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The Happy Few: The Internationalisation of European Firms

New Facts based on Firm-level Evidence

Policymakers tend to view the internationalisation of firms from the perspective of export, import and FDI statistics. A lack of statistical information at the firm level has so far prevented the systematic inclusion of firm-level analysis in the policymaker's standard toolbox. Some firm-level datasets are now available, however, and their analysis reveals some new facts that are simply unobservable at the aggregate level.

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. The lack of such information at the firm level has therefore so far prevented the systematic inclusion of firm-level analysis in the policymaker's standard toolbox.

This paper 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. 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 and FDI per firm. The "extensive margin" refers to the number of firms actually involved in those international activities ("internationalised firms", henceforth IFs).
- 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.
- 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, and 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

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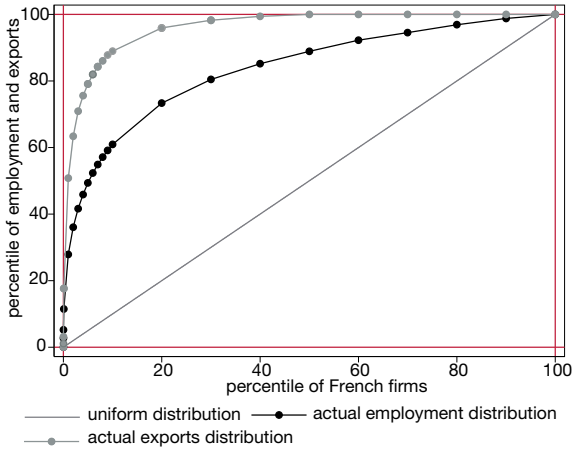
Table 1
Share of Exports of Top Exporters in 2003, Total Manufacturing

Country of origin	top 1%	top 5%	top 10%
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

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 sample.

Source: EFIM.

Figure 1
The Superstar Exporters Phenomenon (France, restricted sample)



Source: EFIM.

productivity are more important than policies fostering exports, imports or FDI *per se*.

The paper is organised as follows. Following on from the introduction, we first show that IFs are rare and their exclusive club is dominated by a handful of top firms. We then demonstrate that IFs are different in that they perform better than other firms. Following that, we dissect aggregate trade and FDI flows to assess the relative importance of the intensive and extensive margins. It is shown that firm-level information is crucial to understanding aggregate behaviour. Finally, we summarise the evidence and discuss its policy implications.

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 homogenous 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.

Superstar Exporters

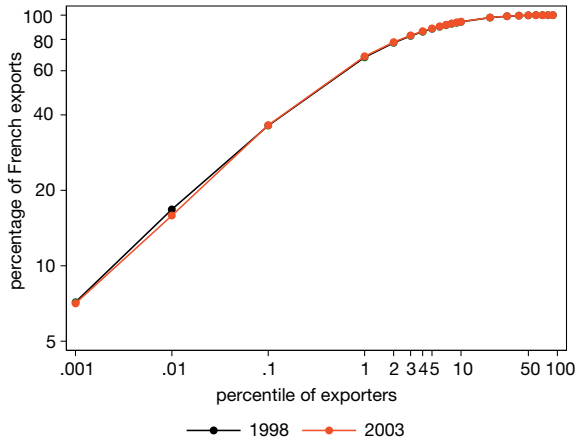
In the following we use firm level data to show that IFs are few and, among these few, only a handful of firms account for the bulk of aggregate exports and FDI.

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 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.

For each country the columns in Table 1 show the contributions of the top 1%, 5% and 10% of exporters. The numbers are striking. In the exhaustive samples, the top 1% of exporters account for more than 45% of aggregate exports; the top 5% of exporters account for more than 70% of aggregate exports; the top 10% of exporters account for more than 80% of aggregate exports. The 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 pale grey 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 1%, 5% and 10% exporters are the ones already reported in Table 1. As a benchmark, the straight grey line plots a distribution corresponding

Figure 2
The Superstar Exporters Phenomenon, Logarithmic Transformation (France, Exhaustive Sample)



to the case in which all firms export the same value. Hence, the further away the curve is from the line, the more concentrated aggregate exports are in the hands of a 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 onto the contributions of "superstar" exporters by showing what happens within the club of the top 1% of exporters.[1] The picture is again striking: the top 0.001%, 0.01% and 0.1% of exporters still account for not much less than 10%, 20% and 40% of aggregate exports respectively.

