	55.4	42.2	22.5	34.1	12.7	20.1	8.9	8.1
Hungary	46.0	51.9	28.2	0.0	0.0	0.0	0.0	5.9
Italy	47.4	31.5	18.3	32.7	13.3	6.2	6.1	15.2
Spain	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' calculations 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 have higher shares. 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 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 differences appear secondary 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	Austria	France	Germany	Hungary	Italy	Spain	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' calculations from EU-EFIGE/Bruegel-UniCredit dataset.

This pattern persists if we carry out our usual econometric exercise and test the linear probability of producing abroad 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[15].

15. 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 of Spanish firms. They also found support for the predictions of the Antras and Helpman (2004) framework. Defever and Toubal (2007) examine the internationalisation mode of French 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 internationalisation modes for the

Table 4.5: Producing abroad or not (the extensive margin)

Linear probability model of producing abroad through FDI and/or IO						
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: firm probability of producing abroad	Country dummies	Add sector dummies	Add firm size	Add productivity No UK	All controls No UK & SP	All controls
Log(Employment)			0.059***	0.058***	0.060***	0.050***
Log(Age)					0.003	0.006**
Log(LP)				0.035***	0.028***	
Group					0.003	0.028**
Foreign own					0.034*	0.045***
Blue-Collar share					-0.001***	
Graduate share					0.001***	0.002***
Product innov					0.032***	0.030***
RD share					0.000	0.000
Bank debt share					0.000**	0.000**
Venture capital					0.277***	0.161***
Austria	0.019	0.022	0.023	0.039**	0.050***	0.030**
France	-0.01	-0.009	-0.004	0.001	0.002	0.000
Hungary	-0.052***	-0.052***	-0.052***	-0.019	-0.026	-0.059***
Italy	-0.030***	-0.035***	-0.021***	-0.023***	-0.011	-0.013**
Spain	-0.050***	-0.052***	-0.038***	-0.039***		-0.039***
UK	-0.004	-0.012	-0.009			-0.013*
Constant	0.092***	0.041***	-0.162***	-0.321***	-0.294***	-0.193***
No. obs.	14161	14161	14161	8313	7110	13326
R-squared	0.005	0.022	0.061	0.077	0.106	0.08

***, **, * significant at 1 percent, 5 percent, 10 percent. Robust standard errors have been computed but not shown for sake of brevity. Columns 2-6 include sector dummies.

Swedish economy. Federico (2009) supports the increasing complexity of internationalisation modes with firm productivity for the Italian economy. For additional empirical evidence concerning the link between productivity and internationalisation modes, see eg 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.

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

So far 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 arms-length agreements[16]. These choices are both related to the characteristics of the activities to be carried out abroad (knowledge content, relevance to 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 higher fixed costs, the more efficient firms, all things being equal, choose this modality. Consistent with these predictions we notice in fact that choices of firms offshoring production abroad are in most cases exclusive, in that only a minority of these 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: The choice between FDI and IO (only firms producing abroad)
(% of firms engaging in each mode of foreign production)

Country	Only FDI	Only IO	Both FDI and IO
Austria	53.0	34.0	12.9
France	33.5	54.7	11.8
Germany	57.0	35.1	7.9
Hungary	49.4	50.6	0.0
Italy	34.0	60.5	5.6
Spain	61.0	34.8	4.2
UK	49.9	37.6	12.6

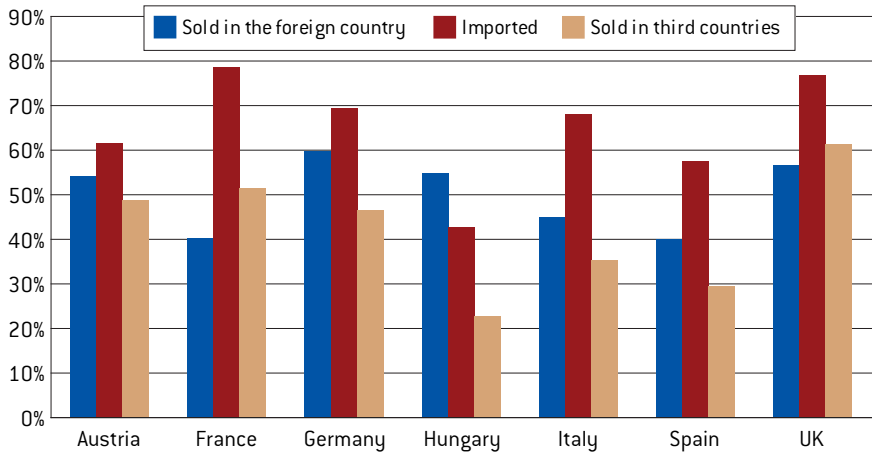
Source: Authors' calculations from EU-EFIGE/Bruegel-UniCredit dataset.

