



The happy few: the internationalisation of European firms New facts based on firm-level evidence

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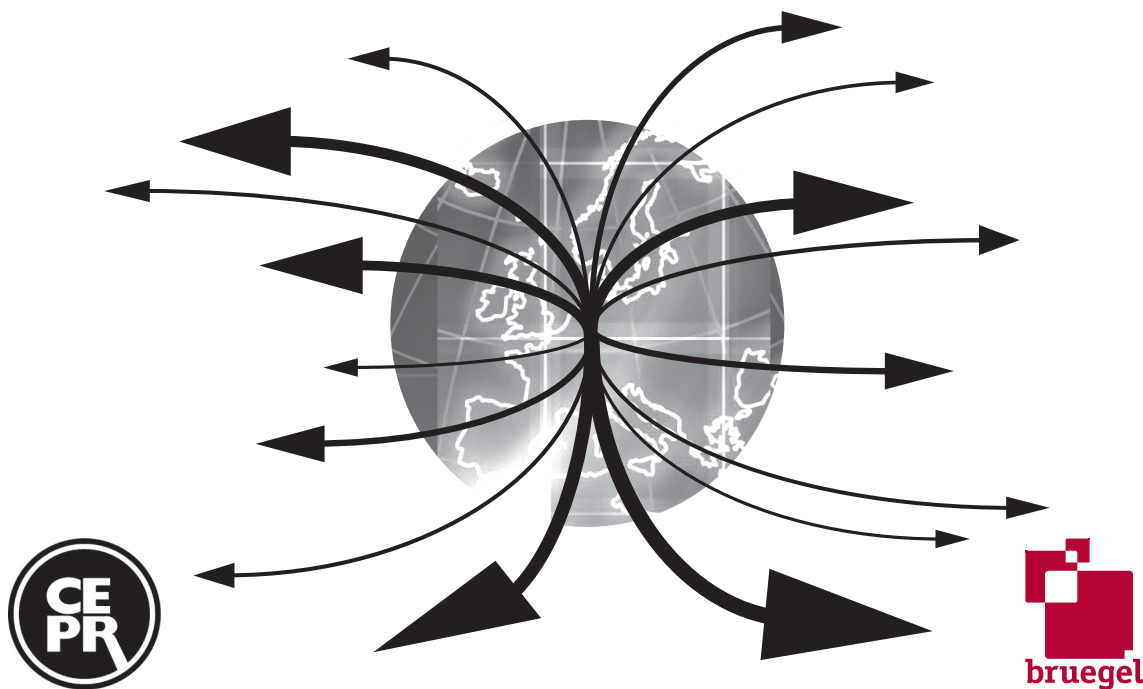
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The Happy Few:

The internationalisation of European firms

New facts based on firm-level evidence

BY THIERRY MAYER AND GIANMARCO I.P. OTTAVIANO



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The happy few: the internationalisation of European firms.

New facts based on firm-level evidence

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Gianmarco I.P. Ottaviano, University of Bologna, Bruegel and CEPR

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Foreword

“Le bon Dieu est dans le detail” (God is in the details)

Gustave Flaubert (1821-80)

Nations do not trade; it is firms that trade. This simple truth makes it clear that understanding the firm-level facts is essential to good policy making in Europe.

What are the features of European firms that successfully compete in international markets? To what extent do they contribute to productivity and employment? What are the policies that can improve a nation's foreign trade performance? What policies can promote the participation of other European firms that are currently excluded from international markets? Which are the gains and the adjustments involved in reducing barriers to trade and foreign direct investment (FDI)? What policies can best maximise gains and smooth adjustments? While these questions are best treated using firm-level trade and (FDI) data, until very recently various constraints on data availability and data processing prevented policy researchers from looking at the firm-level evidence. That has begun to change. To take advantage of this, Bruegel and the Centre for Economic Policy Research (CEPR) have joined forces to establish a network of European research teams working on firm-level data and international issues. The network is called EFIM, short for European Firms and International Markets.

Gianmarco I.P. Ottaviano for Bruegel and Thierry Mayer for CEPR have provided enthusiastic leadership to this project. The founding partners were the *Centre d'Études Prospectives et d'Informations Internationales* (France), the Hungarian Academy of Sciences (Hungary), the *Centro Studi Luca d'Agliano* (Italy), the Institute for Applied Economic Research (Germany), the Leverhulme Centre for Research on Globalisation and Economic Policy (United Kingdom), Stockholm University (Sweden). EFIM now includes also the National Bank of Belgium (Belgium) and the University of Oslo (Norway)¹.

This is EFIM's first report. It is a first step to addressing EFIM's important policy agenda and it is an important first step. We hope that it will help shift the economic

integration debate away from its current focus on sectors and skill groups to a finer level of resolution. Until recently, economists and practitioners had very different views on those issues. Economists tended to assume that trade and FDI opening affected sectors differently but firms similarly. Practitioners viewed them as a selection process in which some firms thrived and other went bankrupt. There was a disconnect between trade models and the fact that, firms being heterogeneous, they fared differently under the pressure from foreign competition. Recent development in trade theory have bridged this gap by introducing firm heterogeneity. In this new framework, trade and FDI opening does not only affect sectors but also firm-level employment and productivity within sectors. Moreover, the divide between winners and losers from globalisation does not run anymore only between sectors or skills. Increasingly, both winners and losers can be found also within sectors.

Recent evidence from US data showed that this framework provides a promising avenue for empirical analysis, but there was so far no consistent cross-country evidence based on European data. The gathering of stylised facts was made difficult by the heterogeneity of the underlying statistical sources and the need to start from a country-by-country perspective. This is why the first EFIM, written by Gianmarco I.P. Ottaviano and Thierry Mayer, consists in statistical information presenting the main stylised facts on the internationalisation of European firms². Even though it highlights several facts about both international trade and FDI, due to richer data availability its focus is nonetheless more on the former than on the latter. The countries covered are Belgium, France, Germany, Hungary, Italy, Norway and the UK, with each national partner working on its own country's dataset³. Typically, the overlap among the different national datasets in terms of sampled variables is far from complete at the targeted level of disaggregation (firm-level data). Different countries are therefore selected depending on the specific issues addressed.

1. The leaders of the eight teams are: Lionel Fontagné, University of Paris I and CEPII; László Halpern, Hungarian Academy of Sciences; Giorgio Barba Navaretti, University of Milan and Ld'A; Holger Görg, University of Nottingham and GEP; Karolina Ekholm, Stockholm University; Claudia Buch, University of Tübingen and IAW; as well as Mauro Pisu, National Bank of Belgium, and Karen Helene Ulltveit-Moe, University of Oslo. Other team members are Mathieu Crozet and Cyrille Schwellnus (CEPII), Gábor Békés and Balázs Muraközy (Hungarian Academy of Sciences), Giulia Felice and Alessandra Tucci (Ld'A), Christian Arndt and Anselm Mattes (IAW), Mirabelle Muûls (National Bank of Belgium), Andreas Moxnes (University of Oslo). Alexandre Janiak and Laurent Eymard (Bruegel) as well as Lorenzo Casaburi (University of Bologna) provided outstanding research assistance. Stephen Gardner (Bruegel) provided useful comments on an earlier draft.

2. A preliminary version of the report was presented at the Conference "The Internationalization of European Firms", Brussels, 19 June 2007. The authors benefited from the discussion by Gert-Jan Koopman and the comments by other participants.

3. The Swedish team has not taken active part in this first report.

EFIM is a multi-year project. In the coming years, the network intends to use the innovative firm-level approach developed in this report to address a range of policy issues. We believe that the revolution it brings to the way we look at trade and FDI has the potential to change policy assessments in the same way research on individual data has changed the assessment of labour market and welfare policies. We would like EFIM to contribute to this transformation.

*Richard E. Baldwin, Policy Director, C&PR
Jean Pisani-Ferry, Director, Bruegel
Brussels and Geneva, November 2007*

Executive summary

Lack of statistical information at the firm level has so far prevented systematic inclusion of firm-level analysis in the policymaker's standard toolbox.

This report argues that the time is ripe to supplement the policymaking toolbox: firm-level datasets are now available and provide new information that one cannot afford to ignore.

The focus of this report is on the characteristics of European firms involved in international activities through exports or foreign direct investment ('internationalised firms', henceforth simply IFs). The analysis of firm-level evidence reveals some new facts that are simply unobservable at the aggregate level:

- *IFs are superstars.* They are rare and their distribution is highly skewed, as a handful of firms accounts for most aggregate international activity.
- *IFs belong to an exclusive club.* They are different from other firms. They are bigger, generate higher value added, pay higher wages, employ more capital per worker and more skilled workers and have higher productivity.
- *The pattern of aggregate exports, imports and foreign direct investment (FDI) is driven by the changes in two 'margins'.* The 'intensive margin' refers to average exports, imports, FDI per firm. The 'extensive margin' refers to the number of firms actually involved in those international activities.
- *The 'extensive margin' is much more important,* as the reaction of aggregate trade and FDI flows to country fundamentals takes place mostly through that margin. This is impossible to see without firm-level data and thus has not been seen so far.

In short, the international performance of European countries is essentially driven by a handful of high-performance firms. Moreover, the opening up of trade and FDI triggers a selection process whereby the most productive firms substitute the least productive ones within sectors. This is good for productivity, GDP and wages.

While the scope of this report is essentially descriptive, such findings lead to six clear implications for policymaking at all levels:

Proposal 1: Promote intra-industry competition.
Proposal 2: Increase the number of exporters and multinationals.
Proposal 3: Do not waste time helping the incumbent superstars.
Proposal 4: Nurture the superstars of the future.
Proposal 5: Fight to reduce small trade costs.
Proposal 6: Assess the export and FDI potential of your industries.

Our findings also leave some questions open. We prioritise six of them for future investigation:

- If firms have to be large to be competitive in international markets, what is the importance of the size of the internal market?
- If superstars dominate international markets, is there any room for global SME's?
- What precisely does the dominance of the extensive over the intensive margins imply for policy intervention aimed at promoting the internationalisation of European firms?
- Do firms improve their performance when exposed to international competition?
- Is the fragmentation of production processes across countries a way through which firms become more competitive in international markets?
- Is the limited internationalisation of European firms eroding political support for the single market?

Answering these questions requires quality data at the firm level to be representative and comparable across European countries. Currently, however, the overlap among the different national datasets in terms of several key variables is far from complete at the targeted level of disaggregation. In this report we select different countries depending on the specific issues addressed. This is clearly a second best approach that is nevertheless enough to highlight the benefits that would come from the creation of a harmonised European dataset.

With this in mind, we suggest three promising areas for European added value:

Proposal 7: Policy-oriented research should prioritise six key issues that are likely to determine the global competitiveness of European firms in the future: the external benefits of the internal market, the speed of intra-industry reallocations, the relative impact of fixed versus variable costs of internationalisation, the relevance of learning through international operations, the opportunities provided by regional production networks, and the political economy of the single market.

Proposal 8: These six issues should be addressed through a detailed analysis of firm-level data that are both representative and comparable across European countries.

Proposal 9: As representative and comparable data allowing for a detailed analysis of these issues are currently unavailable across European countries, an integrated European firm-level dataset should be created as a prerequisite for sound policymaking in support of the global competitiveness of European firms.

1. Introduction

'Internationalisation' is an elusive concept. From the point of view of a policymaker it refers to the presence of countries in international markets as measured by their shares of exports, imports and FDI. From the point of view of a manager, it refers to the ability of firms to generate value through international operations.

Though complementary, the two points of view are typically considered separately. Policymakers fret about aggregate exports, imports and FDI. Their preferred perspective is sectoral. Managers are concerned that international operations, whether through exports, imports or FDI, bring additional costs with respect to domestic activities and these costs generate barriers that only some firms are able to overcome. Their preferred perspective is that of their own firms.

The separation between the two perspectives is due to different objectives and interests but also to different mindsets. Managers like case studies and exemplary evidence. Policymakers like statistical information. Lack of such information at the firm level has therefore so far prevented systematic inclusion of firm-level analysis in the policymaker's standard toolbox.

This report argues that the time is ripe to supplement the policymaking toolbox: firm-level datasets are now available and provide new information that one can not afford to ignore (see Box 1). Interestingly, the statistical analysis at the firm level reconciles the policymaker's and the manager's points of view.

In particular, the analysis of firm-level evidence reveals some new facts that are simply unobservable at the aggregate level:

- *The evolution of aggregate exports, imports and FDI is driven by the changes in two 'margins'.* The 'intensive margin' refers to average exports, imports, FDI per firm. The 'extensive margin' refers to the number of firms actually involved in those international activities ('internationalised firms', henceforth simply IFs).
- *The 'extensive margin' is much more important,* as the reaction of aggregate trade and FDI flows to country fundamental takes place mostly through that margin.

This is impossible to see without firm level data and thus has not been seen so far.

- *The 'extensive margin' is thin.* IFs are rare and their distribution is highly skewed, as a handful of firms accounts for most aggregate international activity.
- *The 'extensive margin' is an exclusive club.* IFs are different from other firms. They are bigger, generate higher value added, pay higher wages, employ more capital per worker and more skilled workers, have higher productivity.

To sum up, the international performance of a country is driven by a handful of high-performance firms. Hence, from a policy perspective, successful internationalisation is much more about increasing the *number* of firms involved than about increasing the *involvement* of already active firms. However, in order to increase the number of firms involved, policies fostering firm performance in terms of employment and productivity are more important than policies fostering exports, imports or FDI *per se*.

The report is organised in seven chapters. Following on from the introduction, chapter 2 shows that IFs are rare and their exclusive club is dominated by a handful of top firms. Chapter 3 shows that IFs are different in that they perform better than other firms. Chapter 4 dissects aggregate trade and FDI flows to assess the relative importance of the intensive and extensive margins. It shows that firm-level information is crucial to understanding aggregate behaviour. Chapter 5 describes the way industries react to external shocks. Chapter 6 explores the connections between firm-level information and aggregate comparative advantage. Chapter 7 summarises the evidence and discusses its policy implications.

The report also includes a statistical appendix, a data appendix, two technical appendices and a reading list. The first appendix contains a number of tables providing additional statistical information. The second describes the data sources. The third and the fourth appendices present information on the econometric methodologies used. The reading list highlights some relevant references classified according to the topics addressed in the different chapters of the report.

A final caveat. Firm-level data are typically collected independently either from balance sheets or from surveys by different public authorities or research institutions in different countries. The lack of harmonisation or coordination among the different players is all but natural. Nonetheless, it prevents the creation of a homogeneous cross-country dataset. The result is that only very few policy-relevant questions can be addressed systematically across all countries. Rather than limiting our attention to those very few questions, we have chosen to cover a larger range of issues by selecting for each issue the best available national datasets.

BOX 1: From sectors to firms: the new perspective on international trade and FDI⁴

The concepts of ‘comparative advantage’ and ‘comparative disadvantage’ are used to identify industries in which a country is stronger than its competitors and those in which it is weaker, meaning industries in which its relative costs of production are respectively low and high. In the global arena industries of comparative advantage are expected to expand while those of comparative disadvantage are expected to shrink. As a result, the owners of assets and skills specific to thriving sectors ‘win’, those committed to withering sectors ‘lose’. As all stakeholders within sectors are expected to face the same destiny, they naturally get organised in pressure groups along sectoral lines. This is, more or less, the political economy of trade liberalisation as we know it.

In recent years this ‘sectoral view’ has been increasingly challenged by the analysis of large firm-level datasets that have unveiled a large heterogeneity in the competitiveness of firms within the very same industry. In this respect, a hallmark result goes under the label of ‘exceptional export performance’ and refers to the fact that exporters are systematically found to be on average more productive than non-exporters. The performance premium is even larger for multinational firms.

In principle causality could run both ways: only more productive firms become exporters (‘selection into export status’) and exporting improves firm efficiency (‘learning by exporting’). The current consensus view favors the former direction of causality. In particular, two stylised facts are often stressed. First, exposure to trade forces the least productive firms to exit the market or to shut down. Second, trade liberalisation leads to market share reallocations towards more productive firms. Thus, there seems to be some robust evidence that the opening of distant markets gives an additional opportunity only to the most productive firms within each industry, allowing them to enlarge their market shares to the detriment of less productive competitors, the least efficient of which are forced to exit.

These facts have been recently explained by theoretical models that differ in terms of the feature that leads only the most productive firms to engage in distant trade (*a fortiori*, in FDI). Some models stress the role of limited product differentiation resulting in tougher worldwide price competition when markets become more

4. <http://www.cepr.org/pubs/PolicyInsights/PolicyInsight8.pdf>

open. Others highlight, instead, the role played by the sunk costs of export and foreign investment that only more productive firms can afford. This selection effect is reinforced by falling markups due to increasing openness to global competition while its strength varies across countries depending on their sectoral specialisation and their geographical position in the global trade network.

The mechanism driving the selection effect is a combination of import competition and export market access. On the one hand, as lower trade costs allow foreign producers to target domestic markets, the operating profits of domestic firms in those markets shrink, however productive they are. On the other hand, some domestic firms gain access to foreign markets and earn additional profits from their foreign ventures. These are the firms that are productive enough to cope with the additional costs of foreign activity (such as those due to transport and administrative duties or institutional and cultural barriers).

The result is the division of initially active domestic firms into three groups. As they start making losses in their home markets without gaining access to foreign markets, the least productive firms are forced to exit. On the contrary, as the most productive firms are able to compensate for lost profits on home sales with new profits on foreign sales, they survive and expand their market shares. Finally, firms with intermediate levels of productivity also survive but, not being productive enough to access foreign markets, are relegated to home sales only and their market shares fall. Since international trade integration eliminates the least productive firms, average productivity grows through the reallocation of productive resources from less to more efficient producers. The bottom line is that trade liberalisation induces a reallocation of resources from less to more productive firms.

The impact of international competition on firm exit and firm heterogeneity within industries has important implications for the political economy of trade liberalisation as it implies that the destinies of better and worse performers diverge. Whether trade openness increases or decreases the differences between firms then becomes crucial for the political sustainability of the ongoing process of global trade liberalisation.