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

[1] 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.

Fact 1 – Aggregate exports are driven by a small number of top exporters. The top 1%, 5% and 10% of exporters account for no less than 40%, 70% and 80% of aggregate exports respectively.

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 shows that the share of sampled firms that export is roughly 65%, 60%, 45%, 75% and 40% 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 the given shares of their turnover, and the percentages of total exports accounted for by these groupings of firms.

The 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% of all firms export more than 50% of their turnover but they account for 50% to 75% of total exports. The distribution can, however, vary substantially across countries.

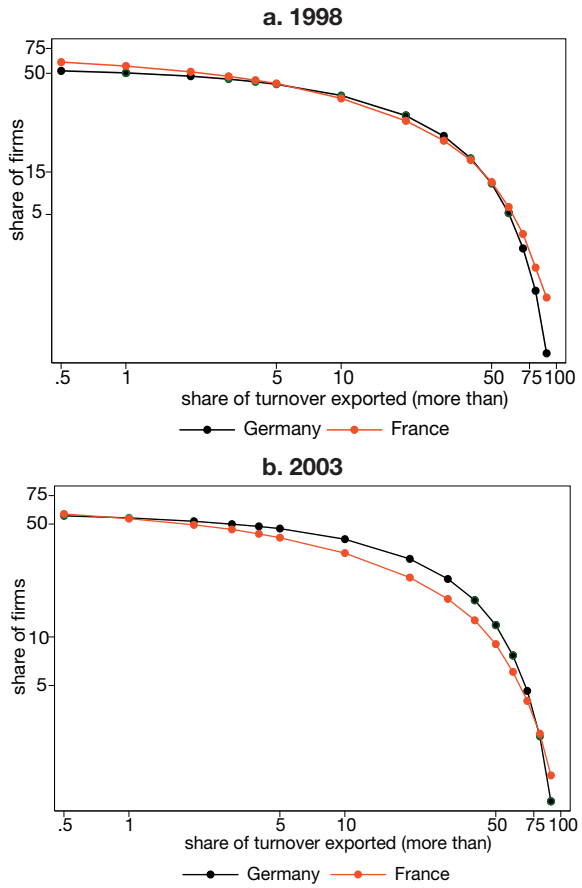
In this respect, an interesting comparison between France and Germany exemplifies the potential of firm-level data analysis. Germany has a larger proportion of firms exporting more than 50% of their turnover, and they represent a much larger share of total exports than in France. From Table 2 we can see that the greatest contribution (68%) to total exports in Germany comes from firms exporting from 50% to 90% of their turnover. In France on the contrary, the greatest contribution (46%) comes from firms exporting from

Table 2
Distribution of our Sample of Exporters by % of Turnover, 2003

				% firms exporting more than				% of total exports by firms exporting more than			
Country of origin	# firms	total mfg exports (€ bn)	% exporters	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	48325	488.66	59.34	46.89	40.30	11.85	0.96	99.49	98.54	73.57	5.95
France	23691	171.73	67.30	41.16	33.04	9.02	1.39	93.58	95.11	49.22	9.71
United Kingdom	14976	71.46	28.33	22.52	19.27	8.07	1.51	97.60	93.40	65.70	19.00
Italy	4159	58.61	74.44	64.90	57.42	25.58	2.91	99.71	98.53	69.09	7.52
Hungary	6404	30.01	47.53	38.43	34.74	22.19	11.01	99.86	99.64	92.01	69.13
Norway	8125	16.07	39.22	17.98	14.45	5.19	1.26	98.51	97.42	70.27	28.57

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

Figure 3
Export Intensity: France versus Germany



Source: EFIM.

10% to 50% of their turnover. France, however, has a larger proportion of firms entirely "globalised" (selling more than 90% of their 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 exporting.[2]

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 exports 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.

For Italy, 3% and 25% of firms export more than 90% and 50% of their turnover and account for roughly 7% and 70% of total exports respectively. For Norway, around 1% and 5% of firms export more than 90% and 50% of their turnover and account for roughly 30% and 70% of total exports respectively.