This difference is important because it suggests that the two modes are frequently used to pursue different purposes. FDI seems to be used for multiple uses, with sales

16. Refer back to footnote 8 for a discussion of this literature.

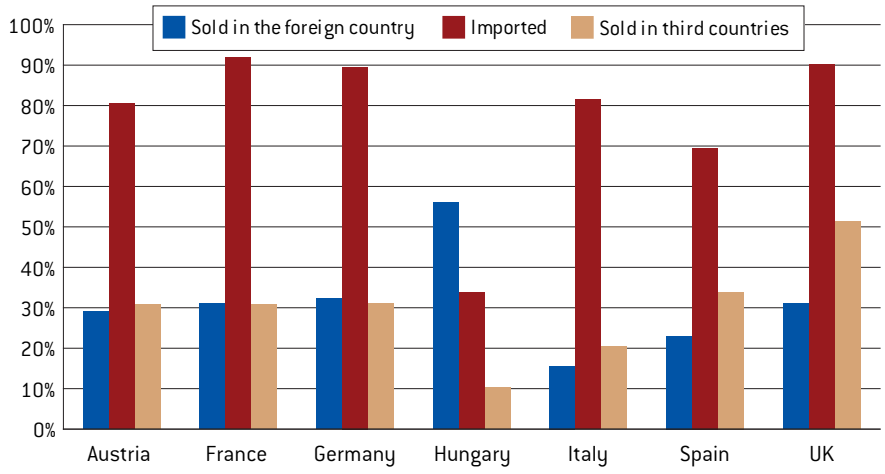
in foreign countries, and imports back home holding similar shares. Offshoring, instead, is predominantly used to de-localise production both of parts and components and finished products (Figures 4.1 and 4.2). Note that this pattern is pretty consistent across countries: in all the largest countries analysed, almost 80 percent of firms doing IO declare that they re-import the goods produced abroad. These goods are either finished products or components. The shares of FDI makers that import goods back home is also 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, and possibly because firms in this country appear to follow complementary strategies of foreign production and exporting (60 percent) (see also thecomment to Table 4.9).

Figure 4.1: Main destinations for FDI production



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

Figure 4.2: Main destinations for IO production



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

Table 4.7: The choice between FDI and IO for firms producing abroad

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: firm probability of making FDI	Country dummies	Add sector dummies	Add firm size	Add productivity No UK	All controls No UK & SP	All controls
Log(Employment)			0.126***	0.129***	0.100***	0.108***
Re-Import					-0.175***	-0.123***
Log(Age)					0.035	0.038**
Log(LP)				0.022	0.013	
Group					0.062	0.013
Foreign own					0.075	0.097*
Blue-collar share					0.000	
Graduate share					-0.001	0.000
Product innov					0.042	0.034
RD share					0.001	0.003*
Bank debt share					0.000	0.000
Venture capital					0.306**	0.222**
Austria	0.011	0.035	0.018	-0.067	-0.069	0.016
France	-0.196***	-0.179***	-0.160***	-0.150***	-0.128**	-0.133***
Hungary	-0.155	-0.127	-0.064	-0.117	-0.196	-0.081
Italy	-0.254***	-0.194***	-0.143***	-0.140***	-0.133***	-0.115***
Spain	0.003	0.021	0.056	0.079		0.095*
UK	-0.024	0.009	0.043			0.016
Constant	0.649***	0.723***	0.160**	-0.133	0.009	0.134
No. obs.	1180	1180	1180	671	617	1091
R-squared	0.051	0.093	0.193	0.197	0.23	0.221

***, **, * significant at 1 percent, 5 percent, 10 percent. Robust standard errors have been computed but not shown for sake of brevity. 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 engaged in foreign production choose FDI instead of IO. The dependent variable is 1 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 1 if these goods are re-imported back into the home country.

