Trade and Innovation Dynamics of French Manufacturing Firms: an empirical analysis

Laura Casi,
Università degli Studi di Milano e ISLA-Bocconi

Roberto Mavilia
Università Mediterranea e KITES-Bocconi

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Abstract

Firms' heterogeneity has primarily been explained in the recent literature by two main drivers: innovation activities or selection induced by internationalization. Only few papers have started to analyze the interactions between internationalization and innovation decision at firm level and their relative importance and results are still puzzled. Our contribution is thus meant to shed some light on the joint role of innovation and exporting activities in shaping productivity patterns for a representative sample of some 100,000 French manufacturing firms over the period 2000-2006. In particular, we are able to exploit a direct measure of output, rather than input (R&D) of the innovation process across all manufacturing sectors, since we match Amadeus data on firms characteristics (including export activities) with the EPO-PATSTAT dataset on accepted patent applications made by each firm belonging to the sample. Using dummies to distinguish firms engaged in exporting activities only, innovating activities only or both, we find evidence that, in almost all sectors, slight productivity improvements are mainly driven by innovation rather than firms' selection through internationalization.

Keywords: Firms Heterogeneity, Trade, Innovation, Productivity
JEL codes: D24, F12, F23, O32

1 Introduction

Economic growth is more than ever needed for European Economies to be able to compete worldwide. Launching the Europe 2020 strategy, President Josè Barroso said: "*Europe has a growth deficit which is putting our future at risk.*

|...| *We need to build a new economic model based on knowledge, low-carbon economy and high employment levels."* The new European agenda adopted by the council last March 2010 is based on three priorities and the first one is exactly the "smart growth" based on knowledge and innovation promotion. In line with this priority the European Institutions and Member States will commit themselves investing in R&D and linking R&D to innovation intensity. Indeed, the first point on Europe 2020 agenda is the so called "*Innovation union*" that consist in "*re-focussing R&D and innovation policy on major challenges, while closing the gap between science and market to turn inventions into products*"

Economic literature is increasingly considering growth not only from the macroeconomic point of view but also from the microeconomic perspective, analysing firm level productivity gains. Indeed the famous Solow residual in firm level analysis is naturally identified as the total factor productivity in a classical production function and it is usually driven by two crucial determinants: efficiency improvements and innovation output. The recent availability of longitudinal micro-level datasets has boosted the development of a number of models that try to disentangle these dynamics of productivity patterns at firm level. Firms' heterogeneity within sectors is either explained in terms of innovation activities (Eaton and Kortum 1999, Klette and Kortum 2004) or by selection induced by internationalization (Melitz, 2003; Melitz&Ottaviano 2008). Only few papers have started to analyze the interactions between internationalization and innovation decision at firm level and their relative importance (Yeaple 2005, Bustos 2006, Constantini and Melitz 2007). This paper is meant to shed some light on the joint role of innovation and exporting activities in shaping productivity patterns for a representative sample of around 100000 French manufacturing firms over the period 2000-2006. To our knowledge, this is the first micro-level study that is able to exploit a direct measure of output of the innovation process across all manufacturing sectors such as accepted patent applications made by each firm belonging to the sample. Our dataset is build matching Amadeus data on firms characteristics with EPO-PATSTAT dataset on European patents. Patent counts are generally accepted as one of the most appropriate indicators that enable researchers to compare the innovative performance of companies in terms of new technologies, new processes and new products (among others: Aspden, 1983; Griliches, 1998; Patel and Pavitt, 1995). Using dummies to distinguish firms engaged in exporting activities only, innovating activities only or both, we find evidence that, in almost all sectors, slight productivity improvements are mainly driven by innovation rather than firms' selection through internationalization. Moreover French economy seems to be very static and differences in productivity between firms persist over time. This result seems to suggest the picture of an economy with low competition and low entry/ exit. High entry and exit barriers are consistent with the result that productivity dynamics within sectors are mainly explainable in terms of improvements in firms' performance through innovation rather than reallocation of market shares between firms.