2. Internationalisation is for the few

This chapter uses firm level data to show that internationalised firms (IFs) are few and, among these few, only a handful of firms account for the bulk of aggregate exports and FDI.

2.1 Superstar exporters

Let us focus on trade and rank a country's firms in terms of their individual exports. Table 1 reports the contributions of different segments of the ranking to aggregate exports in the cases of Belgium, France, Germany, Hungary, Italy, Norway and the UK. The Belgian and Norwegian samples include all firms and are therefore exhaustive. The British, German, Hungarian, and Italian samples cover only relatively large firms and are therefore restricted. The French data provide, instead, both an exhaustive sample and a restricted sample comparable to the British, German, Hungarian, and Italian ones. We mainly use the restricted sample, which provides more detailed data. Where possible, however, we also give results from the exhaustive sample.

Table 1: Share of exports for top exporters in 2003, total manufacturing

Country of origin	Top one percent	Top five percent	Top 10 percent
Germany	59	81	90
France	44 [68]	73 [88]	84 [94]
United Kingdom	42	69	80
Italy	32	59	72
Hungary	77	91	96
Belgium	48	73	84
Norway	53	81	91

Source: EFIM. Note: France, Germany, Hungary, Italy and the UK have large firms only; Belgian and Norwegian data is exhaustive. Numbers in brackets for France are percentages from the exhaustive sample⁵.

5. See the Data Appendix for details of the size thresholds for the various countries.

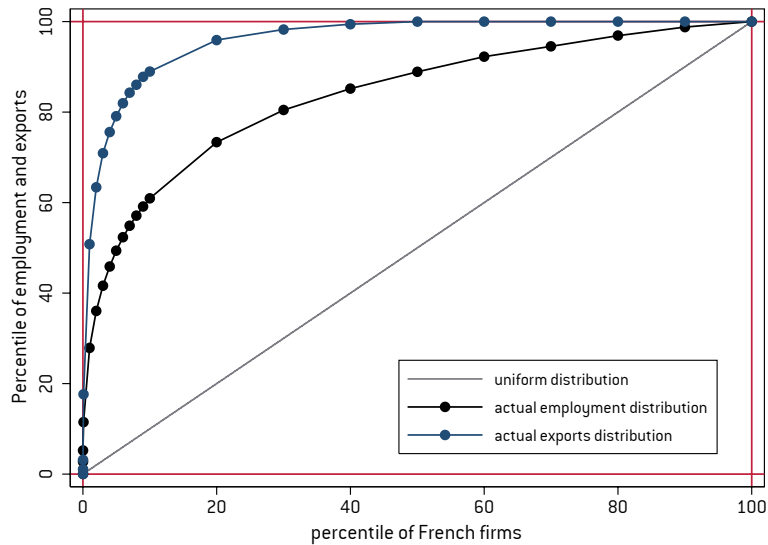
For each country the columns in Table 1 show the contributions of the top one percent, five percent and 10 percent of exporters. The numbers are striking. In the exhaustive samples, the top one percent of exporters account for more than 45 percent of aggregate exports; the top five percent of exporters account for more than 70 percent of aggregate exports; the top 10 percent of exporters account for more than 80 percent of aggregate exports. Results for Germany, Hungary, Italy and the UK are less extreme. However, comparing the exhaustive and restricted samples for France suggests that the focus of those countries' datasets on relatively large firms explains such a finding.

This feature of internationalisation is further investigated in Figure 1 in the case of France using the restricted sample. The blue curve plots the actual distribution of exports: exporters are ranked from left to right, starting with the biggest, along the horizontal axis, with their cumulative contribution to aggregate exports measured along the vertical axis. The contributions of the top one percent, five percent and 10 percent exporters are the ones already reported in Table 1. As a benchmark, the grey line plots a distribution corresponding to the case in which all firms export the same value. Hence, the further away the blue curve is from the grey line, the more concentrated aggregate exports are in the hands of few firms. Using the restricted sample, we can plot a similar distribution for employment (in black) as an interesting benchmark. Figure 1 shows that the concentration is high in terms of employment (the black curve is far from the uniform distribution), but is much higher in terms of exports.

In addition Figure 2 zooms on the contributions of 'superstar' exporters by showing what happens within the club of the top one percent exporters⁶. The picture is again striking: the top 0.001 percent, 0.01 percent and 0.1 percent of exporters still account for not much less than 10 percent, 20 percent and 40 percent of aggregate exports.

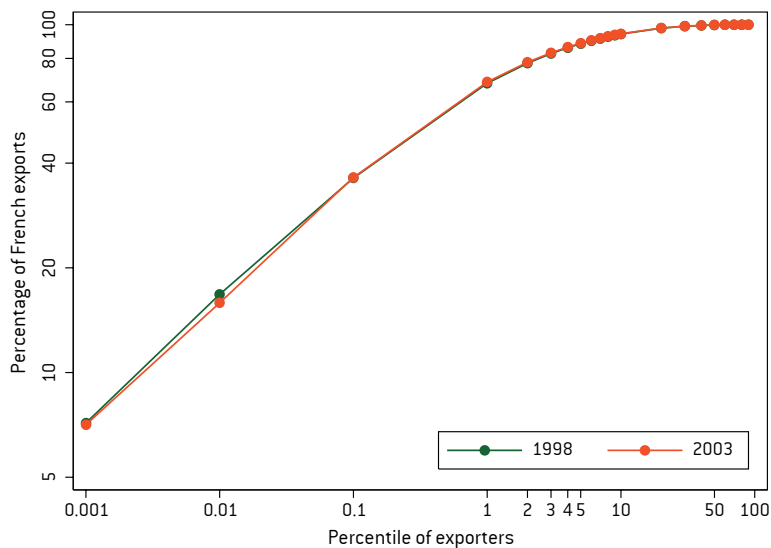
6. As we focus here on a smaller number of firms, we need to use the exhaustive sample to obtain a representative distribution. The logarithmic transformation is used to enhance the readability of the picture.

Figure 1: The superstar exporters phenomenon (France, restricted sample)



Source: EFIM.

Figure 2: The superstar exporters phenomenon, logarithmic transformation (France, exhaustive sample)



Source: EFIM.

For Europe in general, we can summarise the findings as:

Fact 1 – Aggregate exports are driven by a small number of top exporters. The top one percent, five percent and 10 percent of exporters account for no less than 40 percent, 70 percent and 80 percent of aggregate exports.

2.2 Export intensity

The fact that only a handful of firms drive aggregate exports suggests that export status is a mixed bag containing different types of firms.

Table 2 (overleaf) shows that the share of sampled firms that export is roughly 65 percent, 60 percent, 45 percent, 75 percent and 40 percent for France, Germany, Hungary, Italy and Norway respectively. The higher percentages for France, Germany, and Italy reflect the biases of these samples towards relatively large firms. For each country the table reports the percentages of firms exporting more than given shares of their turnover, and the percentage of total exports accounted for by these groupings of firms.

Table 2: Distribution of our sample of exporters by percentage of turnover, 2003

Country of origin	No. firms	Total mfg exports (billion €)	% exporters	% firms exporting more than					% total exports by firms exporting more than				
				5% of turnover	10% of turnover	50% of turnover	90% of turnover	5% of turnover	10% of turnover	50% of turnover	90% of turnover		
Germany	48,325	488.66	59.34	46.89	40.30	11.85	0.96	99.49	98.54	73.57	5.95		
France	23,691	171.73	67.30	41.16	33.04	9.02	1.39	93.58	95.11	49.22	9.71		
United Kingdom	14,976	71.46	28.33	22.52	19.27	8.07	1.51	97.60	93.40	65.70	19.00		
Italy	4,159	58.61	74.44	64.90	57.42	25.58	2.91	99.71	98.53	69.09	7.52		
Hungary	6,404	30.01	47.53	38.43	34.74	22.19	11.01	99.86	99.64	92.01	69.13		
Norway	8,125	16.07	39.22	17.98	14.45	5.19	1.26	98.51	97.42	70.27	28.57		

Source: EFIM. Note: France, Germany, Hungary, Italy and the United Kingdom have large firms only; Norwegian data are exhaustive’.

7. This implies that, when data are not exhaustive, the aggregate figures reported here depart from those reported in official statistics.

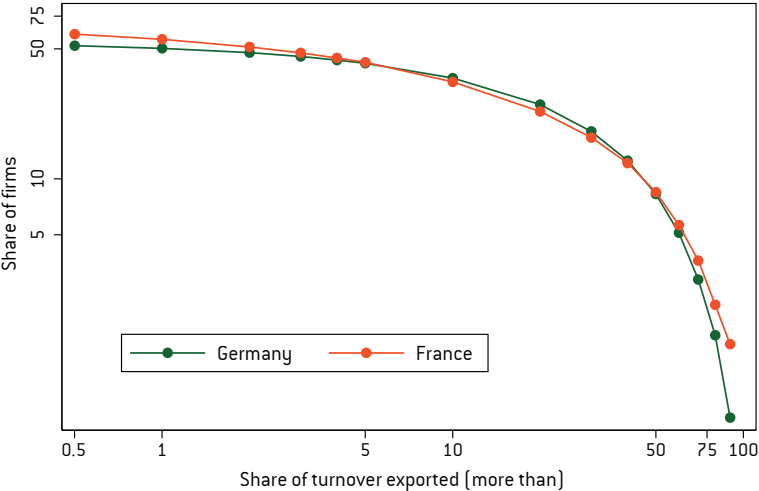
Results for France, Italy and Norway are similar. They show that, even though only a small subset of firms exports a major share of their turnover, they still account for a large fraction of total exports. In France, Germany and the United Kingdom, around 10 percent of all firms export more than 50 percent of their turnover but they account for 50 percent to 75 percent of total exports. The distribution can, however, change substantially across countries.

In this respect, an interesting comparison between France and Germany exemplifies the potential of firm-level data analysis. Germany has a larger proportion of firms exporting more than 50 percent of their turnover, and they represent a much larger share of total exports than in France. From Table 2 we can see that the greatest contribution (68 percent) to total exports in Germany comes from firms exporting from 50 percent to 90 percent of their turnover. In France on the contrary, the greatest contribution (46 percent) comes from firms exporting from 10 percent to 50 percent of their turnover. France, however, has a larger proportion of firms entirely 'globalised' (selling more than 90 percent of turnover abroad) and the share of total exports by those is almost twice as large as for Germany. This echoes other findings showing that one of the strengths of Germany's industrial structure compared to France lies in the larger set of medium-sized firms heavily involved in exporting⁸.

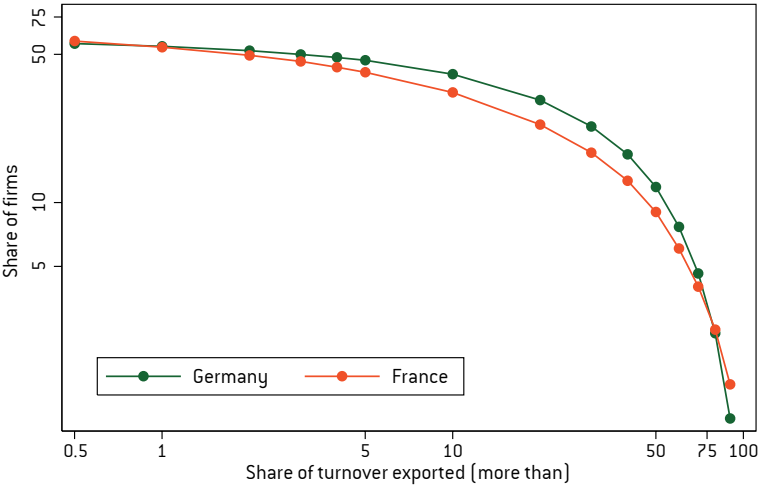
Panels (a) and (b) of Figure 3 illustrate this finding for the entire distribution of firms in two years, 1998 and 2003 respectively. Although this type of cross-country comparison should be read with great caution, it seems indeed to be the case that over time the big divergence between the performance of French and German stems from the middle range of firms. In 1998, the two distributions look quite similar, with France having slightly more of both very small and very large exporters. In 2003 the picture is quite different, with Germany outperforming France for middle-size exporters by a fairly large margin. Whether this change in distribution can explain the drastic differences in export performance of the two countries over the same period is an open question calling for deeper investigation.

8. Artus, P. and L. Fontagné, 2007, *Évolution récente du commerce extérieur français*, rapport n°64 du Conseil d'Analyse Economique, Paris: la Documentation Française. Note that this finding must be taken with caution as none of the two French and German datasets we use are exhaustive. The criteria used by the statistical institutes for sampling firms however seems fairly comparable (see Appendix A).

Figure 3: Export intensity: France vs. Germany



(a) 1998



(b) 2003

Source: EFIM.

For Italy, three percent and 25 percent of firms export more than 90 percent and 50 percent of their turnover and account for roughly seven percent and 70 percent of total exports. For Norway, around one percent and five percent of firms export more than 90 percent and 50 percent of their turnover and account for roughly 30 percent and 70 percent of total exports.

Hungary is somewhat different. Around 10 percent and 22 percent of Hungarian firms export more than 90 percent and 50 percent of their turnover and account for roughly 70 percent and 90 percent of total exports. This reveals that a large fraction of Hungarian firms is involved in intense international activity, probably owing to Hungary's role as the industrial backyard of Germany.

The previous section implies:

Fact 2 – Only a few firms export a large fraction of their turnover. Around five percent and 25 percent of firms export more than 90 percent and 50 percent of their turnover and account for roughly 10 percent and 70 percent of total exports.

Comparing these percentages with the ones reported in Table 1 reveals that the fraction of firms with top export intensity is larger than the fraction of top exporters. Accordingly, top exporters do not necessarily exhibit top export intensity.

2.3 Meet the 'margins'

A handful of firms accounts for a disproportionate share of aggregate exports. These firms, however, do not necessarily export large fractions of their turnover. Hence, their turnover has to be large. Table 3 (overleaf) provides additional information on these superstar exporters. The table refers to France but, as seen in the above, the different countries in our sample are remarkably similar, once the different compositions across countries (exhaustive or restricted sample) have been taken into account.

Table 3: Distribution of French exporters over products and markets⁹*Share of French exporters in 2003 (total number exporters: 99259)*

No. of products	Number of countries			Total
	1	5	10+	
1	29.61	0.36	0.22	34.98
5	0.76	0.45	0.62	4.73
10+	0.95	0.89	10.72	18.57
Total	42.59	4.12	15.54	100

Share of French exports in 2003 (total exports: 314.3 billion €)

No. of products	Number of countries			Total
	1	5	10+	
1	0.7	0.08	0.38	1.86
5	0.3	0.08	1.06	1.97
10+	0.28	0.45	76.3	81.36
Total	2.85	1.55	85.44	100

Source: EFIM.

The top panel of the table reports the percentages of firms exporting given numbers of products (rows) to given numbers of markets (columns). The table reveals a bipolar pattern as the largest percentages of firms are concentrated in the top left and bottom right cells. In particular, 30 percent of firms export only one product to only one market while 10 percent of firms export more than ten products to more than ten markets.

The bottom panel reports, instead, the shares of aggregate exports due to firms exporting given numbers of products (rows) to given numbers of markets (columns). The bipolar pattern is not there: firms exporting more than ten products to more than ten markets account for more than 75 percent of total exports.

Comparing the two panels then yields:

Fact 3 – Top exporters export many products to many locations. Firms exporting more than ten products to more than ten markets account for more than 75 percent of total exports.

9. For more detailed figures, see Table A. 1 in Appendix A.

To summarise, aggregate exports are determined by few top exporters that are relatively big and supply several foreign markets with several differentiated products. This points to the existence of a process through which only firms that are large enough and have a rich enough portfolio of products can withstand international competition. We will explore the characteristics that make exporters, and *a fortiori* top exporters, different from other firms in Section 3. We will refer to such differences as ‘exporters’ premia’.

As to market coverage, most naturally the larger the number of markets a firm serves, the larger their average distance from the firm’s country of origin. Table 3 then suggests that distance affects aggregate trade flows mostly by reducing the number of exporters rather than by reducing average exports per firm. We will compare the two effects in some detail in Section 3.3. There we will refer to the former as the adjustment of aggregate exports along the ‘extensive margin’ and to the latter as their adjustment along the ‘intensive margin’. In this respect, as many trade barriers are typically correlated with distance, Table 3 suggests that the impact of trade policy should materialise mainly through changes in the extensive margin.

3. The talent of internationalised firms

This chapter shows that internationalised firms (IFs) score better than other firms on various performance measures.

3.1 Exporters' and FDI-makers' premia

Table 4 reports employment, value added, wages, capital intensity and, where available, skill intensity 'premia' defined as ratios of exporters' (FDI-makers') over non exporters' (non FDI-makers') values.

Table 4: Exporters and FDI-makers exhibit superior performance

Country of origin	Employment premia	Value added premia	Wage premia	Capital intensity premia	Skill intensity premia
Exporters' premia					
Germany	2.99 [4.39]		1.02 [0.06]		
France	2.24 [0.47]	2.68 [0.84]	1.09 [1.12]	1.49 [5.6]	
United Kingdom	1.01 [0.92]	1.29 [1.53]	1.15 [1.39]		
Italy	2.42 [2.06]	2.14 [1.78]	1.07 [1.06]	1.01 [0.45]	1.25 [1.04]
Hungary	5.31 [2.95]	13.53 [23.75]	1.44 [1.63]	0.79 [0.35]	
Belgium	9.16 [13.42]	14.8 [21.12]	1.26 [1.15]	1.04 [3.09]	
Norway	6.11 [5.59]	7.95 [7.48]	1.08 [0.68]	1.01 [0.23]	
FDI-makers' premia					
Germany	13.19 [2.86]				
France	18.45 [7.14]	22.68 [6.1]	1.13 [0.9]	1.52 [0.72]	
Belgium	16.45 [6.82]	24.65 [11.14]	1.53 [1.2]	1.03 [0.82]	
Norway	8.28 [4.48]	11 [5.41]	1.34 [0.76]	0.87 [0.13]	

Source: EFIM. Note: The table shows premia of the considered variable as the ratio of exporters over non exporters (standard deviation ratio between brackets). France, Germany, Hungary, Italy and the United Kingdom have large firms only, Belgian and Norwegian data are exhaustive.