The regressions confirm that when they produce abroad, firms in Italy and France are less likely to do it through FDI than through IO compared to German firms (the two country dummies are persistently significant and negative). This result holds even when we control for firm characteristics. Nonetheless, firm characteristics remain the dominant explanatory factors also for the choice between IO and FDI (the explanatory power of the regressions increase when we include firm characteristics). Among firm-level features, size is by far the dominant explanatory factor.

Finally, note that foreign affiliates are a less likely mode of foreign production when output is imported back into the home country. This emerges from the negative and significant sign of the Re-import dummy and it also confirms the average patterns reported in Figures 4.1 and 4.2.

Fact 4c – Multi-country strategies of international production are instrumental in increasing foreign exports, especially in emerging economies.

The survey shows that foreign production is an extremely important component of firms' global strategies. To reinforce this point further, it is useful to look at if firms pursue multi-country geographical strategies in internationalising production and how far these are related to export patterns. In other words if firms tend to have a limited number of production facilities in a few regions or, rather if they pursue comprehensive multi-country strategies. This is an important issue, given that differences in factor costs and market dynamics enhance returns from spreading production globally.

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 involved in FDI in China and India, the share of firms that also have foreign plants in other regions. This table shows clearly that French and German firms pursue more comprehensive and diversified geographical strategies than firms from other countries. For example, 40 percent of French firms and 35.4 percent of 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 generally not very likely to invest in any other geographical area.

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

Country	EU15	Other EU	Other Europe	Other Asia	USA CAN	Central/South America	Others
Austria	90.6	86.2	36.8	38.4	24.6	36.8	35.4
France	57.0	32.6	23.0	24.1	39.9	11.2	19.3
Germany	54.2	39.2	37.6	25.5	35.4	14.5	8.3
Italy	32.8	10.0	7.6	7.3	4.2	7.3	13.0
Spain	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' calculations 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 foreign direct investors 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.

Note that this link between foreign production and exports is weaker if we consider North American markets, possibly because exports to this area face lower trade barriers than exports to China and India. In this case there are significant differences in the behaviour of our sample countries. A large share of French exports to North America originate from firms producing there. This share is lower for Germany and lower still for Spain and Italy.

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

Country	Exports of firms with FDI to China and India over total export	Exports of firms with FDI to USA and Canada over total export
France	28.29	44.90
Germany	25.14	18.21
Italy	28.23	7.31

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

5 Reconciling aggregate and firm-level evidence: the role of industrial structures

Fact 5a –Internationalisation patterns of countries differ mainly because nations differ in their internal industrial structures, ie 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 explained 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 exports 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 lose their power to explain 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 because of the large size of their domestic market. However, these are second order explanatory factors compared to national industrial structures and the characteristics of 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 percent of exporters, ranked in terms of export size, account for over 85 percent 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.

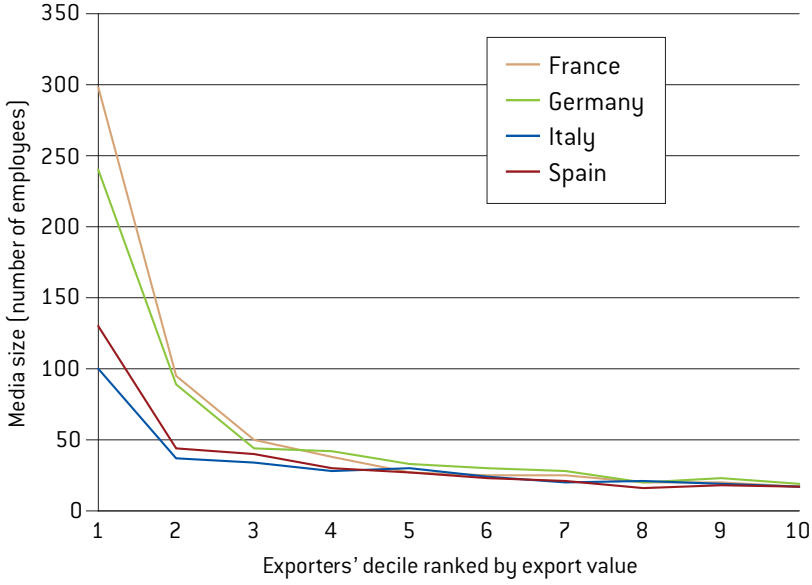
Table 5.1: Share of total exports of top exporters