The rest of the paper is organized as follows: section 2 reviews the epirical literature available on the role of innovation and internationalization at firm

level, section 3 presents some stilized facts on the European and French market as far as patents and internationalization activities of firms are concerned, section 4 discusses empirical results and section 5 concludes.

2 Literature review

As already mentioned, there is extensive empirical literature assessing heterogeneity of firms within sectors (usually identified in terms of productivity, see Bartelsman & Doms, 2000) that has boosted the development of a number of theoretical models trying to disentangle the mechanisms explaining such differences or identifying what they entail in terms of firms' behaviour. Firms' hetherogeneity is usually explained in terms of innovation activities or by selection induced by internationalization. As far as innovation activities are concerned, Klette and Kortum (JPE, 2004) develop a model that predicts the dynamic behavior of innovating firms. They link differences in firms' productivity to exogenous permanent differences across firms in the size of their "innovative step" and consider jointly firms' growth and firms' innovative intensity. In their model they are able to reflect a set of stylized facts from the empirics: a positive relationship between measured productivity and R&D activity, along with a weak relation between R&D and productivity growth; the strong persistence of differences in R&D intensity across firms, whose distribution is highly skewed, with a considerable fraction of firms reporting zero R&D even in high tech industries.

As for internationalization choices of firms and firm level dynamics of export and productivity, the leading work by Melitz (ECONOMETRICA, 2003) introduced in international trade literature a model, characterized by monopolistic competition, where heterogeneous firms entering the market face an initial uncertainty on future productivity level. Firms make a costly and irreversible investment decision prior to entry in the market and only after having drawn their productivity they can choose whether to exit or not. A further decision is made afterward on the opportunity to export or serve only the domestic market. In this context, trade induces a selection effect (only more productive firms are able to serve the export market while least productive firms are forced to exit even from the domestic market) a reallocation effect (resources are reallocated from least productive to more productive firms within an industry) and a variety effect (as in Krugman 1990). An interesting extension of this model by Melitz and Ottaviano considers endogenous mark-ups of firms that respond to thoughness of competition in the market.

As already mentioned, only few papers have started to build a theoretical bridge between innovation and iternationalization decisions at firm level, while empirical evidence on the relationship between the two and their relative importance is still mixed. Constantini and Melitz (2008) develop a model that consider jointly endogenous innovation and export market participation decision of firms. They show that investment in innovation may be a forward looking decision of the firm determined by anticipation of trade liberalization. In line

with this paper is the analysis made by Bustos (AER, Forthcoming) that introduces technology choice in Melitz (2003), arguing that trade liberalization can increase productivity through two main channels: better allocation of production factors on one side and adoption of more advanced technologies on the other side. Indeed the resulting increase in revenues can induce exporters to invest in new technologies increasing productivity further. The empirical test on a sample of Argentinean firms shows that firms in industries facing higher reduction in Brazil's tariffs increase their investment in technology faster, with the strongest effect in the middle-range of firm-size distribution.

Empirical literature on the link between firms' productivity and their decision to export and to invest in innovation is growing, but results are mixed. Trade literature has widely documented the positive relationship between firms' participation to export markets and productivity. In particular, three main hypothesis about the link between exporting and productivity are usually proposed:

- Exogenous self-selection associated to "luckyness of draw" and sunk entry cost
- Learning- by- exporting effect (exporters learn from foreign contracts, new production technologies,...)
- Conscious self-selection, i.e. firms engage in specific investments aimed at rising their productivity prior to entry in the export market.

In this framework, however, a crucial research question still remains unanswered: where does productivity differences come form? More productive firms self-select into the export market or firms learn from exporting and become more productive?

Empirical results are mixed, with robust evidence in favor of self-selection hypothesis but weak learning effect. Once controlled for innovation strategy of a firm, productivity turns out to depend less on the export status of a firm (Aw & Batra (1998), Delgado & Farinas et al. (2002), Cassiman & Golovko (2007)) and innovation activities seem to be the major source of productivity growth. Nonetheless, results seem to depend on the type of innovation measure and estimation strategies used: innovation output (patents) versus innovation input (R&D expenditures), see Crepon (1998); process versus product innovation, see Huergo & Jamandreu (2004), Griffith (2006); new product sales, see Jefferson (2004), switch in primary SIC code, see Bernard & Jensen (2004). Moreover, a huge problem linked to the empirical question about causality posed above is the likely simultaneity in export and innovation decision. Simultaneity, if not controlled for, introduces bias in estimates, making conclusive inference difficult to derive.