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

The previous section implies:

Fact 2 – Only a few firms export a large fraction of their turnover. Around 5% and 25% of firms export more than 90% and 50% of their turnover and account for roughly 10% and 70% of total exports respectively.

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.

Meet the "Margins"

A handful of firms account 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 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.

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-hand and bottom right-hand cells. In particular, 30% of firms export only one

[2] P. Artus, L. Fontagné: Évolution récente du commerce extérieur français, rapport n°64 du Conseil d'Analyse Economique, Paris 2007, 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 seem fairly comparable, however.

Table 3
Distribution of French Exporters over Products and Markets, 2003

Share of Exporters
(total # exporters: 99259)

	# of countries			
# of products	**1**	**5**	**10+**	**Total**
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 Exports
(total exports: 314.3 € bn)

	# of countries			
# of products	**1**	**5**	**10+**	**Total**
1	0.70	0.08	0.38	1.86
5	0.30	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.

product to only one market while 10% of firms export more than ten products to more than ten markets.

The bottom panel reports 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% 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 % of total exports.

To summarise, aggregate exports are determined by a 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 shall explore below the characteristics that make exporters, and *a fortiori* top exporters, different from other firms. We shall 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 suggests that distance affects aggregate trade flows mostly by reducing the number of exporters rather than by reducing average exports per firm. We shall compare the two effects in some detail later on. We shall 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.

The Talent of Internationalised Firms

We shall now show that internationalised firms (IFs) score better than other firms on various performance measures.

Table 4 reports employment, value added, wages, capital intensity and, where available, skill intensity "premia" defined as the ratios of exporters' (FDI-makers') to 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 (5.60)	
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)	14.80 (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 (6.10)	1.13 (0.90)	1.52 (0.72)	
Belgium	16.45 (6.82)	24.65 (11.14)	1.53 (1.20)	1.03 (0.82)	
Norway	8.28 (4.48)	11.00 (5.41)	1.34 (0.76)	0.87 (0.13)	

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

Source: EFIM.

Table 5
French Exporters Exhibit Superior Performance to French Non-exporters, 2003

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 (0.80)
Printing and editing	0.90 (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 equipments	1.22 (1.49)	1.11 (1.40)
Radio-TV-communication	1.31 (1.95)	1.17 (1.78)
Precision instruments	1.21 (1.50)	1.10 (1.45)
Motor vehicules	1.23 (1.40)	1.11 (1.59)
Other transport	1.32 (1.73)	1.14 (1.60)
Furniture	1.29 (5.85)	1.21 (3.67)
Recycling	1.01 (0.71)	0.98 (0.94)

Note: The firms considered are manufacturers with more than 20 employees. 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.

Source: EFIM.

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

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 for 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% higher than non-exporters.

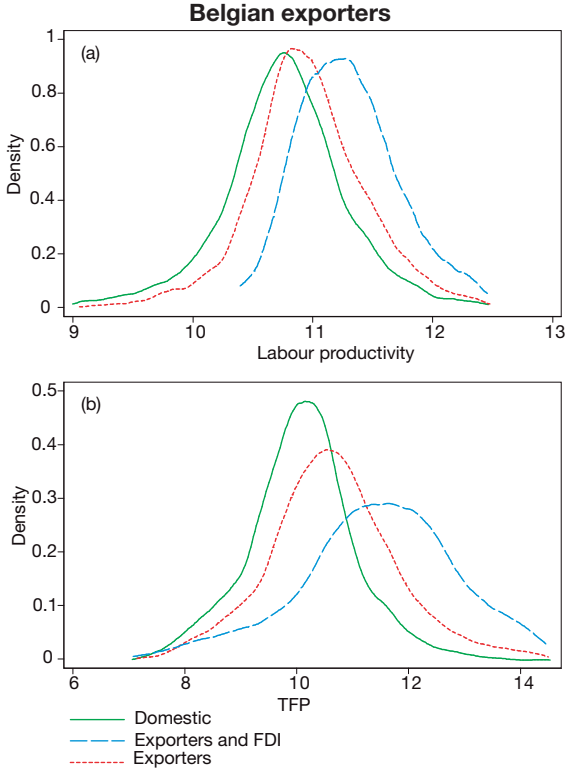
The employment premium for German exporters is in line with those of France and Italy. The United Kingdom employment premium for exporters, on the other hand, is almost zero, which is a puzzling exception compared to all other countries and indicators. This probably derives from the fact that the sample of UK firms is even more biased than the others in favour of large firms.[3] 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% of their turnover). Quite large premia characterise employment (5.3), value added (13.5) and wages (1.44). Capital intensity and productivity, on the other hand, feature 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 markets.[4] Figure 4 shows the productivity distributions for the three types of firms in Belgium. Panel (a) depicts apparent labour productivity whereas panel (b) refers to estimated TFP.