Country	Top 1%	Top 5%	Top 10%	Top 20%
France	48.9	75.8	85.7	93.1
Germany	22.9	52.8	68.8	82.9
Italy	50.4	69.7	78.1	86.8
Spain	27.1	65.2	78.5	89.0

Source: Authors' calculations 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. Consistent with the population distributions in Appendix III, these are indeed different across countries in our sample. 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 percent 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' calculations 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 significantly 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 medium-sized firms, which in the case of this country are second-tier exporters also 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 employees respectively).

The emphasis on firm 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, which are also undertaken also by many medium-sized firms, as shown before. Nevertheless, countries like Italy and Spain would benefit from a larger population of medium and large firms. This is our next point.

Fact 5b – If Italy and Spain had the industrial structure of Germany, their exports would grow considerably, mostly because of firm-size effects.

We have established that country effects are less important that firm characteristics in determining internationalisation patterns. In particular, each country's export performance is explained mostly by its industrial structure – specifically, firm size distribution and specialisation 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 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. Similar reasoning can be applied to any country. This counterfactual experiment requires the selection of 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, which 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 specialisation in order 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 to 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 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 exports 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, as if that the firms we observe are drawn from the German population. We explain in Appendix II how we constructed 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)

	Share of firms exporting			Share of export over turnover		
Country	Weights		Difference	Weights		Difference
	Own	German		Own	German	
Austria	51.8	53.1	1.3	40.4	41.5	1.0
France	44.4	46.7	2.3	28.5	29.8	1.3
Germany	44.0	44.0	0.0	30.0	30.0	0.0
Hungary	49.1	48.5	-0.6	44.8	46.1	1.3
Italy	63.5	66.0	2.5	34.5	35.7	1.2
Spain	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' calculations from EU-EFIGE/Bruegel-UniCredit dataset.

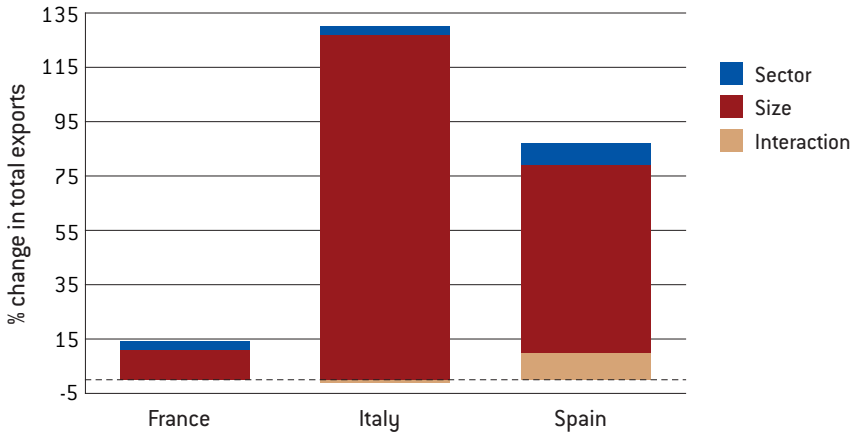
These effects can be explained by the fact that in the German industrial structure there are larger firms that, as we have seen, are more export oriented. Still, the increases we observe are modest. However, one should keep in mind that these are *average* values. In computing the average export propensity, 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 exports. In this case, we have already shown 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 exports considerably. To show this result, we repeat the previous exercise for total exports. Due to data limitations, we perform this exercise only for France, which has an

industrial structure fairly similar to Germany, and for Italy and Spain, which are dissimilar to Germany. We compute the total exports of each country under the own distribution and under the German distribution, and then compute the percentage change in exports[17].

We find that total exports increase by 14 percent for France, 87 for Spain and 129 for 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 exports. A decomposition exercise shows that most of the change comes from the size structure and not from the sectoral component. The effect on French exports is much more limited, as the industrial structures of France and Germany are rather similar.