Aside from all these potential methodological problems and open theoretical issues on the direction of causality in the link between productivity, innovation and export, to our knowledge no-one ever questioned the idea that more productive firms are the most innovative and internationalized ones. For this reason,

according to previous literature, in a simple descriptive analysis distinguishing firms engaged in exporting activities only, innovating activities only or both, we expect innovating and exporting firms to exhibit outstanding productivity levels with respect to the other firms. However, this is not the case, as we will discuss in section 4.

3 Stilized facts

Innovation and internationalization activities are increasingly seen as the crucial ingredients for successfull firm performance. In this period of severe economic crisis, a formula for recovering and sustaining firms and the industrial structure of our countries would be more than ever needed to achieve "smart", "sustainable" and "inclusive" growth, as European Institutions deem it necessary to face the challenge. For this reason, we think it is important to highlight European countries' and firms' state of trade and innovation, with a special focus on French performance in this regard.

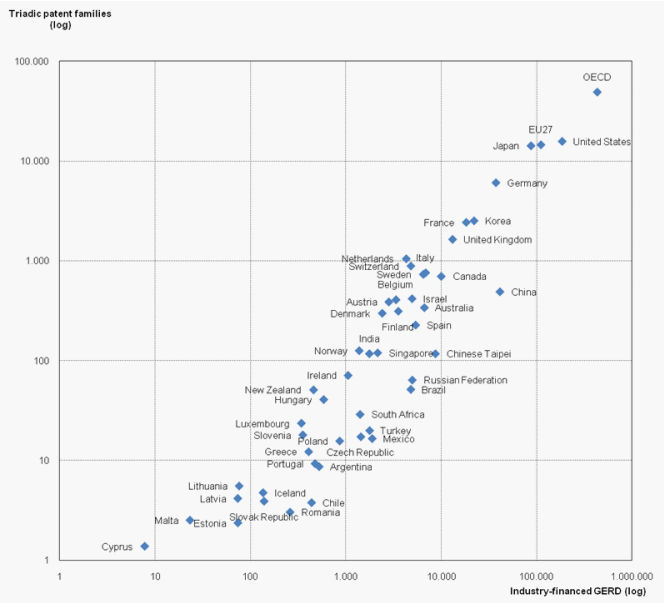
The 2009 European Innovation Scoreboard (EIS) published last March, shows that until 2008 most EU Member States were steadily improving their innovation performance, decreasing the innovation gap with the US and Japan and facing effectively competition from emerging economies. The main source of R&D expenditures in most European countries is the business enterprise sector. It must be noted that this kind of R&D investments are particularly pro-cyclical and thus there is a general concern about the hampering effect that the current economic crisis could have on innovation. The Scoreboard shows that more innovation is needed in Europe and in line with these results the Europe 2020 Agenda calls for a commitment of all economic agents to sustain innovation and give an effective response to the current crisis. In this regard patents[1] give innovators market power over competitors and are thus crucial in stimulating investment in innovation in the perspective of "closing the gap between science and market to turn inventions into products" (EU 2020).

Following these premises France is a good candidate to study innovation dynamics of firms because it is one of the European Countries with the highest number of patents registered and has the highest Gross Domestic Expenditure on R&D[2] as shown in Figure 1 below.

[1] A patent is a legal title granting the holder the exclusive right to make use of an invention for a limited area and time. An invention needs to fulfil three criteria in order to be granted a patent: (1) novelty, (2) inventive step and (3) industrial applicability. All patent applications and patents granted are published. They provide a useful indicator of innovative developments in all areas of technology and can indicate the level of innovative activity in a particular market, region or country.