[3] Sample selection is less likely to explain the cross-country behaviour of FDI premia as French premia are quite large.

[4] In our samples, nearly all FDI-makers are also exporters.

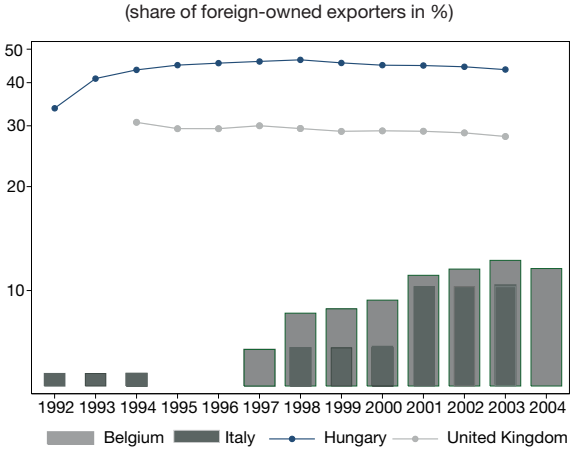
Figure 4
Belgian FDI-makers are more productive than Belgian exporters



Note: Data for Belgium 2004.

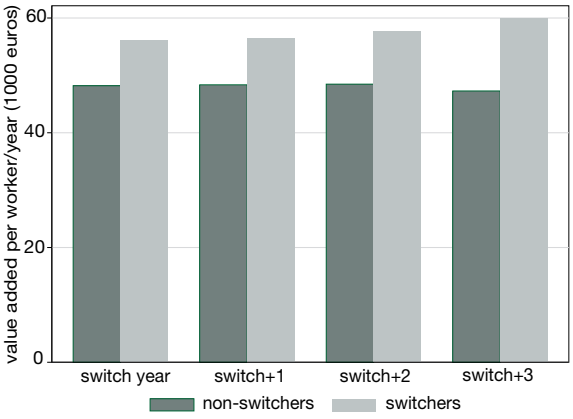
Source: EFIM.

Figure 5
The Rising Foreign Ownership of European Exporters



Source: EFIM.

Figure 6
Compared Performance in Labour Productivity – Exports (France)



Source: EFIM.

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 firms.[5]

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.

Hence, we have:

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

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 Figure 6 and Figure 7 respectively. The figures consider firms in the samples that

Table 6
Share of Foreign-owned Firms among Exporters and Non-exporters in 2003 (%)

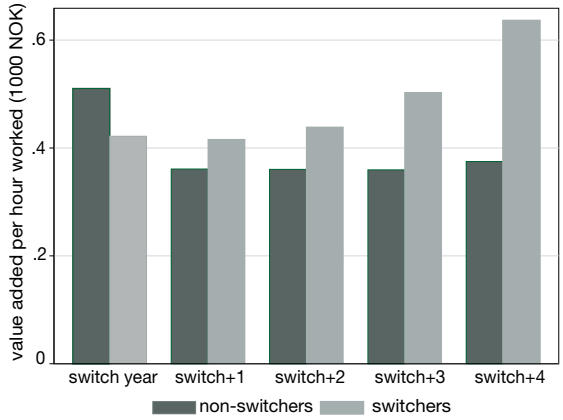
Country of origin	non exporters	Exporters
United Kingdom	18.69	27.94
Italy	4.03	10.26
Hungary	11.47	43.63
Belgium	0.58	12.23

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

Source: EFIM.