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



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

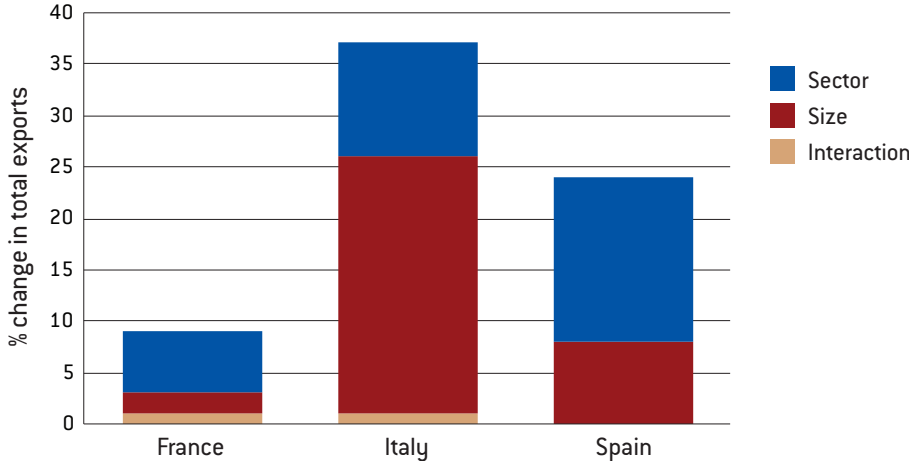
One important caveat is that in the previous exercise we kept the number of firms fixed and changed their size, so that we modified the total size of the manufacturing sector. For example, Italy has a large firm population, but with a small average size. Making the average size the same as the German 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

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

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 of 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 exports would increase by 24 percent for Spain and 37 percent for Italy (Figure 5.3). For France, the increase is a more modest 9 percent, in line with the fact that its industrial structure is more similar to the German one.

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



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

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. There are three reasons for this. *First,* in Italy the sector effect is small, because a large share of its exports is in traditional industries which are no longer competitive in other countries such as 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, which was the dominant factor 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 attributes all of these factors to the sectoral component, constraining size effects so that they occur only within sectors. This seems a more reasonable decomposition than the alternative, which would attribute to the size effect also the across-sector 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).

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 favours the internationalisation of its economy much more than Spain and Italy. In particular, the greater presence of medium and large size firms dictates greater 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 was based on 2008 data, and move to the recent international economic crisis. Thanks to the inclusion on the questionnaires of some questions aiming at assessing how the crisis hit individual firms, we can provide, again for the first time, a description of the effects of the crisis from a perspective that is both comparative and on the firm level. To keep the link with the previous sections, we separately address the effects on the extensive and intensive margins of trade.

Fact 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 exporters, in 2009 the crisis resulted in a reduction of the value of exports for slightly more than half of the firms (51.5 percent); 29.8 percent of firms did not vary their export values, while 18.7 percent increased them (Table 6.1). Only 3.8 percent of sampled firms report having stopped exporting altogether[18]. The share of firms that managed to increase their exports during the crisis is significant, considering the magnitude of the systemic effect.

18. Also Fontagnè *et al* (2009) find that relatively few French firms in 2009.

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

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

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

Given the high heterogeneity of 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 percent of firms affected (versus 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 German firms also made them more resilient to the effects of the crisis. On the other side, France, Hungary, Italy and Spain have higher than average shares of firms with an export reduction.

In terms of size, medium to large exporters have on average suffered marginally more, with around 54 percent of large exporting firms reporting a reduction in exports compared to 50 percent within the small exporters group. Moreover, firms exporting beyond the EU market were more frequently hit by the reduction in their export volumes, with 52.5 percent of 'global' firms reporting a fall in export versus 47.7 percent 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)

		Reduced export	Increased export
	All firms	51.5	18.7
By country	Austria	43.8	17.5
	France	58.8	17.1
	Germany	45.4	20.1
	Hungary	58.7	12.0
	Italy	54.5	13.5
	Spain	53.1	22.6
	UK	45.2	29.6
By firms' size	10-19	50.0	18.4
	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' calculations from EU-EFIGE/Bruegel-UniCredit dataset.