[2] "Triadic" patent families refer to patents filed at the European Patent Office (EPO), the US Patent and Trademark Office (USPTO) and the Japan Patent Office (JPO) which protect the same invention; Gross domestic expenditure on R&D (GERD) is measured as millions of USD (2000) using purchasing power parities, lagged by one year.

Figure 1 .



source: OECD Science, Technology and Industry Scoreboard 2009

In France, governament support to business R&D is the highest among G7 countries and R&D tax subsidy rates are the highest in the OECD area. It is the second among EU members for the value of venture capital investments, but still a study by Eurostat on EU15 countries showed that the share of big innovating firms more than doubles that of SMEs in France.

As for trade performance, the EU's 27 member states act as one unique agent through the European Commission and account for the largest share of the world market in merchandise (19% of world imports and exports). Many studies on European firms operating in international markets have shown that "internationalized firms" are bigger, generate higher value added and have higher productivity (The Happy Few). In 2007, French manufacturing trade balance registered a surplus in both high and medium-high thechnology while in most European countries trade balance was negative.

4 Empirical results

4.1 Our Database

Our sample is an unbalanced panel of around 100000 French manufacturing firms per year, over the period 2000-2005. The dataset has been built match-

ing Amadeus[3] data on firms characteristics with EPO-PATSTAT dataset on European patents. To our knowledge this is the first micro-level study that is able to exploit a direct measure of output of the innovation process across all manufacturing sectors such as accepted patent applications made by each firm belonging to the sample.

From the initial sample downloaded from Amadeus some data cleaning has been necessary: being data retrieved from balance sheets, some variables can not assume negative values, in particular sales, cost of materials, fixed assets and employees have been dropped when negative. Moreover, as far as employees are concerned, firms registering 0 employees have been considered missing. The simple descriptive statistics reported in Table 1 below show that the resulting panel still contains 93018 firms (out of an initial sample of 110314 firms) and it is unbalaced, but more than 50% of companies are observed at least 7 years and more than 60% observed at least 6 years.

Table 1 . Descriptive statistics - Sample

```
     id:  1, 2, ..., 110314                              n =      93018
   year:  2000, 2001, ..., 2006                         T =          7
          Delta(year) = 1 unit
          Span(year)  = 7 periods
          (id*year uniquely identifies each observation)

Distribution of T_i:   min      5%     25%       50%       75%     95%     max
                         1       1       4         7         7       7       7
```

Freq.	Percent	Cum.	Pattern
49653	53.38	53.38	1111111
6087	6.54	59.92	1
4978	5.35	65.28	11
4341	4.67	69.94	111
4175	4.49	74.43	.111111
4002	4.30	78.73	..11111
3785	4.07	82.80	...1111
2293	2.47	85.27	111111.
985	1.06	86.33	1.11111
12719	13.67	100.00	(other patterns)
93018	100.00		XXXXXXX

Considering more closely each variable we can see that the sample is composed of almost 500000 observations and on average firms are small (i.e. around 50 employees) with a minimum of 1 worker and a maximum of almost 500000 workers. Consider also that between 22000 and 29000 firms export every year and between 100 and 400 firms register a patent every year, with most prolific firms registering up to 266 patents per year and registering at least an innovation in 6 years out of the 7 considered. From this first simple description it's already

[3] Amadeus is a commercial dataset reporting company accounts concerning 11 million public and private companies in 41 European countries. For each company Amadeus provides balance sheet data on sales, value added, fixed assets and number of employees, plus information about the ownership structure by nationality, as well as sector of activity of each firm. For more information on Amadeus see www.amadeus.bvdep.com.

clear that if only few firms engage in export activities, i.e. around 1/3 of the sample, "effective" innovation activities are even more "elitist", with only 1% of firms being able to register at least 1 patent in the 7 years we're considering.