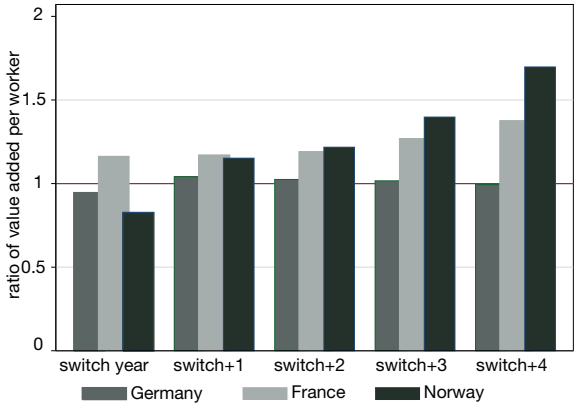
[5] http://www.cepr.org/pubs/PolicyInsights/PolicyInsight8.pdf.

Figure 7
Compared Performance in Labour Productivity – Exports (Norway)



Source: EFIM.

Figure 8
Compared Performance Ratio in Labour Productivity for Three Countries – Exports



Source: EFIM.

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.

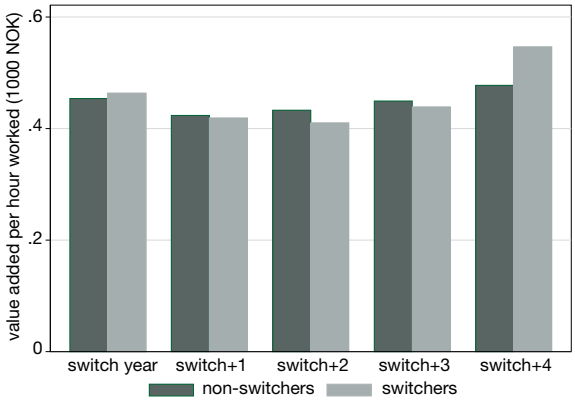
The two figures show that switchers do move along steeper trajectories as they perform increasingly better than non-switchers. This is true no matter whether they already performed better in the switch year (France) or not (Norway). Two very different stories are consistent with those findings. Since 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 the 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.

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.

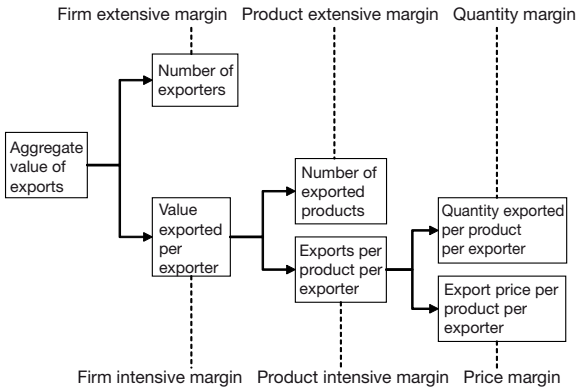
Overall, we have:

Figure 9
Compared Performance Ratio in Labour Productivity – FDI (Norway)



Source: EFIM.

Figure 10
The Margins of Adjustment of Aggregate Exports



Source: EFIM.

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.

The Margins of Exports and FDI

This section 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", i.e. the number of IFs.

The single most robust way to relate aggregate trade and FDI flows to their fundamental drivers is the "gravity equation". This relates the values of flows between two economies to their sizes and a variety of trade impediments.[6] While this relationship works in the case of both exports and FDI, for ease of presentation we shall 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 simple gravity equation into increasingly finer detail, relying on firm-level information. The logic of this decomposition is visualised in Figure 10.

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 product.[7]

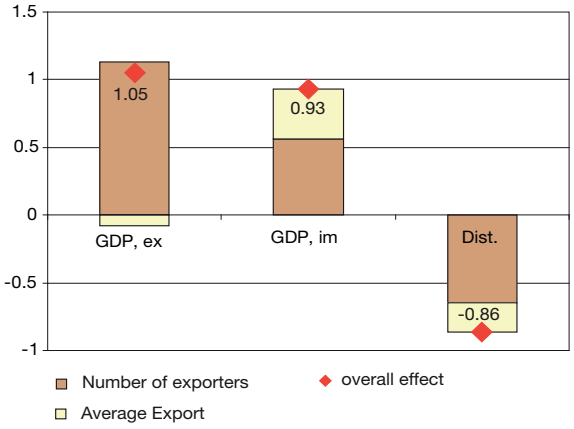
We start with the most simple decomposition exercise, which contains only distance as a trade impediment. Figure 11 presents the results.[8] The bar chart represents the contribution of firm extensive ("number of exporters") and intensive ("average exports") mar-