However, a focus only on the share of firms that increased or decreased their exports does not reveal much about on the real effects of the crisis. To be more precise, it is useful to focus on how large the decreases or increases were relative to 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 firms that experienced in 2009 a reduction in exports, the average reduction in export volumes has been very large, in line with aggregate data (30.7 percent). At the same time, though, the 18.7 percent of exporters that increased their exports did it by a significant amount (24.9 percent). Thus the crisis has been extremely selective. 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
	All firms	30.7	24.9
By country	Austria	27.6	23.2
	France	31.6	34.0
	Germany	27.8	22.4
	Hungary	39.2	28.4
	Italy	30.2	23.2
	Spain	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' calculations from EU-EFIGE/Bruegel-UniCredit dataset.

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

Thus, even though a larger share of large and global exporters has been negatively hit by the crisis, these firms faced less of a reduction in volumes, and in particular lower volatility of exports, both upward and downward. This is probably due to the fact that their export strategies were more diversified and that demand in emerging economies both declined less and recovered more quickly than in advanced countries. To corroborate this evidence, we run a simple econometric regression to test if the 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 percent smaller reduction in exports; for global exporters the reduction was seven percent smaller than for firms exporting only to the EU. In the group of firms that were able to increase their exports, the increase was 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' calculations from EU-EFIGE/Bruegel-UniCredit dataset. Country and industry dummies included but not reported. ***, **, * significant at 1 percent, 5 percent, 10 percent

To better appreciate how important the use of firm level statistics is, 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 percent for Germany and -21.4 percent for Italy), there are many interesting differences. In Germany, fewer firms saw a reduction in export volumes than in Italy (45.3 percent against 54.4 percent), especially among large firms (49.2 percent against 61.1 percent). The average reduction in export volumes has been on average smaller in Germany (27.8 percent) than in Italy (30.2 percent), even if larger firms suffered slightly more in Germany (24.6 percent 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 has the aggregate performance of Germany 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 performed similarly in the two countries and that these firms typically account for most of a country's aggregate exports, Italy and Germany ultimately performed similarly. However, 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
percent of firms reducing export	54.4	45.3
- of which large firms	*(61.1)*	*(49.2)*
average export reduction (%)	-30.2	-27.8
- of which large firms	*(-23.8)*	*(-24.6)*
percent of firms increasing export	13.5	20.1
- of which large firms	*(14.3)*	*(20.2)*
average export increase (%)	+23.2	+22.4
- of which large firms	*(+15.0)*	*(+13.9)*
% of firms not changing export	32.1	34.6
Aggregate export change	*-21.4*	*-18.4*

Source: Authors' calculations 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 the key to 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 number and 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 scale in global operations. Entry barriers have been rising with the toughening of competition in global markets and with the shift of market dynamism towards the emerging economies. To operate in the global market firms need innovative technologies, brand recognition, complex organisation and governance structures and capable managers. These are more difficult to achieve for small firms.

Third, firm size is, however, 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 replicated by 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, which has been lagging compared 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 countries should favour growth and industrial re-allocation 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 in reducing the cost of entry 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 I: Sample description

This 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 EFIGE project – *European firms in a global economy: internal policies for external competitiveness* – supported by the Research Directorate General of the European Commission through its FP7 programme. 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 Germany[19], and 500 firms for Austria and Hungary.

GFK Eurisko 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 balance. 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; internationalisation; finance; market and pricing[20]. 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 was then matched with balance sheet information from Amadeus. At the time of writing EFIGE research team is still working on the data collection concerning turnover data. For France, Germany, Italy and Spain only 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.

19. The German sample will consist of 3,000 firms in the final version.
20. The complete questionnaire is available at http://www.efige.org..