Table 5 presents, instead, two measures of productivity for French exporters¹⁰. Revenue per worker is recorded as ‘apparent labour productivity’. ‘Total factor productivity’ (TFP) refers to the estimated productivity of all inputs taken together and it is a measure of the global efficiency of a firm¹¹.

Table 5: French exporters exhibit superior performance to French non-exporters

Industry	Apparent labour productivity	Estimated TFP (Olley-Pakes)
Total manufacturing	1.31 [6.11]	1.15 [4.09]
Food and beverages	1.27 [2.12]	1.21 [1.86]
Textiles	1.53 [3.76]	1.48 [2.94]
Wearing apparel	2.52 [8.04]	1.87 [3.06]
Leather and shoes	1.27 [1.57]	1.06 [1.27]
Wood and wood products	10.37 [497.82]	5.89 [264.51]
Paper and paper products	1.19 [1.25]	1.01 [0.8]
Printing and editing	0.9 [0.17]	1.03 [0.31]
Coke and refined petroleum	6.75 [46.33]	0.47 [0.54]
Chemicals	0.78 [0.44]	0.74 [0.45]
Rubber and plastics	1.08 [0.58]	1.01 [0.58]
Non-metallic minerals	0.98 [1.28]	0.91 [1.27]
Metals	1.19 [1.09]	1.12 [1.03]
Metal products	1.12 [1.11]	1.05 [1.04]
Machinery and equipment	1.11 [1.47]	1.05 [1.38]
Office machines	1.82 [8.23]	1.83 [8.02]
Electrical equipment	1.22 [1.49]	1.11 [1.4]
Radio-TV communication	1.31 [1.95]	1.17 [1.78]
Precision instruments	1.21 [1.5]	1.1 [1.45]
Motor vehicles	1.23 [1.4]	1.11 [1.59]
Other transport	1.32 [1.73]	1.14 [1.6]
Furniture	1.29 [5.85]	1.21 [3.67]
Recycling	1.01 [0.71]	0.98 [0.94]

Source: EFIM. Note: The firms considered are manufacturers with more than 20 employees [data for France 2003]. The table shows premia of the considered variable as the ratio of exporters over non-exporters. Numbers in brackets are the ratio of the standard deviation.

10. Similar results for alternative measures of productivity are presented in Appendix A, Table A. 2.

11. Appendix C presents some of the most popular procedures for TFP estimation based on firm-level production functions. The one selected in Table 5 is the Olley-Pakes method.

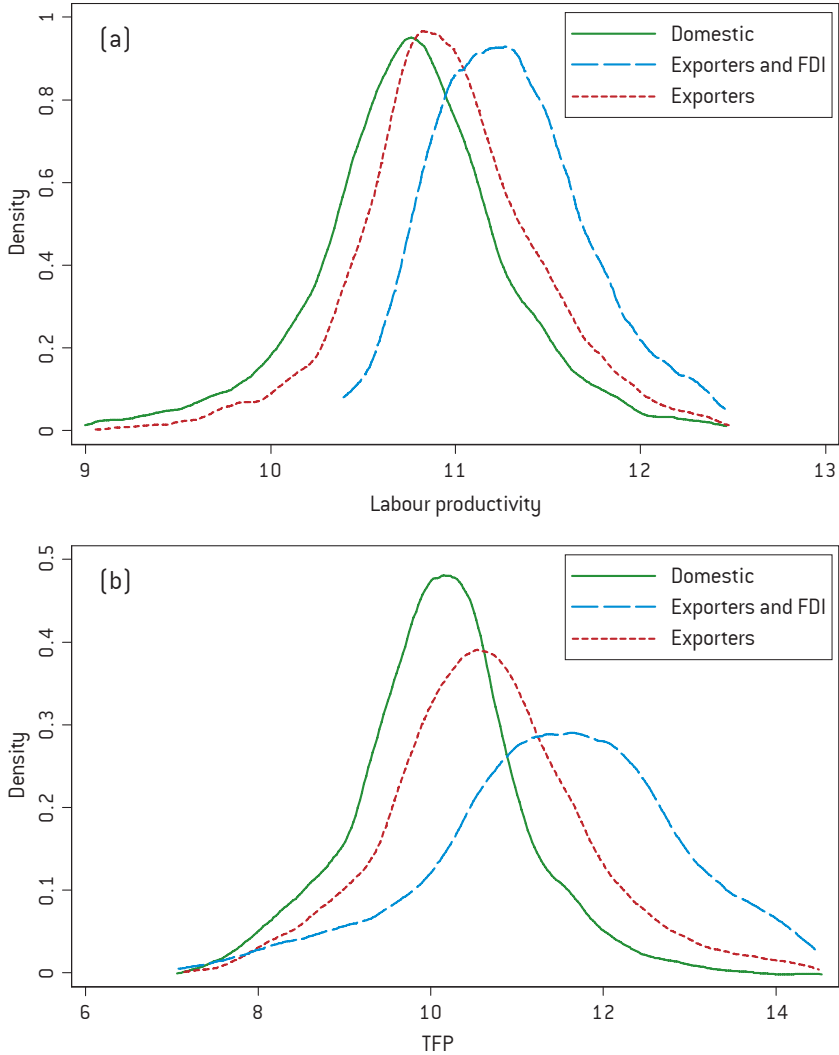
The message conveyed by the two tables is clear: in all countries and on all counts exporters are generally better performers. The difference is particularly pronounced for employment and value added. There is, nonetheless, some variation across countries. For example, exporters' premia are significantly lower for France (2.4 and 2.6) and Italy (2.2 and 2.1) than Belgium (9.1 and 14.8) and Norway (6.1 and 7.9). This is probably due to the fact that the French and the Italian datasets feature relatively large firms only, which gives highly selected samples of non-exporters. The wage premium is, instead, consistently smaller but still exporters tend to pay wages that are 10-20 percent higher than non-exporters.

The employment premium for German exporters is in line with those of France and Italy. The United Kingdom employment premium for exporters is instead almost zero, which is a puzzling exception compared to all other countries and indicators. This probably derives from the fact that the sample of UK firms is even more biased than others in favour of large firms¹². Given that its sample is also restricted to large firms, Hungary is an outlier (as it was also in terms of the percentage of firms that export more than 90 percent of their turnover). Quite large premia characterise employment (5.3), value added (13.5) and wages (1.44). Capital intensity and productivity feature, instead, rather low premia.

The analysis can be refined by comparing firms that not only export but also invest abroad with those that only export or only operate in their domestic markets¹³. Figure 4 shows the productivity distributions for the three types of firms in Belgium. The panels in the figure correspond to the alternative estimates reported in Table 5 in the case of total manufacturing. In particular, panel (a) depicts apparent labour productivity whereas panel (b) refers to estimated TFP.

12. Sample selection is less likely to explain the cross-country behavior of FDI premia as French premia are quite large.

13. In our samples, nearly all FDI-makers are also exporters.

Figure 4: Belgian FDI-makers are more productive than Belgian exporters

Source: EFIM. Note: Data for Belgium 2004.

For the three types of firm, each panel shows the share of firms ('density') that attain each productivity level. In other words, the panels depict the probability of picking a firm with a certain productivity level when the firm is randomly drawn from each type. The two panels send the same message: a randomly drawn FDI-maker is likely to be more productive than a randomly drawn exporter, which in turn is likely to be more

productive than a randomly drawn domestic firm. This type of finding is not specific to Belgium, and has also been shown to exist for Italian exporters compared to domestic Italian firms¹⁴.

We have therefore established:

Fact 4 – FDI-makers perform better than exporters and exporters perform better than non-exporters. Exporters are generally bigger, more profitable, more capital intensive, more productive and pay higher wages than non-exporters. By the same measures, FDI-makers perform better than exporters.

Exporters are also different along an additional dimension. In particular, Table 6 shows that they are more likely to be foreign owned. This phenomenon is more pronounced when the complete population of firms is available (Belgium) than when only large firms are sampled (Hungary, Italy or the UK). In Hungary, where foreign ownership is much more common, exporters are still four times more likely to be foreign owned. The associated Figure 5 depicts the evolution of these figures over time. Hungary and the UK are quite stable in having a very large share of foreign-owned exporters, while foreign ownership is rising fast in Belgium and Italy.

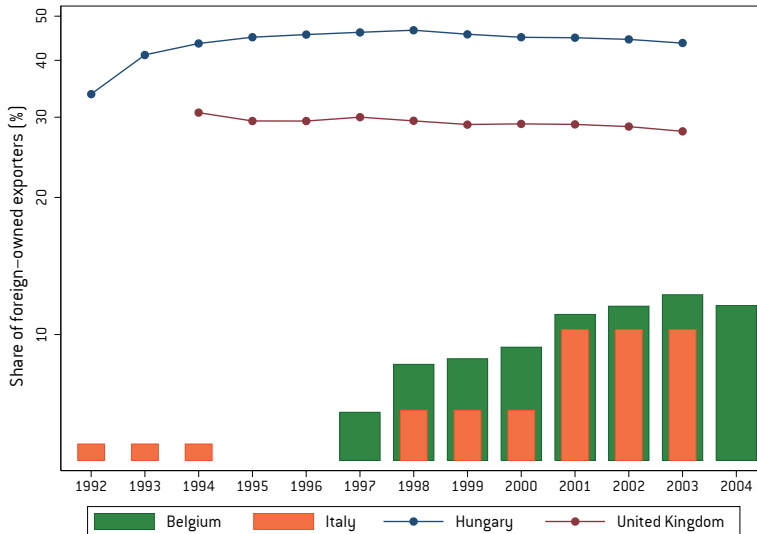
Table 6: Share of foreign-owned firms among exporters and non-exporters in 2003 (%)

Country of origin	Non-exporters	Exporters
United Kingdom	0.58	12.23
Italy	11.47	43.63
Hungary	4.03	10.26
Belgium	18.69	27.94

Source: EFIM. Note: United Kingdom, Italy and Hungary have large firms only, Belgian data are exhaustive.

14. <http://www.cepr.org/pubs/PolicyInsights/PolicyInsight8.pdf>.

Figure 5: The rising foreign ownership of European exporters



Source: EFIM.

Hence, we have:

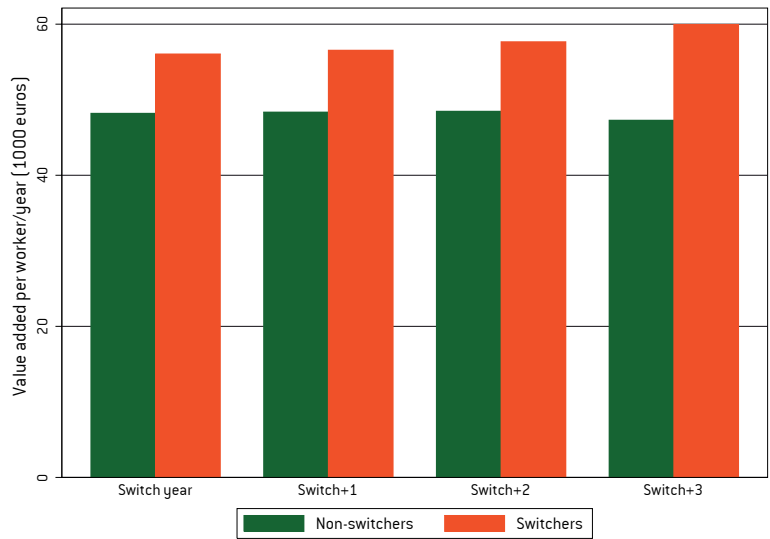
Fact 5 – Exporters are more likely to be foreign owned.

3.2 Learning by exporting and investing abroad?

Exporters are better than non-exporters over a broad spectrum of performance measures. An interesting issue is whether their superior performance predates their access to export markets or rather their performance improves as a result of their access to export markets.

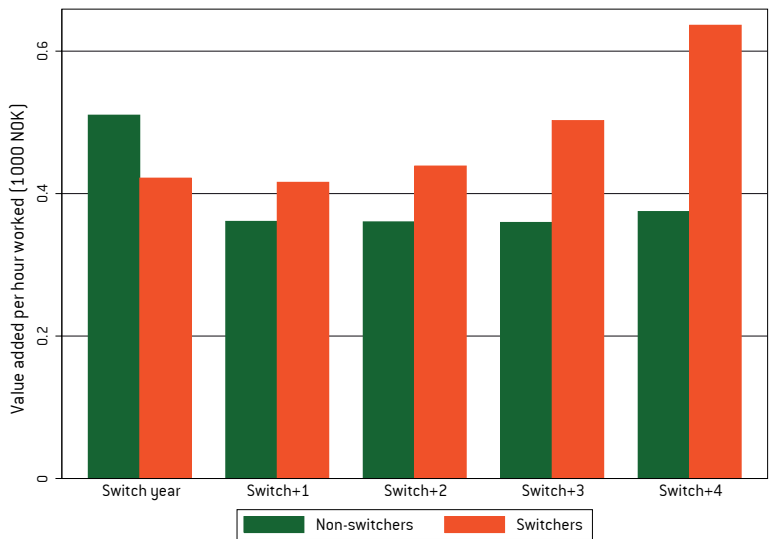
This chicken-and-egg question is presented for France and Norway in Figures 6 and 7 respectively. The figures consider firms in the samples that became exporters during the period of observation and that were observed for four years after switching status ('switchers'). It then compares their behaviour with that of all other firms ('non-switchers'). In particular, the comparison is made in terms of value added per worker a given number of years after the firms first began exporting.

Figure 6: Compared performance in labour productivity – Export (France)



Source: EFIM.

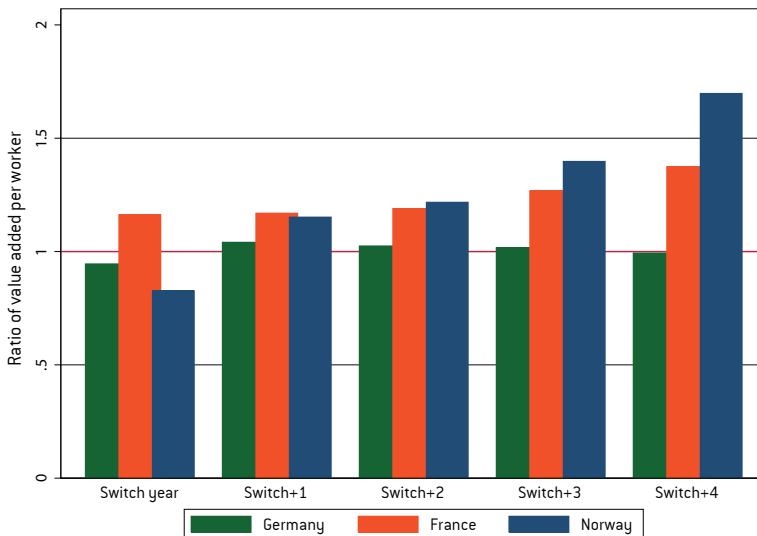
Figure 7: Compared performance in labour productivity – Export (Norway)



Source: EFIM.

The two figures show that switchers do move along steeper trajectories as they perform increasingly better than non-switchers. This is true no matter whether they already performed better in the switch year (France) or not (Norway). Two very different stories are consistent with those findings. Since we do not observe what happened before the switch, perhaps the switchers were already on a better trajectory, so gaining export status was simply the outcome of an already promising performance ['selection into export status']. On the other hand, perhaps the switchers were no different from other firms before switching, but gaining export status as a result of some temporary shock allowed them to learn from international activity ['learning-by-exporting']. Data for Germany are also available but only allow one to calculate performance ratios of switchers over non-exporters. We compute those ratios for the three countries and depict them in Figure 8. While the labour productivity of firms switching to exporter status is generally greater than that of non-exporters one year or more after switching, the pattern over time is not clear. The advantage increases steeply for Norway but much less so for France and does not show any clear trend in the case of Germany.

Figure 8: Compared performance ratio in labour productivity for three countries – Export

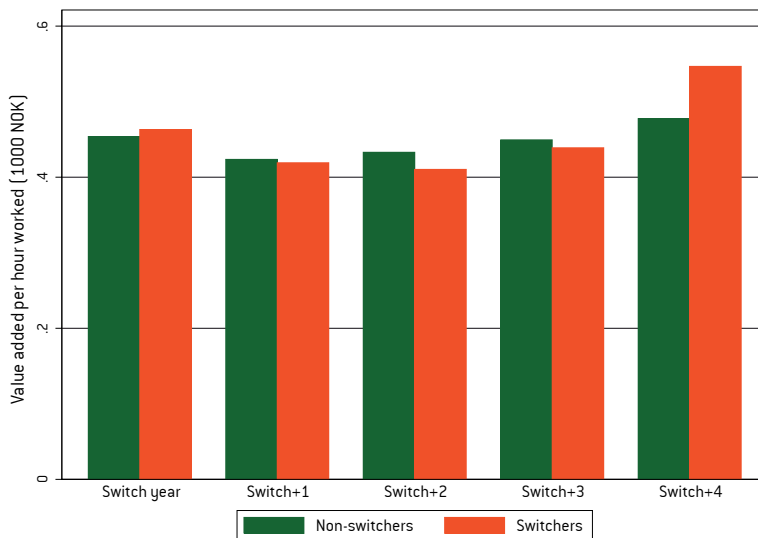


Source: EFIM.

Only the Norwegian data lend themselves to a study of the behaviour of firms that start to invest abroad during the period of observation and that are then observed for the four next years ['switchers']. Figure 9 compares their behaviour with that of all

other firms ('non-switchers') in terms of value added per worker a given number of years after the firms first started to make FDI. The pattern is U-shaped, with switchers underperforming in the first three years and overperforming in the fourth year after switching.

Figure 9: Compared performance ratio in labour productivity – FDI (Norway)



Source: EFIM.