[6] 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 for gravity have become available (see J.E. Anderson, E. van Wincoop: Trade Costs, in: Journal of Economic Literature, Vol. 42, 2004, pp. 691-751 for a survey), and researchers such as Chaney, Helpman et al. and Melitz and Ottaviano have started to investigate the importance of firms' heterogeneity for gravity. (Cf. T. Chaney: Distorted Gravity: The Intensive and Extensive Margins of International Trade?, in: American Economic Review, 2006, forthcoming; E. Helpman, M.J. Melitz, Y. Rubenstein: Estimating Trade flows: Trading Partners and Trading Volumes, in: Quarterly Journal of Economics, 2007, forthcoming; M. Melitz; G. Ottaviano: Market Size, Trade, and Productivity, in: Review of Economic Studies, Vol. 75, 2008, pp. 295–316). On the empirical side, authors such as J. Eaton, S. Kortum and F. Kramarz: An Anatomy of International Trade: Evidence from French Firms, in: Meeting Papers from Society for Economic Dynamics, No. 197, 2005; and A.B. Bernard, J.B. Jensen, S.J. Redding and P.K. Schott: Firms in International Trade, in: Journal of Economic Perspectives, Vol. 21, No. 3, 2007, have investigated those issues for US firms and French firms.

[7] We can thus go even further than existing margin decomposition on US internal (R. Hillberry, D. Hummels: Trade Responses to Geographic Frictions: a Decomposition Using Micro-Data, in: European Economic Review, 2005) or external (B. Bernard et al., op. cit.) data. Another early paper decomposing trade patterns into the extensive and intensive margins is J. Eaton et al., op. cit., using French data for the year 1986.

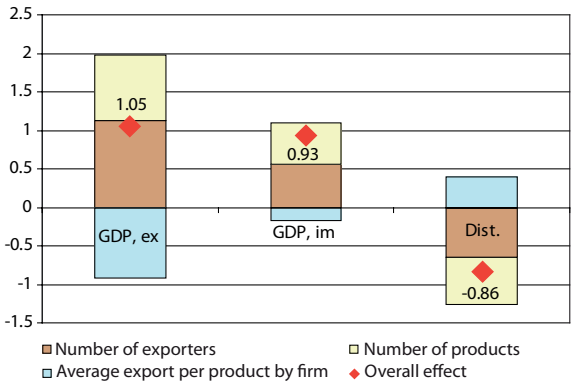
[8] All coefficients are highly significant.

Figure 11
Gravity and Aggregate Exports – I



Source: EFIM.

Figure 12
Gravity and Aggregate Exports – II



Source: EFIM.

gins to the overall effects (small diamonds) 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.")

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% larger than country B, then on average it attracts 10% more exports than B from other countries. Analogously, country A exports on average 10% more than B to other countries. Moreover, if A is on average 10% further away from other countries than B, then it trades 9% 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 that of the intensive margin. For instance, the decrease in the number of firms accounts for 75 % of the impact of distance on trade flows. In the same vein, the increase in trade value associated with the increase in the importing country's size comes mostly (60%) 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 firms.[9]

More detailed estimates also allow us to identify interesting differences in the effects of different trade impediments. 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 tends 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.

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 12 displays the results of this new decomposition. 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 exports per product by firm") to the overall effects (small diamonds) of three gravity forces on bilateral exports. Strikingly, the results point to an extreme parallelism

[9] 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 (T. Chaney, op. cit.; E. Helpman et al., op. cit.; M. Melitz, G. Ottaviano, op. cit.) or not. (S. Redding, A. Venables: Economic Geography and International Inequality, in: Journal of International Economics, Vol. 62, 2004, pp. 53-82).

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 importing countries is much greater than the estimated total effect. This is because, as shown by the corresponding parts of the bars, the effect of these three factors on exports is mitigated by their effect on average exports per product by firm. Indeed, the average exports per product by firm fall with GDP and rise with distance. In particular, a 10% increase in the GDP of the exporting country leads to an increase of roughly 10% in both the number of exporters and the number of products exported as well as a decrease of roughly 10% in firms' average export per product. A 10% increase in bilateral distance leads to a 6% fall in the first two variables and to a 4% increase in the third.[10]

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 exporters' average exports per product.