The main focus of the report is on the firms' internationalisation strategies. In order to identify these modes of internationalisation, 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 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 out 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, also taking into account materials and service imports. 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 (ie foreign affiliates/controlled firms)' are considered as foreign direct investors, 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 internationalisation 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, which also have higher shares 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 a presence of groups and foreign ownership and limited 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								
	Firm size							
Nace Rev 1.1	Between 10 and 49		Between 50 and 249		More than 250		Total	
	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: Between 10 and 49		Between 50 and 249		More than 250		Total	
	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: Between 10 and 49		Between 50 and 249		More than 250		Total	
	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: Between 10 and 49		Between 50 and 249		More than 250		Total	
	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: Between 10 and 49		Between 50 and 249		More than 250		Total	
	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: Between 10 and 49		Between 50 and 249		More than 250		Total	
	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: Between 10 and 49		Between 50 and 249		More than 250		Total	
	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' calculations from EU-EFIGE/Bruegel-UniCredit dataset and Eurostat SBS 2007. For missing data in some cells for the population for (confidentiality) reasons, we formulated hypothese 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 added value per employee
Blue-collar share	Share of blue collars workers 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 percent 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	Austria		France		Germany		Hungary		Italy		Spain		UK	
	mean	*(sd)*	mean	*(sd)*	mean	*(sd)*	mean	*(sd)*	mean	*(sd)*	mean	*(sd)*	mean	*(sd)*
Employment	90		79		77		72		42		49		109	
	413		*473*		*247*		*179*		*126*		*178*		*915*	
LP	170[a]		114		156		59[a]		153		102		-	
	328[a]		*146*		*291*		*106*[a]		*176*		*141*		-	
Blue-collar share	57.7		55.7		56.0		66.7		66.2		74.1		67.2	
	27.5		*29.7*		*28.6*		*23.9*		*18.6*		*14.4*		*18.7*	
Graduate share	5.0		8.2		11.5		15.5		6.5		10.5		8.6	
	9.9		*12.4*		*15.3*		*18.8*		*10.3*		*13.0*		*14.6*	
Age	46		39		45		17		30		27		36	
	39		*33*		*39*		*14*		*20*		*20*		*33*	
Group	12.5		10.1		5.3		12.6		3.0		4.2		14.6	
	33.1		*30.1*		*22.3*		*33.2*		*17.0*		*20.0*		*35.4*	
Foreign own	12.8		10.3		6.3		19.8		4.1		4.5		12.2	
	33.4		*30.4*		*24.3*		*39.9*		*19.9*		*20.8*		*32.8*	
Product innov	58.5		46.2		50.2		43.4		47.8		44.3		56.3	
	49.3		*49.9*		*50.0*		*49.6*		*50.0*		*49.7*		*49.6*	
RD share	3.1		3.0		4.2		1.4		3.9		3.2		3.4	
	7.9		*7.6*		*8.3*		*6.2*		*7.5*		*7.3*		*8.2*	
Bank debt share	87.0		78.7		83.9		82.9		87.5		86.4		65.2	
	29.5		*34.7*		*30.6*		*35.4*		*28.0*		*27.9*		*43.1*	
Venture capital	2.2		1.9		1.3		0.9		0.5		1.0		5.7	
	14.8		*13.6*		*11.4*		*9.3*		*7.2*		*10.2*		*23.2*	

[a]As shown in table 1.1 we have at our disposal a restricted sample of Austrian and Hungarian firms providing turnover data. These observations have also been used in the regressions. Source: Authors' calculations 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 population[21], and make sure that data are representative of firm populations.

All the analyses in the report are prepared using the following weighting scheme. We built 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:

$$rw_{ks} = \frac{Pfirms_{ks} / Pfirms}{Sfirms_{ks} / Sfirms}$$

we define $Pfirms_{ks}$ as the number of firms in sector *k* and size class *s* for the population in a given country[22], $Sfirms_{ks}$ as the number of firms in sector *k* and size class *s* in the sample, *Pfirms* and *Sfirms* 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:

$$w_{ks} = \frac{Pfirms_{ks} / Pfirms}{Sfirms_{ks} / Sfirms} \times \frac{Pfirms}{Sfirms} = \frac{Pfirms_{ks}}{Pfirms} \times \frac{Pfirms}{Sfirms_{ks}}, \text{ that is } w_{ks} = \frac{Pfirms_{ks}}{Sfirms_{ks}}$$

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

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

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.

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 calculations involved the use of this variable.