Overall, we have:

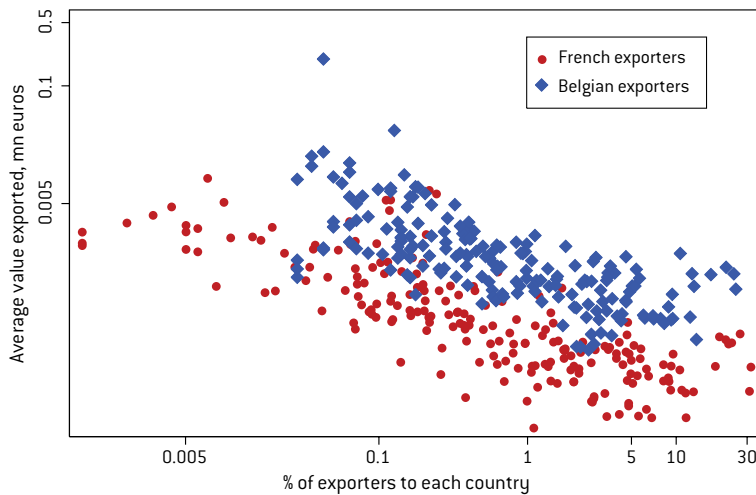
Fact 6 – There is no clear evidence of firms performing differently after accessing foreign markets. While the performance of firms that start exporting is generally better than that of non-exporters one year or more after starting to export, the pattern over time is not clear. The picture is even more blurred in the case of firms that start to invest abroad.

3.3 Tougher markets are for large exporters

Some markets are more difficult to access by firms than others. Along its horizontal axis, Figure 10 reports the shares of Belgian and French firms exporting to each foreign market. Some markets are served by one out of three firms, others by less than five firms in a thousand. It is natural to interpret such percentages as indirect measures of how easy it is for Belgian and French firms to access the various foreign

markets. Along its vertical axis, Figure 10 also reports the average value exported per firm.

Figure 10: 'Easy' markets and value exported

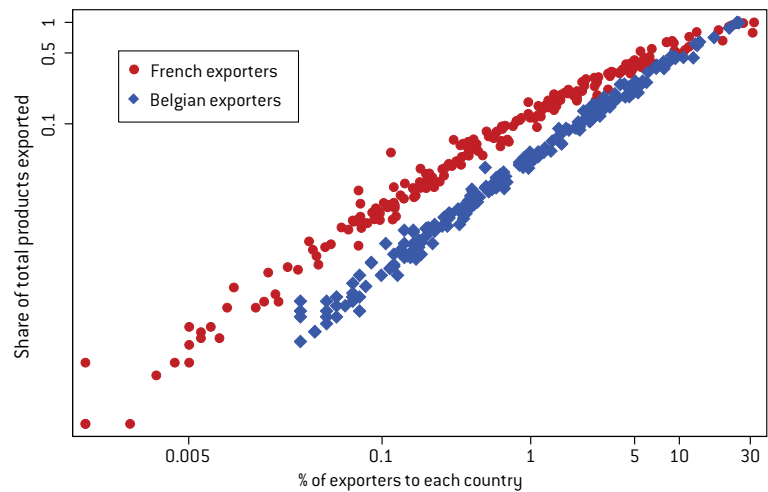


Source: EFIM.

This figure exhibits a clear downward sloping pattern as the average value exported is smaller in 'easier' markets. This suggests that 'difficult' markets are typically served by few large exporters, whereas a large number of small exporters are also able to cater for 'easy' markets¹⁵. While this is true for both Belgian and French firms, the former generally outperform the latter managing larger exports per firm in most markets. Interestingly, as shown in Figure 11 (overleaf), this difference in performance contrasts with the fact that, even though easier 'markets' are reached by a richer variety of products in both the Belgian and the French cases, French firms tend to export more products than Belgian ones. This may be due to the fact that a larger domestic market nurtures a wider variety of products.

15. Such comparisons should always be made with care since the data are collected by different customs offices. However, note that the EU is trying to harmonise data-collecting procedures for foreign trade and that both the Belgian and the French datasets we use are exhaustive for trade (subject to the same Eurostat requirements), are reported in the same currency units and for the same level of the same product classification.

Figure 11: ‘Easy’ markets and products exported



Source: EFIM.

4. The margins of exports and FDI

This chapter breaks down aggregate exports and FDI into their fundamental drivers. It shows that the most important channel through which these drivers affect aggregate flows is the ‘extensive margin’, ie the number of internationalised firms (IFs).

4.1 Firm margins

The single most robust way to relate aggregate trade and FDI flows to their fundamental drivers is the so-called ‘gravity equation’. This relates the values of flows between two economies to their sizes and a variety of trade impediments¹⁶. While this relationship works in the case of both exports and FDI, for ease of presentation we will initially focus on trade flows and deal with FDI later.

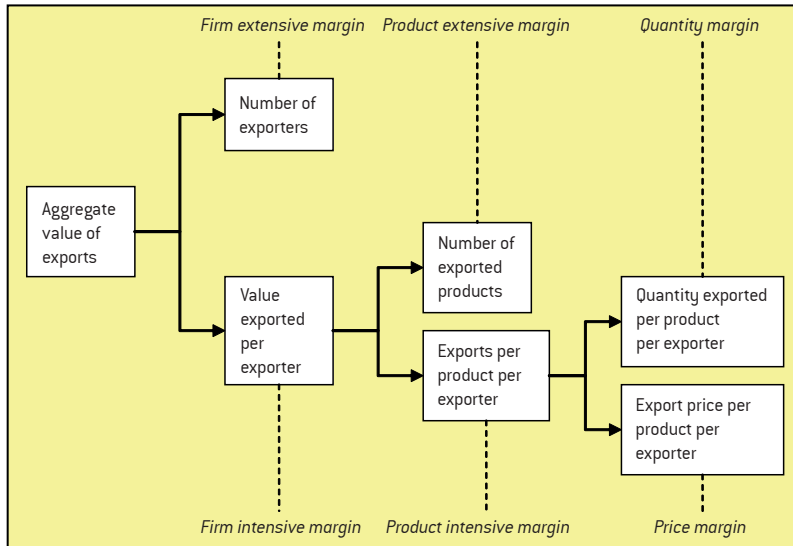
Aggregate data show that bilateral trade flows are positively affected by countries’ sizes and negatively affected by trade impediments. As some trade impediments increase with the distance between countries, this result is reminiscent of Newton’s law of gravitational attraction, whence the name ‘gravity equation’.

Through which channels does gravity determine bilateral trade flows? First of all, gravity may affect the number of exporters (‘firm extensive margin’). Then, it may affect the average exports per exporter (‘firm intensive margin’). It may also affect the number of products exported (‘product extensive margin’), and the average exports per firm of each product (‘product intensive margin’). Finally, gravity may affect export prices (‘price margin’) and exported quantities (‘quantity margin’) in different ways. To handle this complexity in a consistent way, we decompose the

16. The theoretical foundations of this empirical relationship have emerged late in time compared with the vast number of empirical applications of gravity. In the last ten years a wide range of theoretical explanations behind gravity has become available (see Anderson and van Wincoop 2004 for a survey), and researchers such as Chaney (2006), Melitz and Ottaviano (forthcoming), Helpman *et al.* (2007) have started to investigate the importance of firms’ heterogeneity for gravity. On the empirical side, authors such as Eaton, Kortum, Kramarz (2004) and Bernard *et al.* (2007) have investigated those issues for US firms and French firms.

simple gravity equation into increasingly finer detail, relying on firm-level information. The logic of this decomposition is visualised in Figure 12 and formally described in Appendix D.

Figure 12: The margins of adjustment of aggregate exports



Source: EFIM

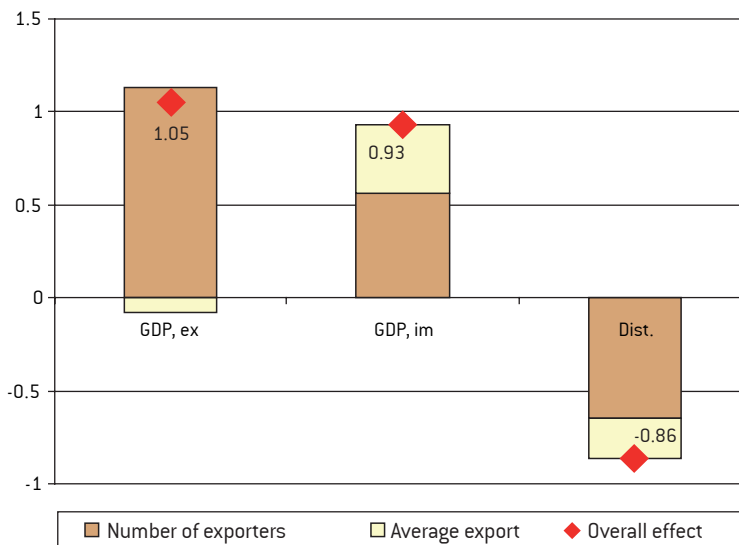
Let us begin with the decomposition in terms of firm extensive and intensive margins. In other words, we ask: do spatial separation, differences in language, currencies and so on hinder trade flows by limiting the entry of exporters ('firm extensive margin') or rather by constraining the volumes exported by firms ('firm intensive margin')?

The decomposition of exports into extensive and intensive margins can be carried out in a similar fashion for the French and Belgian data, which both provide near-exhaustive data for exports over a very comparable set of years. Furthermore, we are able to compute for both countries not only the average export value per firm, but also the number of products exported, the average quantity (in kilograms) and therefore the unit value for each product¹⁷.

17. We can thus go even further than existing margin decomposition on US internal (Hillberry and Hummels, 2005) or external (Bernard *et al.*, 2007) data. Another early paper decomposing trade patterns into the extensive and intensive margins is Eaton *et al.* (2004) in French data for the year 1986.

We start with the most simple decomposition exercise, which contains only distance as a trade impediment. Figure 13 presents the results¹⁸. The bar chart represents the contribution of firm extensive ('Number of exporters') and intensive ('Avg. Exports') margins to the overall effects (red dots) of three gravity forces on bilateral exports: the size of the exporting country ('GDP, ex'), the size of the importing country ('GDP, im') and distance ('Dist.').

Figure 13: Gravity and Aggregate Exports – I



Source: EFIM

The overall effects are extremely standard: close to one for GDPs and close to -0.9 for distance. In other words, if country A is 10 percent larger than country B, then on average it attracts 10 percent more exports than B from other countries. Analogously, country A exports on average 10 percent more than B to other countries. Moreover, if A is on average 10 percent further away from other countries than B, then it trades nine percent less than B with those countries.

More interestingly, the results of the decomposition show that the reaction of the firm extensive margin of trade to gravitational forces is much greater than the intensive margin. For instance, the decrease in the number of firms accounts for 75 percent of the impact of distance on trade flows. In the same vein, the increase in trade value

18. For more detailed regression output, see Table A. 3 in Appendix A. All coefficients are highly significant.

associated with the increase in the importing country's size comes mostly (60 per cent) from the increase in the number of exporters to the country in question. Note also that the entire effect of the exporting country's size on trade comes from the number of its exporting firms¹⁹.

More detailed estimates also allow one to identify interesting differences in the effects of different trade impediments²⁰. Sharing a language increases the number of exporters and does not affect the average amount exported. GATT/WTO membership and colonial links increase the number of exporters and reduce the average amount exported. This evidence is compatible with the notion that being a member of GATT/WTO and having linguistic or colonial links tend to reduce the fixed costs of exporting rather than the variable ones.

We have thus established:

Fact 7 – The number of exporters matters the most. The change in the number of exporting firms accounts for most of the negative impact of trade barriers and most of the positive impact of the importing country's size on bilateral exports. The increase in the number of exporting firms accounts entirely for the positive impact of the exporting country's size on bilateral exports.

4.2 Product margins

In datasets where the information is available, a further decomposition makes it possible to assess how the number of products exported by firms varies with different barriers to trade.

Figure 14 displays the results of this new decomposition²¹. The bar chart represents the contribution of the firm extensive margin ('Number of exporters'), the product extensive margin ('Number of products') and the product intensive margin ('Average Export per product by firm') to the overall effects (red dots) of three gravity forces on bilateral exports. Strikingly, the results point to an extreme parallelism in the firm extensive margin and the product extensive margin. Together, these two margins would imply that the effect of the size of and distance between exporting and

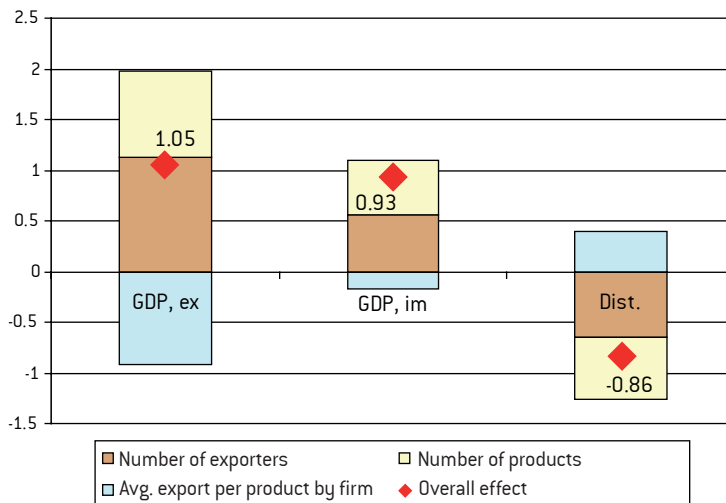
19. This is exactly what should be expected from most theoretical foundations of the gravity equation and, in particular, from the ones with differentiated products and imperfect competition, whether with heterogenous firms [Chaney, 2006; Helpman *et al.*, 2007; Melitz and Ottaviano, forthcoming] or not [Redding and Venables, 2004].

20. See Table A. 3 in Appendix A for detailed results.

21. For more detailed results, see Table A. 4 in Appendix A.

importing countries is much greater than the estimated total effect. This is because, as shown by the pale blue parts of the bars, the effect of these three factors on exports is mitigated by their effect on average export per product by firm. Indeed, the average export per product by firm falls with GDPs and rises with distance. In particular, a 10 percent increase in the GDP of the exporting country leads to an increase of roughly 10 percent in both the number of exporters and the number of products exported as well as a decrease of roughly 10 percent in firms' average export per product. A 10 percent increase in bilateral distance leads to a six percent fall in the first two variables and to a four percent increase in the third²².

Figure 14: Gravity and Aggregate Exports – II



Source: EFIM

These findings establish:

Fact 8 – The number of exported products matters too. Larger countries have more exporters, export more products and their exporters have smaller average exports per product. An increase in bilateral trade barriers reduces the positive effects of country size on the number of exporters and products. It also reduces the negative effect of country size on exporter' average exports per product.

22. These findings are very similar to the ones by Bernard *et al.* [2007] and Hillberry and Hummels [2007], respectively, for external and internal US trade flow.

The results on the product intensive margin are particularly interesting. They imply that the indications of the (net) impacts of GDPs and distance on the firm intensive margin highlighted in Figure 13 are attributable to their impact on the total number of exported products, which is far greater than the impact on average export per product²³.

We can thus write:

Fact 9 – Firms’ average exports per product matter less. The changes in the number of exporting firms and in the number of exported products accounts entirely for the negative impact of higher trade barriers and the positive impact of larger countries’ size on bilateral exports.

The finding that the ‘product intensive margin’ falls with GDPs and increases with distance is puzzling at first sight. Two hypotheses can be proposed to explain it, one related to ‘efficiency sorting’ and another related to ‘quality sorting’ of firms over different export markets. The former refers to the fact that only the most productive firms from a certain country manage to export to distant or small foreign markets. This occurs because only those firms are able to quote low enough prices but still succeed in exporting large enough quantities to at least break even. Nearer or larger markets attract many more exporting firms, and the proportion of high cost – high price – low quantity exporters is larger²⁴. Since the product intensive margin only considers the average shipment value, such a composition effect may explain why the effects of GDPs are negative and those of distance are positive.

Alternatively, the puzzling signs of the effects may have to do with the quality or price/weight ratio exported to different markets. If firms differ in the quality of the product exported (or have different qualities in their portfolio of products), one may observe that only the high quality varieties are exported to distant or small markets, while low quality products can only be exported to nearer or large markets²⁵. Distinguishing between the two alternative explanations is a complex issue, but one can use the average price of shipments to shed some light on it.

We now turn to the last decomposition, which allows one to distinguish between the gravity effects on average quantity and on average price.

23. This finding parallels the one by Bernard *et al.* (2007) for US exporters.

24. See Melitz and Ottaviano (forthcoming) for a theoretical formalisation of this idea

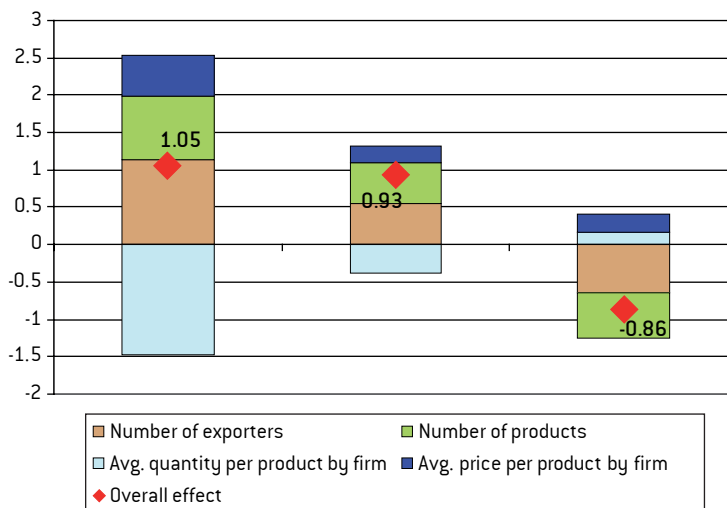
25. Bernard *et al.* (2007) conjecture that this second explanation might be the relevant one to explain their result, but do not investigate it further.

4.3 Price and quantity margins

A final decomposition of the average export per product by firm (product intensive margin) into average quantity per product by firm and average price per product by firm can be carried out using information on the value and quantity of shipments measured at product level. The results of this final decomposition are reported in Figure 15.

The bar chart in Figure 15 represents the contribution of the firm extensive margin ('Number of exporters'), the product extensive margin ('Number of products'), the quantity margin ('Average quantity per product by firm') and the price margin ('Average price per product by firm') to the overall effects (red dots) of three gravity forces on bilateral exports.