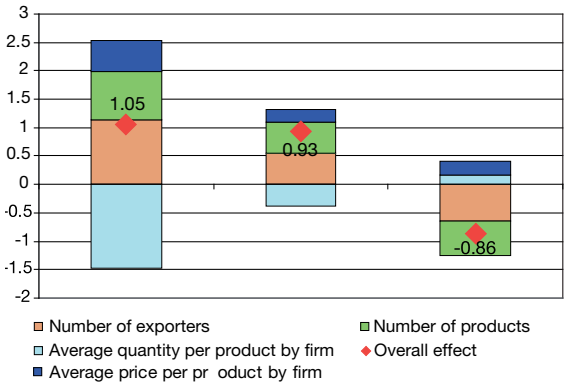
The results on the product intensive margin are particularly interesting. They imply that the indications of the (net) impacts of GDPs and distance on the firm intensive margin highlighted in Figure 11 are attributable to their impact on the total number of exported products, which is far greater than the impact on average exports per product.[11]

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 GDP 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 larger.[12] Since the product intensive margin only considers the average shipment value, such a composition effect may explain why the effects of GDP are negative and those of distance are positive.

Figure 13
Gravity and Aggregate Exports – III



Source: EFIM.

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), it may be observed 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 markets.[13] Distinguishing between the two alternative explanations is a complex issue, but the average price of shipments can be used to shed some light on it.

Price and Quantity Margins

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

A final decomposition of the average exports per product by firm (product intensive margin) into aver-

[10] These findings are very similar to the ones by A.B. Bernard et al., op. cit., and R. Hillberry, D. Hummels op. cit., for external and internal US trade flows, respectively.

[11] This finding parallels the one by A.B. Bernard et al., op. cit., for US exporters.

[12] See M. Melitz, G. Ottaviano, op. cit., for a theoretical formalisation of this idea.

[13] A.B. Bernard et al., op. cit., conjecture that this second explanation might be the relevant one to explain their result, but do not investigate it further.

age 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 13.

The bar chart in Figure 13 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 (small diamonds) of three gravity forces on bilateral exports.

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 13 shows that the average quantity exported decreases with GDP and increases with distance, pointing to the presence of less efficient exporting firms in larger or closer markets. The dark 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 GDP. Hence, overall "quality sorting" seems to be a weaker explanation of the aggregate observed behaviour of the product intensive margin.[14]

We have therefore:

Fact 10 – Prices and quantities defy gravity. The average quantity exported by firms 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.

Further analysis of French data reveals that former colonial ties and sharing a common language have a positive impact on trade flows along both the intensive and the extensive margins. Moreover, 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. As colonial ties and a common language are not directly related to distance, that suggests that such variables proxy for lower fixed costs of exporting.

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, 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.

The Margins of FDI

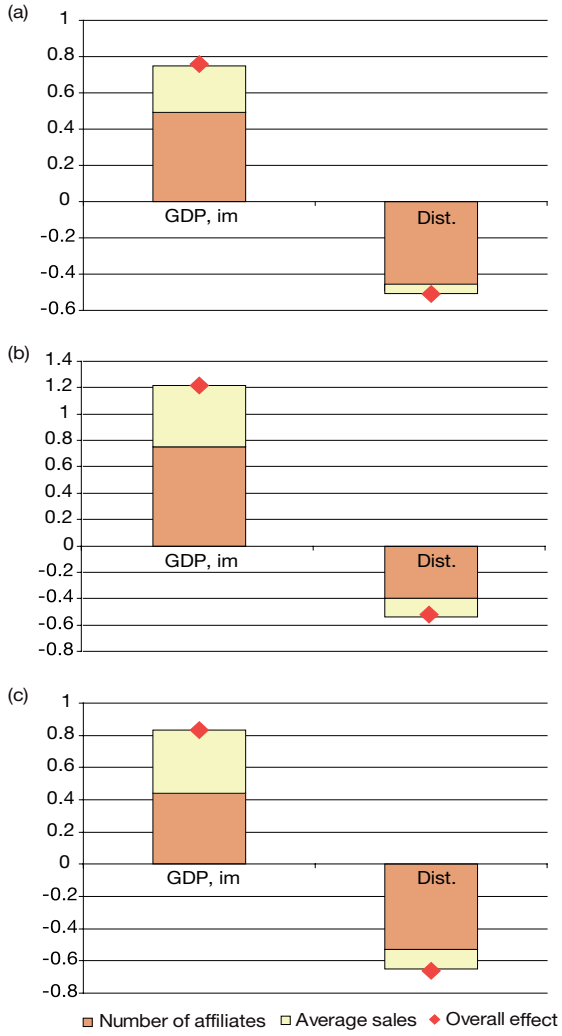
The gravity model has been primarily devoted to the study of trade flows, but more recently a fair amount of research has used the same variables to explain patterns of bilateral FDI flows or stocks.[15] The equilibrium equation for bilateral capital flows closely resembles the gravity relation for bilateral 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 highlight the channels through which gravity forces affect the sales of foreign affiliates. In Figure 14 each bar chart repre-