B. Counterfactual exercise and decomposition

As Eurostat data shows, the structure of manufacturing by firm size and sector specialisation is different across countries. We implement a counterfactual exercises hypothesising 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 equation[23]:

$$w_i = \frac{Pfirms_i}{Sfirms_i}$$

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

$$w_i^{GER} = \frac{Pfirms_i^{GER}}{Pfirms^{GER}} \times \frac{Pfirms}{Sfirms_i}$$

where $Pfirms_i^{GER}$ is the number of firms in cell *i* for the German population, thus the term $Pfirms^{GER}{}_i/Pfirms^{GER}$ represents the share of cell *i* in the German manufacturing sector and the term $Pfirms/Sfirms_i$ 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 exports under the own distribution and the German one are:

23. The cell i consists of the intersection between the sector k and size class s, thus $\omega_i = \omega_{ks}$.

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

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.

We define $Pfirms_k$ ($Sfirms_k$) as the number of firms in sector k in the population (sample), $Pfirms_s$ ($Sfirms_s$) as the number of firms in size class s in the population (sample), $Pfirms_{ks}$ ($Sfirms_{ks}$) as 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, that is, what drives the change in our export performance indicators, and we use the following decomposition:

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

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 represents 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 the 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:

$$e_j = \frac{Pemployment_i}{Semployment_i} \text{ with firm } j \text{ cell } i^{24}$$

where $Pemployment_i$ is employment in the population in cell *i* and $Semployment_i$ 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:

$$e_j^{GER} = \frac{Pemployment_i^{GER}}{Pemployment^{GER}} \times \frac{Pemployment}{Semployment_i}$$

For the decomposition, the procedure is the same as shown above (*Pemployment* instead of *Pfirms*).

24. This weight refers to each employee in the firm *j*.

Appendix III: Industrial structures

Table A5: Distribution of firms by sector and by country

Sector Description	Germany	Spain	France	Italy
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
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	100	100	100

Source Eurostat, Structural Business Statistics.

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

Sector Description	Germany	Spain	France	Italy	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* eg provides extensive evidence of export and import statistics for all WTO member states. Concerning merchandise exports, Europe accounts in 2008 for 41 percent of world's total merchandise exports. Within Europe, there are still major differences between the single economies. While Germany accounts for 9.3 percent 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 accounts for 7.5 percent of worlds 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 percent for Germany, 23.5 percent for Italy, 21.6 percent for France, 16.7 percent 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 percent of GDP, Austria 2.9 percent, France a deficit of -1.6 percent of GDP, Italy -3.2 percent and Spain -9.6 percent.

Concerning the value in US$, Germany exported merchandise products worth $1,461.9 billion in 2008, France $605.4 billion, Italy $538.0 billion, the UK $458.6 billion, Spain $268.3 billion, Austria $181.0 billion, and Hungary $107.7 billion. With respect to merchandise imports, Germany imported in 2008 $1,203.8 billion, France $705.6 billion, the UK $632.0 billion, Italy $554.9 billion, Spain $401.4 billion, Austria $183.4 billion, and Hungary $107.9 billion. As these figures suggest , Germany was 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, 69.3 percent of West German firms that export, compared to only 50.9

percent of East German firms. For France this work shows an extensive margin of 74.8, for the UK a rate of 69.5, and Italy of 69.3 percent. Sweden is leading the European countries with an export participation rate of 83.0 percent.

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

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 percent for Germany, 1.4 percent for France, 1.2 percent for Italy, 0.3 percent for Spain, and 1.3 percent for the UK.

For a huge amount of additional statistics concerning country differences in international trade structures, and also, for example, the contribution of exports to countries' growth rates, see eg IMF (2005).

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The global operations of European firms
The second EFIGE policy report

This report uses new, comparable cross-country data on the international activities of 15,000 firms in Austria, France, Germany, Hungary, Italy, Spain and the United Kingdom. The authors 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 characteristics support more complex internationalisation strategies, such as exporting to more and more distant markets, and manufacturing abroad. These features influence the patterns of internationalisation in a remarkably similar way across countries. Consequently, national differences in export performance are mostly related to differences in industrial structures. We also find that firms pursuing comprehensive international strategies have coped better with the financial and economic crisis. The authors conclude that structural policies that contribute to firm growth, productivity, accumulation of human capital and innovation are the best way to boost the international presence of European firms. Although more difficult to implement, their impact will be greater and more durable than that of policies directly targeting international activities.

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