Figure 15: Gravity and Aggregate Exports – III



Source: EFIM

The chart shows some support for both 'efficiency sorting' and 'quality sorting'. The former implies that firms managing to export to smaller or more distant markets are on average more productive and therefore have on average higher volumes of sales. Figure 15 shows that the average quantity exported decreases with GDPs and increases with distance, pointing to the presence of less efficient exporting firms in larger or closer markets. The dark blue areas report the results for the average unit price of exports. Average prices tend to increase with distance from the exporting

country, which is consistent with ‘quality sorting,’ as long as higher quality varieties are the only ones able to reach distant markets. However, such a mechanism would certainly predict a negative effect of GDPs. Hence, overall ‘quality sorting’ seems to be a weaker explanation of the aggregate observed behaviour of the product intensive margin²⁶.

We have therefore:

Fact 10 – Prices and quantities defy gravity. The average quantity exported by firm and the average export price per product are respectively smaller and larger in larger countries. A reduction in trade barriers leads to a fall in both of them.

4.4 The margins of exports

An alternative, more intuitive, way to look at the decomposition of aggregate exports in the four margins (firm and product extensive margins, quantity and price margins) is presented in Figures 16, 17 and 18. These use the example of France as the exporting country. Very similar graphs can be obtained for Belgium²⁷.

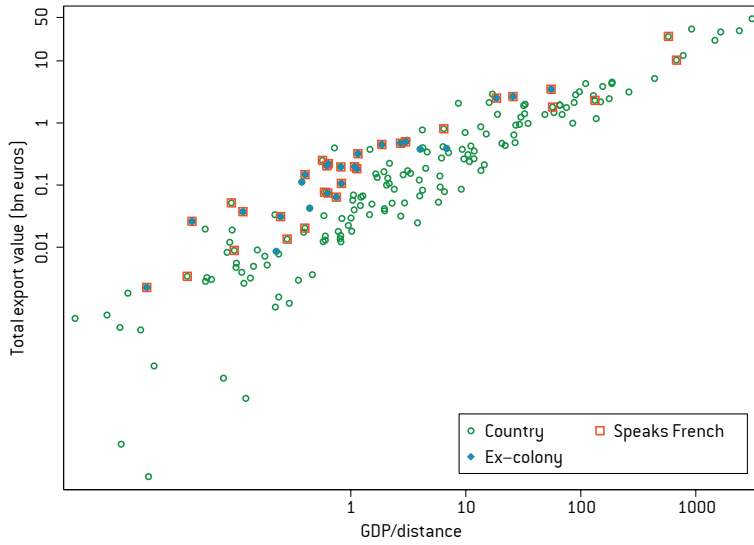
Figure 16 is a simple plot for 2003 of the total value exported by France to each country in the world against the distance-weighted GDP (‘ease of access’) of each country. The variable on the horizontal axis captures the expected export flow from the simplest gravity equation, with unitary coefficients extremely close to the ones actually reported in Figure 13. The fit is impressive, as expected, and shows that markets with large GDP over distance ratios attract French exports.

The figure also distinguishes between three groups of countries: former French colonies, French speakers and all the rest. The first two groups, which are obviously not mutually exclusive, tend to plot above the simple gravity prediction.

26. One must be cautious in interpreting these results since validating the ‘quality sorting’ hypothesis would imply running the analysis at the firm level and measuring quality more directly. More generally, the average price is a mixed bag of all sorts of underlying product prices, and therefore trade composition effects are likely to blur any story concerning efficiency or quality sorting at the industry or even firm level. Those sorting effects could only be properly uncovered through careful firm or industry level analysis, which goes well beyond the scope of the present descriptive analysis. See Baldwin and Harrigan [2007] and Crozet *et al.* [2007] for more detailed hypotheses on this issue. Deeper investigation is also needed to shed light on additional issues such as the opposite effects of regional trade agreements (RTA) on average export price and average export quantity. For more detailed results, see Table A.5 in Appendix A.

27. Figure 16 and panel (a) of Figure 17 can also be produced for Norway. The patterns are remarkably similar.

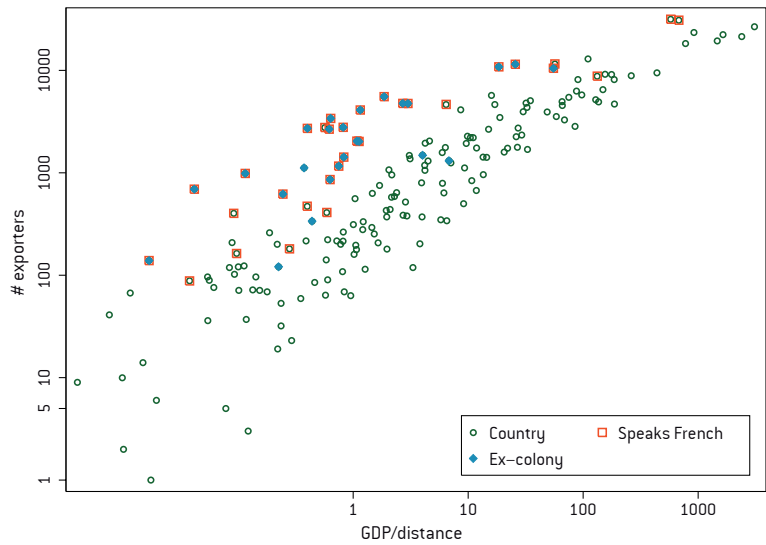
Figure 16: The forces of gravity for France in 2003



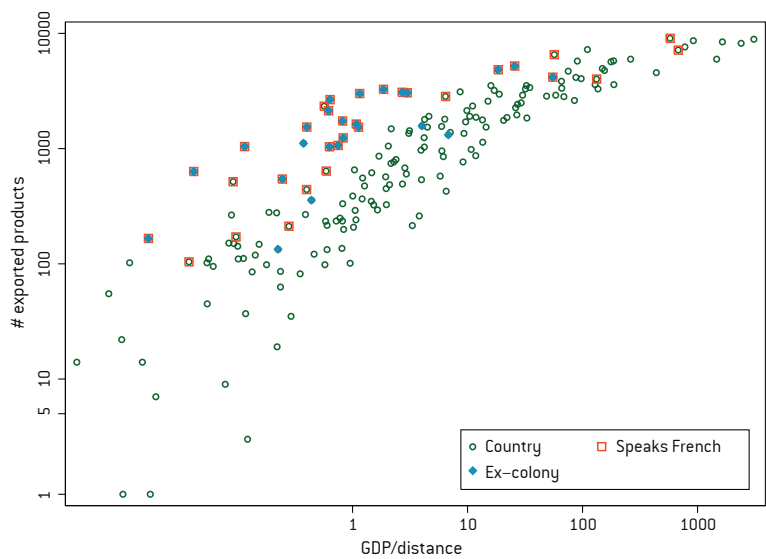
Source: EFIM

Figures 17 and 18 (overleaf) decompose the effects of gravity forces in different margins following the same logic as Figures 14 and 15. The extensive margins in terms of the number of firms and the number of products are represented in Figure 17, which shows the very strong relationship between the numbers of (a) exporting firms and (b) exported products on the one hand, and market size (divided by distance) on the other.

Figure 17: The extensive margin



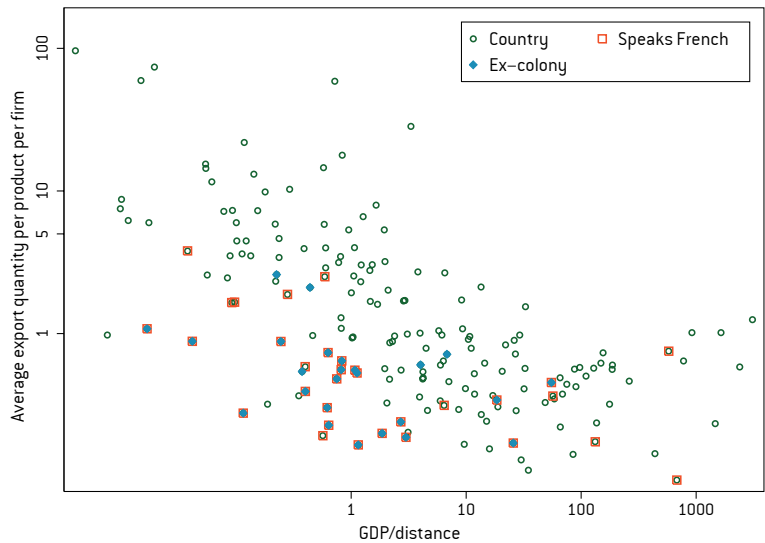
(a) gravity for # of firms



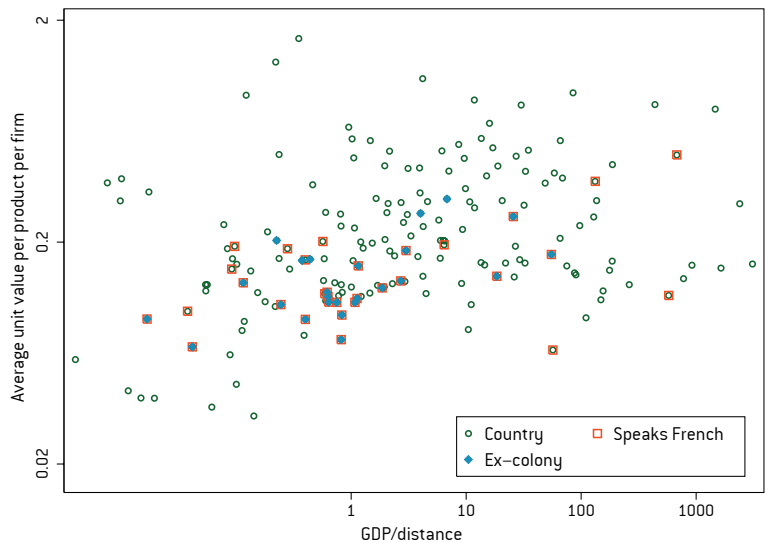
(b) gravity for # of products

Source: EFIM

Figure 18: The intensive margin



(a) gravity for average quantity



(b) gravity for average price

Source: EFIM

Ex-colonies and French-speaking countries are very large positive outliers in both panels of Figure 17. As colonial ties and a common language are not directly related to distance, this suggests that such variables proxy for lower fixed costs of exporting. Additional insight on the issue can be gained from panel (a) of Figure 18 where former colonies and French-speaking countries appear as negative outliers in the negative relationship between average quantity shipped and ease of access. Accordingly, in markets that are easier to access, such as those of former colonies and francophone countries, French exporters are more numerous and on average less efficient, which drives down the average quantity exported.

Hence, we can highlight:

Fact 11 – Historical ties and common language matter. Historical ties such as former colonial links and a common language foster exports, making it easier for less efficient firms to export.

Finally, in panel (b) of Figure 18, we observe that the relationship between market size and average prices is not as clear as the other three relationships. This is not unexpected, since this average price is a mixed bag of all sorts of underlying product prices.

4.5 The margins of FDI

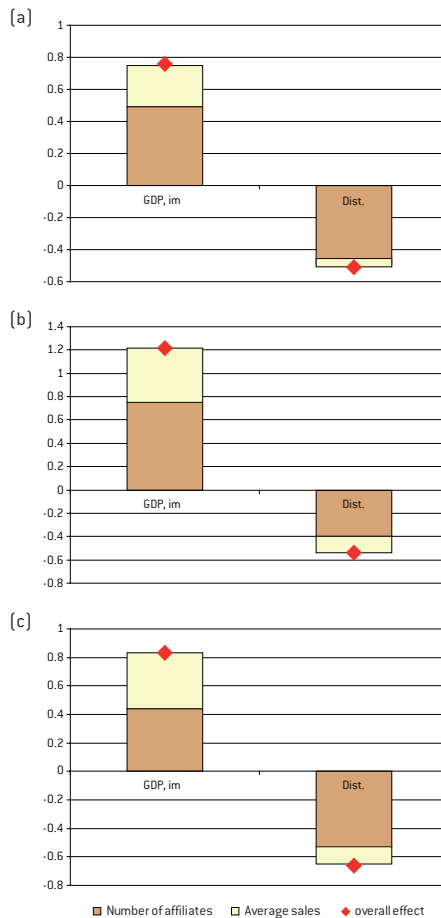
The gravity model has been primarily devoted to the study of trade flows, but more recently a fair amount of research has used the same variables to explain patterns of bilateral FDI flows or stocks²⁸. The equilibrium equation for bilateral capital flows closely resembles the gravity relation for bilateral trade flows. Nonetheless, the interpretation of the coefficients is sometimes very different. Most importantly, in the case of trade flows the negative coefficient on distance captures the frictions due to trade costs (including freight costs), while in the case of FDI flows the same coefficient captures the frictions due to information and transaction costs associated with the acquisition or installation of new capital abroad.

As in the case of bilateral exports, the decomposition of the margins can be used to

28. For example, Head and Ries [forthcoming] have recently developed a model of FDI where heterogeneous investors bid to obtain control rights on existing overseas assets. The equilibrium equation for bilateral capital flows closely resembles the type of trade flow gravity equation derived with heterogeneous exporters. In the same spirit, Hijzen, Görg and Manchin [forthcoming] investigate the role of trade costs in explaining the increase in the number of cross-border M&As.

highlight the channels through which gravity forces affect the sales of foreign affiliates. In Figure 19 each bar chart represents the contribution of firm extensive ('Number of affiliates') and intensive ('Average Sales' per affiliate) margins to the overall effects (red dots) of two gravity forces: the size of the destination country ('GDP, im') and distance ('Dist.'). The decomposition of the margins is possible for Norway (a), Germany (b) and Belgium (c), for which we have both the number and the local sales of foreign affiliates²⁹.

Figure 19: Gravity and aggregate FDI



Source: EFIM

29. More detailed results are presented in Table A.6 and Table A.7 in Appendix A. In particular, these tables display also some limited results for France and Italy.

Figure 19 shows that, as in the case of exports, the overall pattern of foreign affiliate sales is overwhelmingly driven by the extensive margin. The contribution of the number of affiliates abroad is systematically higher than the contribution of average sales per affiliate for all three countries³⁰.

The massive positive influence of the GDP of the country of destination is noteworthy. It highlights the fact that, at this level of aggregation, FDI is primarily driven by market access considerations ('horizontal FDI') and not cost-saving ones ('vertical FDI')³¹. Moreover, Figure 19 shows that the rise in foreign affiliate sales associated with the increase in the GDP of the country of destination comes mostly (65 percent for Norway, 61 percent for Germany and 53 percent for Belgium) from the increase in the number of foreign affiliates.

More detailed estimations also reveal the key role of the number of affiliates also in transmitting the effects of other gravity forces³²: the effect of distance for Belgium, Italy and Norway; the RTA, language and colonial effects for Germany and France; the RTA effect for Italy and the colonial effect for Belgium; the effect of GATT/WTO membership for Belgium, France, Germany and Norway³³.

Hence, we have established:

Fact 12 – The number of foreign affiliates matters. Larger countries and lower trade barriers attract more multinational activities. This attraction is evident mostly in terms of larger numbers of foreign affiliates than in terms of more sales per affiliate.

30. See Table A. 6 and Table A. 7 in Appendix A for the corresponding regression tables. These also show that the fit of the gravity model is strikingly similar (and high) for France and Italy, for which only the number of affiliates is available.

31. See eg Barba Navaretti and Venables (2004) and Blonigen (2005) for definitions of the two types of FDI and related empirical evidence.

32. See Table A. 6 and Table A. 7 Appendix A for the corresponding regression tables. In these tables, it might be considered puzzling that the effect of distance on FDI is not significant for both France and Germany, our two largest source countries. This is in fact due to the correlation of the distance variable with the RTA variable.

33. In a recent study on the offshoring activities of German firms, Buch *et al.* (2007) present results for a larger list of determinants, including per capita income and country ratings. In this study, distance becomes a significant determinant of German firms' FDI.

5. Intra-industry reallocations

Industries are typically characterised by the presence of few highly productive firms and many low-productivity firms. Industries where this pattern is more pronounced adjust to shocks mainly through changes in the international status of firms rather than in the intensity of firms' international activity.

When considered together the facts presented in previous chapters are consistent with a scenario in which very heterogeneous firms coexist within the same industry. Because of the existence of fixed costs to international activity, lower-performing firms tend to be active in their own domestic markets only. Higher performing firms also tend to be active in foreign markets. The better they are, the more they sell in those markets. This occurs thanks to richer product lines and more numerous destinations. Indeed, a country's penetration of foreign markets is driven mainly by such extensive margins.

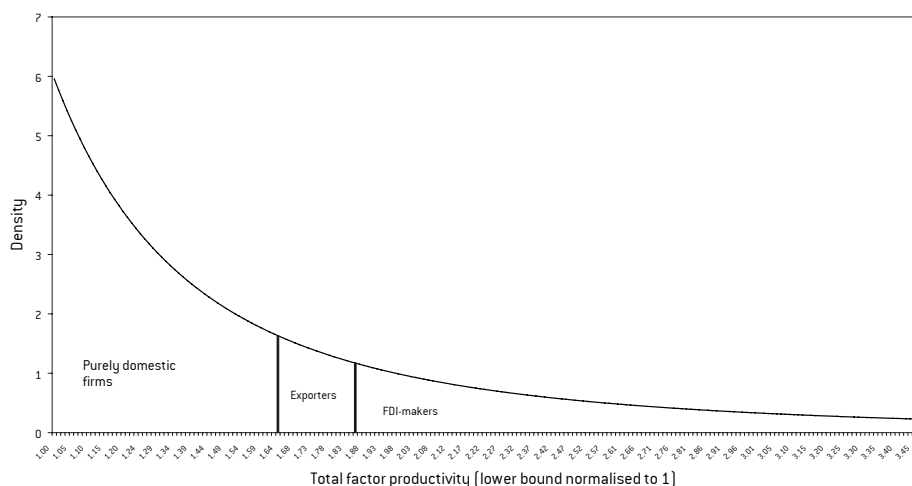
This pattern is neatly portrayed in Figure 4: firms involved in both export and FDI are on average more productive than firms that only export and these are more productive than firms that only operate in their domestic markets. Put in equivalent terms, the group of high-productivity firms is mainly composed of multinationals, the group of intermediate productivity firms mainly consists of exporters, and the group of low-productivity firms, consists mainly of purely domestic firms.