[14] 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 R. Baldwin, J. Harrigan: Zeros, Quality and Space: Trade Theory and Trade Evidence, in: NBER Working Paper No. 13214, 2007; and M. Crozet, K. Head, T. Mayer: Quality sorting and trade: Firm-level evidence for French wine, in: mimeo, CEPII, 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.

[15] For example, K. Head, J. Ries: FDI as an Outcome of the Market for Corporate Control: Theory and Evidence, in: Journal of International Economics, Vol. 74, Issue 1, 2008, pp. 2-20 have recently developed a model of FDI where heterogeneous investors bid to obtain control rights to 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, A. Hijzen, H. Görg, M. Manchin: Cross-border mergers and acquisitions and the role of trade costs, in: European Economic Review, 2007, forthcoming, investigate the role of trade costs in explaining the increase in the number of cross-border M&As.

Figure 14
Gravity and Aggregate FDI



Source: EFIM.

sents the contribution of firm extensive ("number of affiliates") and intensive ("average sales" per affiliate) margins to the overall effects (small diamonds) 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 affiliates.

Figure 14 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 countries.

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").[16] Moreover, Figure 14 shows that the rise in foreign affiliate sales associated with the increase in the GDP of the country of destination comes mostly (65% for Norway, 61% for Germany and 53% for Belgium) from the increase in the number of foreign affiliates.

More detailed estimations also reveal the key role of the number of affiliates in transmitting the effects of other gravity forces: 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 Norway.[17]

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.

Conclusions

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

This paper 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 paper is on the characteristics of European firms involved in international activities through exports or foreign direct investment ("interna-

[16] See e.g. G. Barba Navaretti, A. J. Venables: Multinational Firms in the World Economy, 2004, Princeton University Press; and B. A. Blonigen : A Review of the Empirical Literature on FDI Determinants, in: Atlantic Economic Journal, Vol. 33, 2005, pp. 383-403 for definitions of the two types of FDI and related empirical evidence.

[17] In a recent study on the offshoring activities of German firms, C. Buch, M. Schnitzer, C. Arndt, I. Kesternich, A. Mattes, J. Eaton, C. Mugele and H. Strotmann: Analyse der Beweggründe, der Ursachen und der Auswirkungen des so genannten Offshoring auf Arbeitsplätze und Wirtschaftsstruktur in Deutschland, IAW Tübingen 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.

tionalised firms"). 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 added value, 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 is driven by the changes in two "margins". The "intensive margin" refers to average exports, imports and 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.

We stress six policy implications.

- First, promote intra-industry competition. The opening up of trade and FDI triggers a selection process in which the most productive firms replace 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.

- Second, 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 exports and FDI. So governments should focus on policies that broaden the export base.

- Third, 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 trade.[18]

- Fourth, 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.

- Fifth, keep up the fight against small-trade costs. Small (fixed) costs of internationalisation matter because they reduce the number of exporters and multinationals.

- Sixth, 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.

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 significance of the size of the internal market? If superstars dominate international markets, is there any room for global SMEs? What precisely does the dominance of the extensive over the intensive margin imply for policy intervention designed to promote 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 paper 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.

[18] See J. Head, K. Ries: "Do trade missions increase trade?", University of British Columbia, mimeo, 2007.