Figure 20 provides a stylised representation of the productivity distribution of Norwegian manufacturers³⁴. A long and thin left tail of very unproductive firms has been truncated as statistically negligible. The resulting downward slope reflects the fact that high-productivity firms are relatively scarce in the sample. There are two thresholds ['cut-offs']. A first threshold separates the group mainly made up of exporters from the group mainly comprising purely domestic firms ('export cut-off'). The second separates the group mainly made up of exporters from the group mainly comprising FDI-makers ('FDI cut-off'). The figure shows that on average only firms

34. The stylised representation is obtained as the best fit of a Pareto distribution to the actual distribution. See Appendix C as well as Del Gatto, Mion and Ottaviano (2006) for details.

that are productive enough gain export status and only the very productive ones engage in FDI. The pronounced curvature of the distribution shows that many firms operate only domestically, few firms export and even fewer firms are involved in FDI activities. Accordingly, the curvature is a measure of the asymmetry of the distribution.

Figure 20: Distribution of firm productivity for Norwegian manufacturers



Source: EFIM. Note: TFP distribution, Norway, 2004. Estimation method: Olley-Pakes [see Appendix C for details].

Figure 20 can be used to shed light on the operation of the firm extensive margin. Consider the effects of a fall in fixed export costs, which reduces the export cut-off. Most naturally, aggregate exports rise as a result. However, because the fall is in fixed costs, the adjustment takes place through an increase in the number of exporters ('firm extensive margin') rather than through an increase in average export per exporter ('firm intensive margin'). This adjustment along the extensive margin is larger when the curvature of the distribution is more pronounced. The reason for this is that a more pronounced curvature is associated with a larger fraction of firms with productivity below the export cut-off. Thus, when this cut-off falls, more firms start to export.

While the figure concerns total Norwegian manufacturing, analogous illustrations could be made for each manufacturing sector. These would be qualitatively similar to Figure 20. They would differ, however, in terms of thresholds and curvature. Table 7 presents the estimated curvature ('Pareto k ') across various sectors for France and Italy. Larger k 's correspond to industries characterised by larger shares of small and

unproductive firms and which are therefore more prone to adjustment along the extensive margin³⁵.

Table 7: ‘Unexploited export potential’ by industry for France and Italy

Industry	Pareto k	
	Italy	France
Mining of coal	-	1.58
Crude petroleum and gas	-	2.00
Mining of uranium	-	-
Mining of metal ores	-	-
Other mining	-	2.95
Food and beverages	4.17	2.54
Tobacco	2.65	-
Textiles	2.39	2.51
Wearing apparel	2.15	2.15
Leather and shoes	3.75	2.74
Wood and wood products	2.43	2.38
Paper and paper products	3.80	3.08
Printing and editing	2.72	2.04
Chemicals	3.21	2.07
Rubber and plastics	4.85	3.43
Non-metallic minerals	2.02	3.24
Metals	2.09	3.02
Metal products	3.01	3.71
Machinery and equipment	3.45	3.18
Office machines	1.49	2.79
Electrical equipment	2.10	3.16
Radio-TV-communication	2.59	2.88
Precision instruments	1.91	3.08
Motor vehicles	2.68	3.42
Other transport	1.78	3.05
Furniture	3.28	2.80
Recycling	6.95	2.59
Total manufacturing	3.03	2.55

Source: EFIM. Note: Data for France and Italy 2003, exporters and non-exporters. The firms considered have more than 20 employees. French TFP was estimated by fixed effects and Italian TFP by the Levinshon-Petrin methodology (see Appendix C for details).

35. See Appendix C as well as Del Gatto, Mion and Ottaviano (2006) for details.

Two important features of the data stand out. First, the propensity to adjust along the extensive margin varies a lot across sectors in both countries. Second, there are relevant differences within sectors across countries. In Italy the sectors that are more likely to react to reductions in fixed trade costs through an increase in the number of exporters are recycling, rubber and plastics, and food and beverages. In France, they are: metal products, rubber and plastics, and motor vehicles. Since the adjustment along the extensive margin drives the reaction of aggregate trade flows to changes in trade barriers, those sectors exhibit larger ‘unexploited export potential’³⁶.

To summarise, as an analogous argument is readily constructed in the case of FDI, we can write:

Fact 13 – Industries differ in terms of unexploited export and FDI potential. Some industries are more likely than others to react to shocks through adjustments in the numbers of exporters and FDI-makers.

36. Table 7 reports very preliminary results that merit further investigation. Its main purpose is to show how firm-level data can be used to generate useful sectoral information that is simply impossible to glean from sectoral data.

6. Firm productivity and industry specialisation

Countries generate larger numbers of highly productive firms, and therefore internationalised firms, in some industries than in others. This points to the national specificities of the entry and exit process at the industry level as a key driver of international competitiveness.

So far, firm-level evidence has shown that, while low-performing firms are active in their own domestic markets only, better performing ones are also active in foreign markets. The more efficient these firms are, the more they sell abroad thanks to richer product lines and more numerous destinations. A country's penetration of foreign markets is thus mainly driven by those extensive margins. How do we reconcile this new micro-view with the traditional macro-view of aggregate export performance as determined by countries' inter-industry cost differentials?

In the traditional view, a country specialises in the production of those goods that its firms are able to supply at a relatively low cost compared with their competitors in other countries. This pattern of specialisation in production then implies a corresponding pattern of specialisation in exports: a country is a (net) exporter of the products in which it exhibits a relative ('comparative') cost advantage. Accordingly, the observed pattern of trade can be used to infer a country's pattern of comparative advantage (and disadvantage) across industries. This is the idea behind the 'index of revealed comparative advantage' (henceforth, simply RCA) defined as:

$$(1) \text{ RCA} = \frac{X_{cs} / X_s}{X_{ws} / X_w}$$

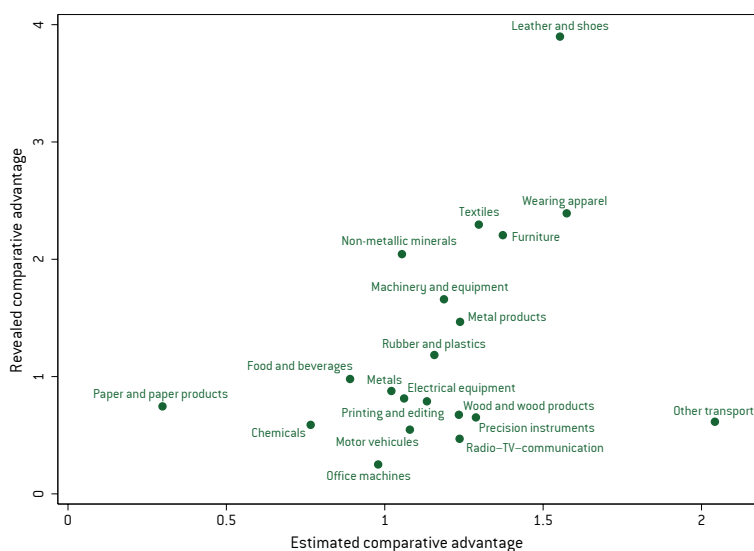
where X is export, c is the country label, s is the industry label and w is the label for the group of countries under consideration. The index is larger (smaller) than one if the exports of country c are more (less) specialised in industry s than the exports of the other countries. In this case, country c is said to exhibit a revealed comparative advantage (disadvantage) in industry s .

Figure 21 and Figure 22 respectively plot the RCA of Italy and the UK against their index of 'estimated comparative advantage' (ECA) across several manufacturing industries. The ECA is defined as:

$$(2) ECA = \frac{P_{cs} / P_s}{P_{ws} / P_w}$$

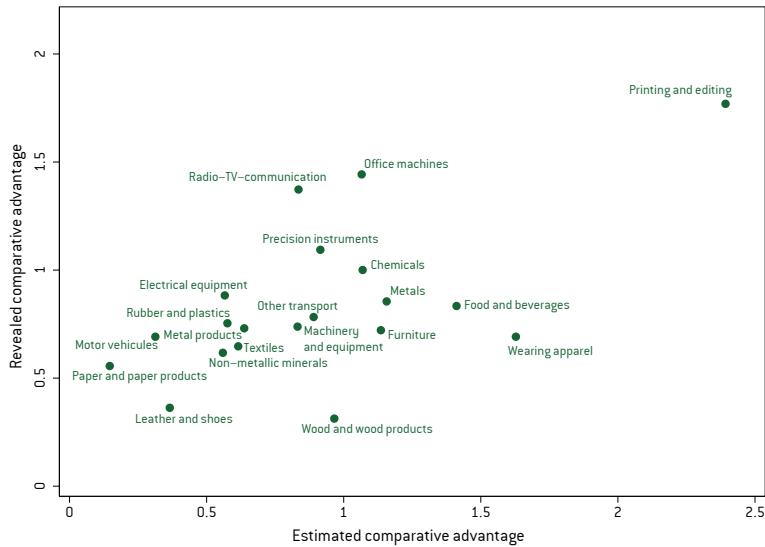
where P is productivity, c is the country label, s is the industry label and w is the label for the group of the other countries. The index is larger (smaller) than one if country c is relatively more (less) productive in industry s than the other countries. In this case, country c is said to exhibit an estimated comparative advantage (disadvantage) in industry s .

Figure 21: Revealed and estimated comparative advantage – Italy



Source: EFIM. Note: Based on apparent labour productivity.

Figure 22: Revealed and estimated comparative advantage –UK



Source: EFIM. Note: Based on apparent labour productivity.

Both Figure 21 and Figure 22 reveal a positive correlation between RCA and ECA. The latter is obviously only a crude measure of comparative advantage, as it does not take into account important determinants of international competitiveness such as differences in factor prices and accessibility across countries. Nevertheless, the two figures create a bridge between the micro and the macro perspectives. Countries generate larger numbers of highly productive firms in some industries than in others. As these are the firms eventually able to compete in international markets, the aggregate export (and FDI) performance of a country is therefore better in some industries than in others. This points to the national specificities of the entry and exit process at the industry level as the key driver of international competitiveness.

Hence, we have established:

Fact 14 – The relative export performance of countries at the macro level is positively correlated with the relative productivity of their firms measured at the micro level.

7. Conclusions

In summary, firm-level evidence sheds new light on the way the internationalisation of individual European firms maps into aggregate export and FDI performance. This has important policy implications.

We have highlighted fourteen stylised facts:

1. Aggregate exports are driven by few top exporters.
2. Few firms export a large fraction of their turnover.
3. Top exporters export many product to many locations.
4. Multinational firms perform better than exporters and exporters perform better than non-exporters.
5. Exporters are more likely to be foreign owned.
6. There is no clear evidence of firms performing differently after gaining access to foreign markets.
7. The number of exporters is the main determinant of aggregate exports.
8. The number of exported products is also an important determinant of aggregate exports.
9. Firms' average exports per product are a less important determinant of aggregate exports.
10. A reduction in trade barriers leads to a decrease in both the average quantity exported per firm and the average export price per product.
11. Colonial links and a common language foster bilateral trade flows.
12. The number of affiliates is the main determinant of foreign affiliate sales.
13. Industries differ in terms of unexploited export and FDI potential.
14. Across industries, the relative export performance of countries is positively correlated with the relative productivity of their firms measured at the micro level.

While the scope of this report is essentially descriptive, such findings suggest some important policy implications and raise related policy questions.

7.1 Policy implications

We stress six policy implications:

A. Promote intra-industry competition

The opening up of trade and FDI triggers a selection process whereby the most productive firms substitute the least productive ones within sectors. This is good for productivity, GDP and wages, even when it does not lead to sectoral specialisation. Moreover, precisely because winners and losers belong to the same sector, the benefits of selection are likely to be associated with limited social costs of adjustment.

B. Increase the number of exporters and multinationals

What matters most for a country's trade and FDI performance is, first of all, how many of its firms engage in export and FDI. So governments should focus on policies that broaden the export base.

C. Forget the incumbent superstars

If the aim is to broaden the export base, governments should not focus on policies that favour existing superstar exporters and multinationals. Instead, heads of government should work on lowering barriers to exports and FDI at home. Trade missions do not generate trade³⁷.

D. Nurture the superstars of the future

Governments should provide the conditions for tomorrow's superstars to emerge by allowing small exporters and multinationals to grow.

E. Keep up the fight against small trade costs

Small (fixed) costs of internationalisation matter because they reduce the number of exporters and multinationals.

F. Assess the export and FDI potential of your industries

Some industries are more likely than others to react to shocks through adjustment in the numbers of exporters and FDI-makers. Hence, they have greater unexploited export and FDI potential. These are industries characterised by a larger presence of small, low-productivity firms. As such, they are also more likely to react to import competition through the exit of the worst-performing firms and therefore also have greater unexploited productivity gains from selection.

37. See K. Head and J. Ries (2007), "Do trade missions increase trade?", University of British Columbia, mimeo.

To summarise, we propose:

- Proposal 1:** Promote intra-industry competition.
- Proposal 2:** Increase the number of exporters and multinationals.
- Proposal 3:** Forget today's superstars.
- Proposal 4:** Nurture the superstars of the future.
- Proposal 5:** Fight small trade costs.
- Proposal 6:** Identify which industries have the greatest export and FDI potential.

7.2 Policy questions

While leading to some clear policy implications, our findings also leave some issues open which call for further scrutiny. We prioritise six of them:

A. Size of the internal market

If firms have to be large to be competitive in international markets, what is the importance of the size of the internal market? Were internal size important as theoretical models suggest, important implications would derive along various dimensions. Most naturally, the process of integration of European markets through EU policies on the single market and monetary union would clearly foster the global competitiveness of European firms.

B. Industry dynamics

If superstars dominate international markets, is there any room for global SME's? Firms are typically small when they start their operations. An important difference between European and American start-ups is that, if they survive, the latter grow much faster than the former. This implies that, at any given moment, resources are less likely in Europe than in the US to be allocated to their most productive use, thus putting European firms at a disadvantage in terms of global competitiveness. In this respect, it is crucial to identify which specific European regulations as well as product, capital and labour market institutions could foster the reallocation of productive resources from worse to better performing firms.

C. Fixed cost of internationalisation

What does the dominance of the extensive over the intensive margins imply for policy intervention aimed at promoting the internationalisation of European firms? At first sight, the fact that the numbers of exporters and investors are the main determinants of aggregate exports and FDI suggests that the fixed more than the variable costs of foreign operations are the crucial constraint on firms' internationalisation.

Yet, recent theoretical models show that fixed costs are not necessary to explain the dominance of the extensive margin, stressing instead the role of other industry characteristics such as variable demand elasticity, the extent of product differentiation and the disparity of performance among firms.

D. Learning through international operations

Do firms improve their performance when exposed to international competition? In manufacturing as a whole we have found little evidence that breaking into international markets improves firm performance. This may be due to the fact that different industries offer different learning potentials to different countries depending on their absolute and comparative advantages. Whether this is true or not may have important consequences for industrial policy, as different industries in the same country may face very different learning paths.

E. Regional production networks

Is the fragmentation of production processes across countries a way through which firms become more competitive in international markets? We have found evidence that exporters are more likely to be foreign owned than non-exporters. Especially in the case of Germany, the fragmentation of production across different European countries has sometimes been highlighted as a welcome effect of the single market that has allowed national firms to keep up with global competitors.

F. Firms' internationalisation and the political economy of the single market

Is the limited internationalisation of European firms eroding the political support for the single market? Part of the implementation of the single market strategy involves the design of standards and bureaucratic procedures that firms have to comply with for the single market to develop its full potential. These imply an additional burden for all firms. We have seen, however, that only a restricted number of large firms is actually able to operate abroad and thus reap the envisaged gains from the single market. Smaller firms face, instead, the additional burden without seeing the benefit. In this perspective, the single market is less likely to find support in industries characterised by the prevalence of small firms with relatively low productivity and in countries relatively specialised in such industries.

Answering these questions requires quality data at the firm level to be representative and comparable across European countries. Currently, however, the overlap among the different national datasets in terms of several key variables is far from complete at the targeted level of disaggregation. In this report we have selected different countries depending on the specific issues addressed. This is clearly a second-best

approach but it is nevertheless enough to highlight the benefits that would come from the creation of an integrated European firm-level dataset as a prerequisite for sound policymaking in support of the global competitiveness of European firms.

To summarise, we propose:

Proposal 7: Policy-oriented research should prioritise six key issues that are likely to determine the global competitiveness of European firms in the future: the external benefits of the internal market, the speed of intra-industry reallocation, the relative impact of fixed versus variable costs of internationalisation, the relevance of learning through international operations, the opportunities of regional production networks, and the political economy of the single market.

Proposal 8: These issues should be addressed through a detailed analysis of firm-level data that are both representative and comparable across European countries.

Proposal 9: As representative and comparable data allowing for a detailed analysis of those issues are currently unavailable across European countries, an integrated European firm-level dataset should be created as a prerequisite for sound policymaking in support of the global competitiveness of European firms.

Appendix A: Tables

This appendix provides additional tables to complement the information presented in the main text.

Table A.1: Distribution of French exporters over products and markets
Share of French exporters in 2003 (total no. exporters 99,259)

No. of products	Number of countries										Total
	1	2	3	4	5	6	7	8	9	10+	
1	29.61	2.7	0.99	0.55	0.36	0.23	0.16	0.09	0.07	0.22	34.98
2	6.35	5.16	1.38	0.73	0.41	0.28	0.21	0.15	0.11	0.34	15.12
3	2.49	2.36	1.69	0.77	0.49	0.36	0.25	0.19	0.12	0.5	9.25
4	1.3	1.24	1.14	0.78	0.45	0.33	0.23	0.18	0.14	0.55	6.34
5	0.76	0.74	0.73	0.57	0.45	0.31	0.23	0.19	0.13	0.62	4.73
6	0.45	0.51	0.49	0.46	0.38	0.27	0.22	0.17	0.14	0.64	3.73
7	0.29	0.33	0.29	0.32	0.29	0.23	0.21	0.15	0.12	0.67	2.9
8	0.23	0.23	0.21	0.23	0.24	0.2	0.18	0.13	0.13	0.64	2.42
9	0.16	0.17	0.18	0.16	0.16	0.15	0.14	0.11	0.1	0.64	1.97
10+	0.95	0.86	0.85	0.91	0.89	0.9	0.87	0.83	0.79	10.72	18.57
Total	42.59	14.33	7.95	5.48	4.12	3.26	2.7	2.19	1.85	15.54	100.01

Share of French exports in 2003 (total exports 314.3 billion euros)

No. of products	Number of countries										Total
	1	2	3	4	5	6	7	8	9	10+	
1	0.7	0.23	0.11	0.08	0.08	0.05	0.17	0.03	0.03	0.38	1.86
2	0.23	0.22	0.15	0.16	0.07	0.07	0.07	0.04	0.03	2.32	3.36
3	0.12	0.14	0.18	0.15	0.24	0.13	0.09	0.06	0.06	0.81	1.98
4	0.43	0.11	0.27	0.09	0.08	0.1	0.08	0.04	0.07	0.69	1.96
5	0.3	0.08	0.08	0.11	0.08	0.08	0.05	0.05	0.08	1.06	1.97
6	0.17	0.08	0.09	0.1	0.08	0.11	0.05	0.06	0.08	0.84	1.66
7	0.39	0.04	0.05	0.11	0.08	0.07	0.09	0.03	0.1	1	1.96
8	0.04	0.09	0.04	0.1	0.16	0.04	0.17	0.06	0.08	0.96	1.74
9	0.19	0.09	0.04	0.04	0.23	0.12	0.04	0.06	0.26	1.08	2.15
10+	0.28	0.3	0.33	0.43	0.45	0.57	0.75	0.79	1.16	76.3	81.36
Total	2.85	1.38	1.34	1.37	1.55	1.34	1.56	1.22	1.95	85.44	100

Table A.2: French exporters exhibit superior performance to French non-exporters³⁸

Industry	Apparent labour productivity	Estimated TFP (OP)	Estimated TFP (OLS)	Estimated TFP (LP)
Total manufacturing	1.31 [6.11]	1.15 [4.09]	1.11 [2.82]	1.59 [5.84]
Food and beverages	1.27 [2.12]	1.21 [1.86]	1.15 [1.96]	1.53 [2.29]
Textiles	1.53 [3.76]	1.48 [2.94]	1.35 [2.13]	1.55 [2.28]
Wearing apparel	2.52 [8.04]	1.87 [3.06]	1.65 [2.36]	2.18 [3.47]
Leather and shoes	1.27 [1.57]	1.06 [1.27]	1.07 [1.34]	1.15 [1.48]
Wood and wood products	10.37 [497.82]	5.89 [264.51]	2.27 [58.43]	2.59 [57.27]
Paper and paper products	1.19 [1.25]	1.01 [0.8]	1 [0.79]	1.4 [1.83]
Printing and editing	0.9 [0.17]	1.03 [.31]	1.08 [0.44]	1.27 [0.67]
Coke and refined petroleum	6.75 [46.33]	0.47 [0.54]	2.46 [10.45]	0.6 [0.64]
Chemicals	0.78 [0.44]	0.74 [0.45]	0.73 [0.46]	1.13 [0.73]
Rubber and plastics	1.08 [0.58]	1.01 [0.58]	1.01 [0.58]	1.16 [1.11]
Non-metallic minerals	0.98 [1.28]	0.91 [1.27]	0.94 [1.62]	1.3 [1.97]
Metals	1.19 [1.09]	1.12 [1.03]	1.1 [0.94]	1.7 [1.75]
Metal products	1.12 [1.11]	1.05 [1.04]	1.04 [1.03]	1.15 [1.29]
Machinery and equipment	1.11 [1.47]	1.05 [1.38]	1.04 [1.33]	1.16 [1.48]
Office machines	1.82 [8.23]	1.83 [8.02]	1.63 [8.88]	2.14 [7.92]
Electrical equipment	1.22 [1.49]	1.11 [1.4]	1.08 [1.35]	1.35 [1.81]
Radio-TV-communication	1.31 [1.95]	1.17 [1.78]	1.15 [1.83]	1.39 [2.47]
Precision instruments	1.21 [1.5]	1.1 [1.45]	1.08 [1.44]	1.3 [1.85]
Motor vehicles	1.23 [1.4]	1.11 [1.59]	1.11 [1.58]	1.35 [1]
Other transport	1.32 [1.73]	1.14 [1.6]	1.11 [1.48]	1.45 [1.91]
Furniture	1.29 [5.85]	1.21 [3.67]	1.18 [2.7]	1.47 [2.43]
Recycling	1.01 [.71]	0.98 [0.94]	0.98 [0.96]	1.03 [1.04]

Note: The firms considered are manufacturing and more than 20 employees (data for France 2003). The table shows premia of the considered variable as the ratio of exporters over non exporters. Number in parenthesis is the ratio of the standard deviation.

38. For a detailed presentation of productivity computation, see Appendix C.

Table A.3: Gravity and aggregate exports – I³⁹

Model	(1)	(2)	(3)	(4)	(5)	(6)
Depvar	$\ln X_{ij}$	$\ln N_{ij}^f$	$\ln x_{ij}^{-f}$	$\ln X_{ij}$	$\ln N_{ij}^f$	$\ln x_{ij}^{-f}$
ln GDP, ex	1.05 ^a (0.05)	1.13 ^a (0.05)	-0.08 ^b (0.03)	0.97 ^a (0.05)	1.03 ^a (0.04)	-0.06 ^c (0.03)
ln GDP, im	0.93 ^a (0.02)	0.56 ^a (0.02)	0.37 ^a (0.01)	0.96 ^a (0.02)	0.58 ^a (0.02)	0.37 ^a (0.01)
ln Dist (avg)	-0.86 ^a (0.05)	-0.65 ^a (0.04)	-0.21 ^a (0.03)	-0.86 ^a (0.06)	-0.66 ^a (0.06)	-0.21 ^a (0.04)
Shared language				0.50 ^a (0.12)	0.52 ^a (0.11)	-0.02 (0.07)
Colonial history				1.11 ^a (0.18)	1.35 ^a (0.16)	-0.24 ^a (0.08)
RTA				-0.13 (0.15)	-0.11 (0.13)	-0.02 (0.10)
Both GATT				0.23 ^b (0.11)	0.40 ^a (0.08)	-0.16 ^b (0.07)
Currency union, strict defn				-0.03 (0.09)	-0.09 (0.11)	0.06 (0.09)
N	2623	2623	2623	2623	2623	2623
R2	0.874	0.820	0.700	0.899	0.887	0.707
RMSE	0.995	0.85	0.617	0.893	0.673	0.61

Note: France (1998-2003) and Belgium (1996-2004) considered as exporting countries. Standard errors in brackets with ^a, ^b and ^c respectively denoting significance at the one percent, five percent and 10 percent levels. All regressions have year dummies.

39. For a detailed presentation of productivity computation, see Appendix D.

Table A.4: Gravity and aggregate exports – II

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Depvar	$\ln X_{ij}$	$\ln N_{ij}^f$	$\ln N_{ij}^p$	$\ln \bar{x}_{ij}^p$	$\ln X_{ij}$	$\ln N_{ij}^f$	$\ln N_{ij}^p$	$\ln \bar{x}_{ij}^f$
$\ln \text{GDP, ex}$	1.05 ^a (0.05)	1.13 ^a (0.05)	0.85 ^a (0.05)	-0.92 ^a (0.06)	0.97 ^a (0.05)	1.03 ^a (0.04)	0.77 ^a (0.04)	-0.82 ^a (0.05)
$\ln \text{GDP, im}$	0.93 ^a (0.02)	0.56 ^a (0.02)	0.54 ^a (0.02)	-0.17 ^a (0.02)	0.96 ^a (0.02)	0.58 ^a (0.02)	0.56 ^a (0.02)	-0.19 ^a (0.02)
$\ln \text{Dist (avg)}$	-0.86 ^a (0.05)	-0.65 ^a (0.04)	-0.61 ^a (0.04)	0.40 ^a (0.05)	-0.86 ^a (0.06)	-0.66 ^a (0.06)	-0.65 ^a (0.06)	0.44 ^a (0.08)
Shared language					0.50 ^a (0.12)	0.52 ^a (0.11)	0.40 ^a (0.11)	-0.42 ^a (0.13)
Colonial history					1.11 ^a (0.18)	1.35 ^a (0.16)	1.12 ^a (0.17)	-1.37 ^a (0.18)
RTA					-0.13 (0.15)	-0.11 (0.13)	-0.20 (0.15)	0.18 (0.18)
Both GATT					0.23 ^b (0.11)	0.40 ^a (0.08)	0.33 ^a (0.08)	-0.49 ^a (0.10)
Currency union, strict defn					-0.03 (0.09)	-0.09 (0.11)	-0.15 (0.12)	0.21 (0.16)
N	2623	2623	2623	2623	2623	2623	2623	2623
R2	0.874	0.820	0.805	0.481	0.899	0.887	0.853	0.612
RMSE	0.995	0.85	0.812	1.018	0.893	0.673	0.693	0.882

Note: France [1998-2003] and Belgium [1996-2004] considered as exporting countries. Standard errors in brackets with ^a, ^b and ^c respectively denoting significance at the one percent, five percent and 10 percent levels. All regressions have year dummies.

Table A.5: Gravity and aggregate exports – III

Model	{1}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}	{10}
Depvar	$\ln X_{ij}$	$\ln N_{ij}^f$	$\ln N_{ij}^p$	$\ln \bar{q}_{ij}^{\bar{f}p}$	$\ln \bar{p}_{ij}^{\bar{f}p}$	$\ln X_{ij}$	$\ln N_{ij}^f$	$\ln N_{ij}^p$	$\ln \bar{q}_{ij}^f$	$\ln \bar{p}_{ij}^{\bar{f}p}$
ln GDP, ex	1.05 ^a (0.05)	1.13 ^a (0.05)	0.85 ^a (0.05)	-1.48 ^a (0.06)	0.56 ^a (0.03)	0.97 ^a (0.05)	1.03 ^a (0.04)	0.77 ^a (0.04)	-1.40 ^a (0.05)	0.57 ^a (0.03)
ln GDP, im	0.93 ^a (0.02)	0.56 ^a (0.02)	0.54 ^a (0.02)	-0.38 ^a (0.02)	0.21 ^a (0.01)	0.96 ^a (0.02)	0.58 ^a (0.02)	0.56 ^a (0.02)	-0.41 ^a (0.02)	0.22 ^a (0.01)
ln Dist (avg)	-0.86 ^a (0.05)	-0.65 ^a (0.04)	-0.61 ^a (0.04)	0.17 ^a (0.06)	0.23 ^a (0.03)	-0.86 ^a (0.06)	-0.66 ^a (0.06)	-0.65 ^a (0.06)	0.32 ^a (0.08)	0.12 ^a (0.04)
Shared language						0.50 ^a (0.12)	0.52 ^a (0.11)	0.40 ^a (0.11)	-0.31 ^c (0.16)	-0.11 (0.09)
Colonial history						1.11 ^a (0.18)	1.35 ^a (0.16)	1.12 ^a (0.17)	-1.25 ^a (0.20)	-0.11 (0.11)
RTA						-0.13 (0.15)	-0.11 (0.13)	-0.20 (0.15)	0.59 ^a (0.21)	-0.41 ^a (0.10)
Both GATT						0.23 ^a (0.11)	0.40 ^a (0.08)	0.33 ^a (0.08)	-0.54 ^a (0.12)	0.05 (0.06)
Currency union, strict defn						-0.03 (0.09)	-0.09 (0.11)	-0.15 (0.12)	0.35 ^c (0.19)	-0.14 (0.10)
N	2623	2623	2623	2623	2623	2623	2623	2623	2623	2623
R2	0.874	0.820	0.805	0.639	0.493	0.899	0.887	0.853	0.698	0.505
RMSE	0.995	0.85	0.812	1.193	0.713	0.893	0.673	0.693	1.093	0.705

Note: France {1998-2003} and Belgium {1996-2004} considered as exporting countries. Standard errors in brackets with ^a, ^b and ^c respectively denoting significance at the one percent, five percent and 10 percent levels. All regressions have year dummies.

Table A.6: Gravity and aggregate FDI, with only GDP and distance

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Orig. country	NOR	NOR	NOR	DEU	DEU	DEU	BEL	BEL	BEL	FRA	ITA
Depvar	Sales	Avg. sales	No. aff.	Sales	Avg. sales	No. aff.	Sales	Avg. sales	No. aff.	No. aff.	No. aff.
ln GDP, im	0.76 ^a (0.07)	0.26 ^a (0.06)	0.49 ^a (0.06)	1.22 ^a (0.06)	0.47 ^a (0.04)	0.75 ^a (0.04)	0.83 ^a (0.08)	0.39 ^a (0.06)	0.44 ^a (0.05)	0.58 ^a (0.03)	0.76 ^a (0.04)
ln Dist (avg)	-0.50 ^a (0.18)	-0.08 (0.13)	-0.45 ^a (0.13)	-0.54 ^a (0.10)	-0.14 ^a (0.05)	-0.40 ^a (0.06)	-0.66 ^a (0.11)	-0.12 (0.08)	-0.53 ^a (0.06)	-0.33 ^a (0.07)	-0.55 ^a (0.09)
N	361	361	361	546	546	546	350	350	350	832	144
R2	0.44	0.118	0.555	0.744	0.52	0.762	0.595	0.278	0.727	0.701	0.762
RMSE	1.642	1.411	0.899	1.157	0.719	0.691	1.103	0.891	0.523	0.813	0.997

Note: Year samples are as follows: NOR (1999-2004), DEU (1996-2003), BEL (1997-2004), FRA (1993-2002), ITA (2004). Standard errors in brackets with ^a, ^b and ^c respectively denoting significance at the one percent, five percent and 10 percent levels. All regressions have year dummies and standard errors are clustered by destination country.

Table A.7: Gravity and aggregate FDI

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
Orig. country	NOR	NOR	NOR	DEU	DEU	DEU	BEL	BEL	BEL	FRA	ITA
Depvar	Sales	Avg. sales	No. aff.	Sales	Avg. sales	No. aff.	Sales	Avg. sales	No. aff.	No. aff.	No. aff.
In GDP, im	0.71 ^a (0.07)	0.22 ^a (0.07)	0.48 ^a (0.07)	1.15 ^a (0.07)	0.47 ^a (0.05)	0.68 ^a (0.04)	0.83 ^a (0.08)	0.39 ^a (0.06)	0.44 ^a (0.05)	0.61 ^a (0.03)	0.73 ^a (0.05)
In Dist (avg)	-0.22 (0.27)	0.14 (0.21)	-0.41 ^b (0.21)	-0.20 (0.15)	-0.13 (0.09)	-0.06 (0.09)	-0.34 (0.22)	0.07 (0.15)	-0.40 ^a (0.13)	-0.03 (0.14)	-0.42 ^a (0.14)
RTA	0.75 (0.62)	0.57 (0.49)	0.10 (0.42)	0.88 ^c (0.46)	0.03 (0.26)	0.85 ^a (0.24)	0.56 (0.53)	0.28 (0.36)	0.28 (0.28)	0.78 ^b (0.31)	0.83 ^c (0.43)
Both GATT	0.74 (0.51)	0.29 (0.47)	0.43 ^c (0.25)	0.57 (0.37)	0.07 (0.21)	0.50 ^b (0.20)	0.65 (0.42)	0.15 (0.32)	0.50 ^a (0.16)	0.33 ^c (0.20)	0.01 (0.27)
Shared language				0.75 ^b (0.30)	0.08 (0.19)	0.68 ^a (0.19)	0.84 ^b (0.36)	0.68 ^a (0.22)	0.16 (0.24)	0.48 ^b (0.20)	-0.39 (0.32)
Colonial history				0.45 (0.28)	-0.02 (0.17)	0.47 ^a (0.15)	0.00 ^a (0.00)	0.00 ^a (0.00)	0.00 ^a (0.00)	0.35 ^c (0.21)	-0.11 (0.50)
Currency union, strict defn				-0.18 (0.27)	-0.23 (0.16)	0.05 (0.16)	-0.33 (0.34)	-0.32 (0.21)	-0.02 (0.18)	0.09 (0.14)	-0.36 (0.35)
N	361	361	361	546	546	546	350	350	350	832	144
R2	0.466	0.139	0.564	0.774	0.522	0.830	0.628	0.324	0.749	0.757	0.771
RMSE	1.609	1.399	0.891	1.094	0.721	0.586	1.062	0.868	0.505	0.735	0.997

Note: Year samples are as follows: NOR (1999-2004), DEU (1996-2003), BEL (1997-2004), FRA (1993-2002), ITA (2004). Standard errors in brackets with ^a, ^b and ^c respectively denoting significance at the one percent, five percent and 10 percent levels. All regressions have year dummies and standard errors are clustered by destination country.

Appendix B: Data

This appendix describes the sources of data used in this report.

Belgium (NBB)⁴⁰

The Belgian team uses the Belgian Balance Sheet Trade Transactions Dataset (BBSTTD). It covers manufacturing firms with at least one full-time equivalent employee. It contains most of the needed variables in this report, including export and FDI by destination, and all balance-sheet data.

The wage is calculated as the ratio of the total wage bill (including wages, salaries, social security and pension costs) to full-time equivalent number of employees. 'Capital intensity' is the ratio of tangible assets to full-time equivalent number of employees. A 'foreign-owned' firm is a recipient of outward FDI where the participation of the foreign firm in the Belgian firm is greater than 10 percent.

Trade

Exporter/non-exporter status: trade data on individual transactions concerning exports are collected separately at company level for intra-EU (Intrastat) and extra-EU (Extrastat) trade. Transactions are reported by eight-digit product (combined nomenclature). Different types of international trade transactions are reported. To classify firms as exporters, we consider only those involving a change in ownership of the traded goods. Companies report Intrastat transactions monthly, but the BBSTTD aggregates them on an annual basis. Firms are only liable for Intrastat declarations if their annual trade flows (receipts or shipments) exceed the threshold of 250,000 euro. Extrastat contains exactly the same information as Intrastat for transaction flows with countries outside the European Union. The data is collected by customs agents and centralised at the National Bank of Belgium. The threshold of Extrastat is lower than for Intrastat, as all flows are recorded, unless their value is

40. The Belgian team would like to thank the Microeconomic Information and the General Statistics Departments of the National Bank of Belgium for making the balance sheet, foreign trade and foreign direct investment data available.

smaller than 1000 euro or their weight smaller than one tonne.

Some legal entities do export and have a VAT number but do not file any accounts with the Central Balance Sheet Office. We exclude these from our sample. Although these firms only make up a marginal fraction of the whole population, they accounted for 25.5 and 37.2 per cent of total exports in 1996 and 2004. The bulk of trade conducted by unmatched firms in 2004 was attributed to foreign firms with no actual production site in Belgium. Therefore, our results are unlikely to be biased by this matching issue.

FDI

FDI-maker/non-maker: FDI data comes from the yearly survey conducted by National Bank of Belgium to compute the balance of payment and statistics about foreign direct investments. All firms in Belgium are obliged to supply each year information about the foreign direct investment they undertook the previous year. The questionnaire asks for detailed information about each direct or indirect participation of Belgian firms into foreign companies. FDI is defined according to the Balance of Payment Manual of the IMF, as a direct or indirect participation into a of company operating abroad of at least ten percent of ordinary shares or the voting power. In order not to breach confidentiality rules we report results for the whole manufacturing sector only. In many three-digit industries there are only two or three firms, sometimes just one, having foreign operations in a given country. These firms could be easily identified, so we can report results only at a more aggregate level.

France (CEPII)⁴¹

Trade

Firm-level exports are collected by the French Customs. This database reports the amount of exports by 8-digit product (combined nomenclature) and country, for each firm located on French metropolitan territory. The data covers the period 1998-2003. For each flow, the customs record values and quantities. The database does not report all export shipments. Indeed, inside the EU, shipments are reported only if their annual trade value exceeds the threshold of 250,000 euro. For exports outside the EU all flows are recorded, unless their value is smaller than 1000 euros or one ton. Nevertheless, the database is almost comprehensive. There are 225 countries of destination, 11,578 products and about 102,300 exporting firms per year. The

41. The French team would like to thank the French customs (Direction générale des douanes et droits indirects) for access to French data.

French trade database thus contains information on more than 12 millions shipments.

FDI

Information on date and destination country of French FDI is given by the annual survey on Financial Linkages (LiFi). This survey is conducted by the French national institute for statistics, for each year between 1994 and 2002. Large French firms (ie more than 1.2 million euros of portfolio participations and 500 employees), are interviewed and asked to report the country of establishment and the financial participations in their affiliates in France and abroad. Even though information on the year of investment is not directly available in LiFi, it can be constructed by assuming that the investment takes place in the year the parent company reports the affiliate for the first time. To make sure the affiliate is not erroneously assigned the year of entry of the parent company into LiFi, only new affiliates of pre-existing parent companies are considered as investments. LiFi further contains information on affiliates' employment and sector of activity. In 2002 the database provided information on 193,895 manufacturing establishments, both in France and abroad.

Other

Other firm-level data are issued from the Enquêtes Annuelles d'Entreprises (EAE), which is provided by the French national institute for statistics (INSEE). This database reports several types of information: production, value added, number of employees, capital stocks and investment. However, this data covers only manufacturing and agricultural firms of more than 20 employees, ie about 24,300 firms per year. We thus have detailed balance sheet information for about 43 percent of French exporters.

Germany (IAW-Tuebingen)⁴²

Trade

The German team uses an Establishment Level Panel Data obtained from firm-level trade data from the Research Data Centres of the Federal Statistical Office. For details on the data definitions and sources, see:

<http://www.forschungsdatenzentrum.de/bestand/betriebspanel/index.asp> and
<http://www.forschungsdatenzentrum.de/bestand/monatsbericht/index.asp>.

42. The German team would like to thank the Statistics Department of the Deutsche Bundesbank, the Research Centre of the Deutsche Bundesbank as well as the FDZ (Research Data Centre of the Federal Statistical Office Germany) and in particular Maurice Brandt for timely access to German trade and FDI data.

Data cover manufacturing sectors only, with total coverage of establishments larger than 20 employees. Reporting is mandatory. The panel is monthly, but we use annual data for the 1995-2004 period. Plants are the panel units, but respective firms are identified. The data contains information about four-digit sectoral code compatible with NACE and ISIC rev. 3 (WZ-2003), domestic turnover/orders, total exports/orders (direct and indirect via/from exporting firms), total exports/orders to/from (non) EU-countries, total number of employed persons (including the owners), number of total effective hours worked. There is no information about countries firms export to, number of products exported, value added, capital stock, foreign ownership.

FDI

The German team uses FDI data obtained from the Micro-Database Foreign Direct Investment (MiDi) provided by the Deutsche Bundesbank. For details on data definitions and the scope of the database see Lipponer (2007) "Micro-Database Direct Investment – MiDi, A Brief Guide", http://www.bundesbank.de/download/vfz/fdi/vfz_mikrodaten_guide.pdf.

Data are collected in accordance with German foreign trade regulations through surveys. Replying to surveys is mandatory, with a complete inventory count (within reporting limits). The reporting limits are three million euros (total assets) or more than 10 percent share of subsidiary owned. Data are available in principle going back to 1989, but panel information is available going back to 1996.

The dataset contains information about stocks of foreign direct investment, both German FDI abroad, and foreign firms in Germany. It also has data on the subsidiaries: balance sheet information, sales, employment, stock of investments. Last, the data contains information on the parent companies: sectoral information, number of subsidiaries / investment projects, size (employment, since 2002). Data access is only possible at the Bundesbank in Frankfurt/Main.

Owing to reporting limits, there are no small investments (ie foreign affiliates) in the dataset. Since reporting limits refer to the investments (ie the foreign affiliates), no clear conclusion can be drawn with regard to the size (especially employees) of the German investing multinationals.

Because MiDi is focused on the investments (foreign affiliates) and hence some key variables are lacking for the German investing firm, German firm-level data from Dafne (Bureau van Dijk) were merged in order to obtain more information on the German investor.

Hungary (Institute of Economics of the Hungarian Academy of Sciences)

Trade

The Hungarian team uses a sample of 2043 large (exports > 100 million HUF or 400th €) Hungarian manufacturing firms for 1992-2003. These firms represent 60-70 percent of total exports, and 50-60 percent of total imports. The data contains sales, exports, employment, capital, cost measures, foreign ownership and location. Export and import figures are detailed at the six-digit Harmonised System categories level in HUF, USD, metric tons and units for EU and non-EU.

Italy (Centro Studi Luca d'Agliano)

Trade

The Italian team uses the Capitalia database. Capitalia's Observatory on Italian Firms conducts every three years a survey on a representative sample of Italian manufacturing firms. The available surveys cover the following periods: 1989-91, 1992-94, 1995-97, 1998-00 and 2001-03. The sample is selected with a stratified design on location, industrial activity and size for all firms with less than 500 employees and more than 11. All firms with more than 500 employees are included in each wave.

We merged the last four waves. Thus variables are available for an unbalanced panel for the period 1992-2003 for manufacturing firms. The Capitalia dataset also includes the sample weights, which can 'translate' the information at sample level into information about the population.

The Capitalia cross-sections are representative of the sectoral population of Italian firms. We checked the sample weights, taking into account the level of sectoral disaggregation they used. We have to underline that in providing the sectoral statistics we are using an unbalanced panel. This has to be kept in mind in considering our statistics.

FDI

We employ the CER-ICE Dataset, Italian firm-level data, which merges Capitalia 2004 (period 2001-2003) and the Reprint-ICE Database (2001-2003). Capitalia is a rotating panel of 5,000 firms in the manufacturing and service sectors with a large amount of information combined with firm-level data. Reprint-ICE has data on inward and outward FDI combined with balance sheet data from Aida.

Norway (University of Oslo)

The Norwegian database includes all non-financial joint-stock companies (firms) in the manufacturing sector. The value added in these firms represents approx. 90 per cent of the manufacturing industry totals. The firm is defined as ‘the smallest combination of legal units that is an organisational unit producing goods or services which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. A firm carries out one or more activities at one or more locations’.

Trade

The trade in commodities data is a census covering all exports and imports above NOK 1000. A firm is an exporter if exports exceed this threshold.

Wages are measured as ‘payroll expense’/‘man-hours worked’, ie the hourly nominal wage. Capital intensity is measured as ‘Real cost of capital’/‘man-hours worked’. Real cost of capital is calculated as deflated costs of buildings and land + other tangible fixed assets + rental costs of buildings, land and other tangible fixed assets.

FDI

The FDI data is a census covering all outward FDI stocks. 20 percent ownership is used to distinguish direct investment from portfolio investment. FDI sales are defined as affiliate sales multiplied by the parent’s ownership share in the affiliate.

United Kingdom (GEP)

Trade

For the UK, the team used FAME data. This is a commercial company-level dataset provided by Bureau van Dijk. This data is derived from the accounts that companies are legally required to deposit at Companies House. The description of FAME given by Bureau van Dijk reads as follows:

“FAME is a database that contains information for companies in the UK and Ireland. FAME contains information on 3.4 million companies, 2.4 million of which are in a detailed format. For the top 2.4 million companies the reports typically include: contact information including phone, e-mail and web addresses plus main and other trading addresses, activity details, 29 profit and loss account and 63 balance sheet items, cash flow and ratios, credit score and rating, security and price information (listed companies only), names of bankers,

auditors, previous auditors and advisors, details of holdings and subsidiaries (including foreign holdings and subsidiaries), names of current and previous directors with home addresses and shareholder indicator, heads of department, shareholders, news plus access to the scanned image of the latest annual returns and reports."

FAME is one of a very small number of datasets to contain firm level export data in the UK. The version available to us covers the period 1994-2003. Our version of FAME reports balance sheet data, including nationality of ownership and level of export turnover as well as variables to calculate productivity. Export destinations or information on product-level exports are not available in FAME. Also, FDI data are not available in our database.

Appendix C: TFP estimation

This appendix explains the methods we used to estimate Total Factor Productivity.

The productivity of an input is the amount of output generated per unit of input used. In this respect, it is a measure of efficiency in the use of that input. Labour productivity, for example, is generally measured as output per worker (or output per hour worked).

Total Factor Productivity (TFP) refers to the productivity of all inputs taken together and it is a measure of the global efficiency of a firm. The present report considers several alternative methods to estimate TFP at the firm level⁴³.

Value added

A first method is simply to consider the firm value added per worker. This ratio is straightforward to compute but strictly speaking is a measure of labour productivity as it neglects the contribution of other factors such as physical capital.

For this reason, we also estimate TFP by a number of econometric techniques. These assume that production at the firm level can be expressed as a function that takes the following Cobb-Douglas specification:

$$(3) \quad Y_{i,t} = A_{i,t} K_{i,t}^{\alpha} L_{i,t}^{\beta} M_{i,t}^{\gamma}$$

where $A_{i,t}$ is the TFP of firm i at time t , $K_{i,t}$ and $L_{i,t}$ are its stock of physical capital and employment respectively, and $M_{i,t}$ are materials. The parameters α , β and γ are positive and have to be estimated.

Fixed effects

The simplest way to evaluate TFP is to assume that it is constant over time and rep-

43. For a review of these methods see Arnold (2005).

resents a firm fixed effect. In this case, one can consider the logged specification of (3) and use the least square dummy variable (LSDV) estimator. This gives the second method we use to estimate TFP.

This second method may, however, lead to biased estimation. First, firm-level productivity may evolve over time. Second, the LSDV estimator does not account for simultaneity: a firm may have some private information, not observed by the statistician, on how its productivity will evolve over time and may adjust its factor demand accordingly. When this happens, it leads to the so-called ‘simultaneity bias’. Third, the LSDV estimator is also subject to a ‘selection bias’, which occurs when observations are non-randomly selected. In our case, this is a relevant concern because firms are generally observed in our national samples only if they perform well enough to operate above a certain size threshold. Hence, we consider two additional estimators.

Olley-Pakes

When data on investment in physical capital is available, we use the technique proposed by Olley and Pakes (1996). This uses information on the firm investment behaviour to control for simultaneity while using a selection equation to correct for the selection bias.

Unfortunately, data on investment is often characterised by frequent zero values, which may vastly reduce the number of observations available for implementing the Olley-Pakes technique.

Levinshon-Petrin

This is why we also use the alternative estimation procedure devised by Levinshon and Petrin (2003). The logic is similar to that of Olley and Pakes (1996), but relies on intermediate inputs such as materials to control for simultaneity.

Pareto distribution

Once TFP is estimated for each firm, one can fit its distribution to a Pareto by estimating the shape parameters k 's. Specifically, consider a random variable X (our TFP) with observed cumulative distribution $F(X)$. If the variable is Pareto distributed with skewness k and support $[X_m, \infty)$, then its cumulative distribution is:

$$[4] F(X) = 1 - \left(\frac{X}{X_m} \right)^{-k}$$

After a logarithmic transformation, [4] can be rewritten as:

$$[5] \ln(1 - F(X)) = k\ln(X_m) - k\ln(X)$$

Hence, as shown by Norman, Kotz and Balakrishnan [1994], the OLS estimate of the slope parameter in the regression of $\ln(1 - F(X))$ on $\ln(X)$ plus a constant is a consistent estimator of k and the corresponding R^2 is close to one. The estimated k then allows one to recover an estimate for X_m from the constant.

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Appendix D: Gravity regression

This appendix explains the methods we used to decompose the margins in the gravity regression.

Firm extensive and intensive margins

The first and most simple decomposition separates the contributions of the number of exporters ('firm extensive margin') and of their average value exported ('firm intensive margin') to the growth of aggregate trade flows. In so doing, it builds on the following identity:

$$[6] X_{ij} = N_{ij}^f \times \bar{x}_{ij}^f$$

where X_{ij} is the total value of exports from country i to country j , N_{ij}^f is the number of exporters to j in country i and $\bar{x}_{ij}^f$ is the average value shipped by each exporter.

This decomposition of the total value of exports can be used in combination with the gravity model of trade flows to estimate the impact of the major trade determinants on each of different margins of trade. The gravity model in a general form can be expressed as:

$$[7] X_{ij} = A \times S_i \times S_j \times \varnothing_{ij}$$

where A is a constant, S_i and S_j account for the exporting capacity of country i and importing potential of country j respectively while $\varnothing_{ij}$ accounts for the bilateral factors that promote or hinder trade.

Theoretical foundations for such a log linear relationship have flourished recently and all show the S variables to be proportional to the economic sizes of the countries, usually captured by their GDPs: $S_i = (GDP_i)^{a_1}$ and $S_j = (GDP_j)^{a_2}$. To implement a traditional gravity framework, we also use the bilateral distance as proxy for $\varnothing_{ij}$ so that $\varnothing_{ij} = (dist_{ij})^\beta$. We finally use standard controls for additional factors affecting trade

that are not related to distance *per se*, such as common language, colonial links, regional trading agreements (RTAs) and common currency usage⁴⁴.

Combining the firm margin decomposition (6) and the gravity equation (7) and applying a logarithmic transformation gives:

$$(8) \ln X_{ij} = \ln N_{ij}^f + \ln \bar{x}_{ij}^f = \ln A + \alpha_1 \ln GDP_i + \alpha_2 \ln GDP_j + \beta \ln dist_{ij}$$

Accordingly, the coefficients α_1 , α_2 and β can be decomposed into the impacts of the corresponding determinants on the 'firm extensive margin' (in the regression where $\ln N_{ij}^f$ is the dependent variable) and on the 'firm intensive margin' (in the regression where $\ln \bar{x}_{ij}^f$ is the dependent variable).

Product extensive and intensive margins

The second decomposition separates the contributions of the number of products ('product extensive margin') and of average value exported per product by firm ('product intensive margin') to the growth of aggregate trade flows. In so doing, it fragments the firm intensive margin using the following identity:

$$(9) X_{ij} = \ln N_{ij}^f \times N_{ij}^p \times \bar{x}_{ij}^{fp}$$

where N_{ij}^p is the total number of products exported from country i to j ('product extensive margin') and $\bar{x}_{ij}^{fp}$ is the average value exported of each product by each firm ('product intensive margin')⁴⁵.

We can now use the new decomposition (9) to replace $X_{ij} = N_{ij}^p$ in the gravity equation (7) and run an analogous regression to (8).

44. All theoretical foundations also show that S_i and S_j include more than just GDPs, and in particular complex price index terms. The 'true' gravity equation can be consistently estimated using fixed effects that capture totally S_i and S_j . However, this requires to have large numbers of exporting and importing countries, which is not the case here. We therefore adhere to the simple traditional gravity framework and use GDPs as proxies for sizes of countries i and j , as well as the traditional variables included in ϕ_{ij} , namely distance, common language, colonial links, regional trading agreements (RTAs) and use of a common currency.

45. A product is measured as 8-digit Combined Nomenclature category in our French and Belgian data, which makes up to nearly 10,000 products at this level of disaggregation.

Quantity and price margins

The third and last decomposition separates the contributions of average quantity exported per product by firm ('quantity margin') and of average export price per product by firm ('price margin') to the growth of aggregate trade flows. In so doing, it considers the third identity

$$(10) X_{ij} = N_{ij}^f \times N_{ij}^p \times \bar{p}_{ij}^{fp} \times \bar{q}_{ij}^{fp}$$

where $\bar{q}_{ij}^{fp}$ and $\bar{p}_{ij}^{fp}$ are the average quantity and the average price of shipments of each product by a firm.

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New developments in the world economy have increased the competitive pressures on European firms in international markets. The divide between winners and losers from globalisation no longer runs only between sectors: winners and losers are increasingly found within sectors. Current macroeconomic data is blind to this trend and cannot help policymakers to grow world-beating export performance. Eight research centres from eight EU countries, coordinated by Bruegel and CEPR, have created a network to analyse these issues and develop new facts based on firm-level trade and FDI data. The network is called **EFIM (European Firms in International Markets)**, and this is its first report.

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