Table 2 . Descriptive statistics - Variables of interest

Variable	Obs	Mean	Std. Dev.	Min	Max
id	484112	45269.24	30743.75	1	110314
year	484112	2003.225	1.995902	2000	2006
labour	484112	51.68992	1399.919	1	465577
capital	484112	2804.737	87705.75	0	1.75E+07
materials	484112	6045.656	245631.5	0.939761	5.60E+07
revenues	484112	10768.68	320148.6	0.887627	6.70E+07
capital intensity	484112	0.23979	8.486492	0	5114.5
innovators	484112	0.002962	0.0543448	0	1
innovations per year	484112	0.014003	0.7772023	0	266
year-innovator	5349	0.918116	1.327612	0	6
exporters	484112	0.36435	0.4812478	0	1
export turnover	483488	2091.668	51153.4	-46652	2.01E+07

Note also that sectors where a larger number of firms register patents are chemicals, rubber and plastic, fabricated metals, computer, electronic and optical products, electrical equipment, machinery and motor vehicles, which are also the same where the highest number of patents have been accepted. The least productive in terms of innovation activities, instead, are bevarages, tobacco, leather and related products and furniture.

Finally, it is interesting to compare the transition probabilities for the two dummies of interest: innovator and exporter.

Table 3 . Transition probabilities (innovator)

	innovators		
innovators	0	1	Total
0	99.90	0.10	100.00
1	62.83	37.17	100.00
Total	99.81	0.19	100.00

Table 4.Transition probabilities (exporter)

exporters	exporters 0	1	Total
0	88.28	11.72	100.00
1	14.60	85.40	100.00
Total	46.92	53.08	100.00

As it is clear form Table 3 above, over 99% of firms that were non-innovators in one period remain non-innovators in the next one. If we consider instead firms that innovate in one period, almost 63% of them then go back to non innovator status, while only about 37% of them innovate also in the next period. As for exporters the probability of being an exporter for a firm that was exporter in the previous period is 85% while over 88% of firms that are domestic in one period remain domestic alson in the folloowing one. It is more likely that an exporter goes back to non exporting status than for a domestic firm to became exporter.

4.1.1 Descriptive results

Bearing in mind the structure of our sample, we start our analysis from simple desctriptive statistics that shed some light on the link between innovation activities, export decisions and productivity at firm level. To do this, we first need to estimate productivity at firm level. We use three different techniques and we compare the results. In particular we first obtain a TFP measure using simple OLS estimation, from a standard Cobb-Douglas production function of the form $Y_{it} = A_{it}K_{it}^{\beta_K}L_{it}^{\beta_L}$, where Y_{it} is value added, K_{it} is capital input, L_{it} is labour input and A_{it} is our index of Total Factor Productivity. Log-linearizing the equation above yields the following simple econometric specification: $y_{it} = \beta_K k_{it} + \beta_L l_{it} + a_{it}$,where a_{it} is the variable of interest we want to obtain. In what follows, the above equation is estimated separately for each of the NACE2-digits sector[4]. Moreover, all variables are deflated using price indexes available on Eurostat[5]. Note however that consistent OLS estimation requires errors to be uncorrelated with the regressors, but profit maximizing firms that observe a productivity shock are likely to adjust their inputs accordingly, within the minimum time span econometrician track variables' dynamics (one year). For this reason, in the equation above, regressors are likely to be

[4]In particular we considered the rev.2 version of this classification. According to it, manufacturing is made of 24 sectors ranging from code 10 to 33. For a detailed list of these sectors see the Appendix (Table A1).

[5]In particular we used the sectoral specific PPI (producer price index) to deflate sales, GDP deflator for capital and energy price index for materials.

correlated with the error term, leading to inconsistent OLS estimates. In order to take into account this endogeneity problem, we estimate the same regression using two semi-parametric techniques developed respectively by Olley and Pakes (OP, 1996) and Levinsohn and Petrin (LP, 2003). Both methods follow a similar logic: they develop a multiple stage estimation routine that controls for productivity shocks, using respectively investments and material costs as proxies for the productivity term. Results are presented using the LP methodology, using OLS and OP TFP estimates as robustness checks. It is worth remarking that the three measures of productivity are highly correlated among each others, reaching over 90% correlation in most sectors: see table 3 below.

Table 5 . Productivity measures, correlations.

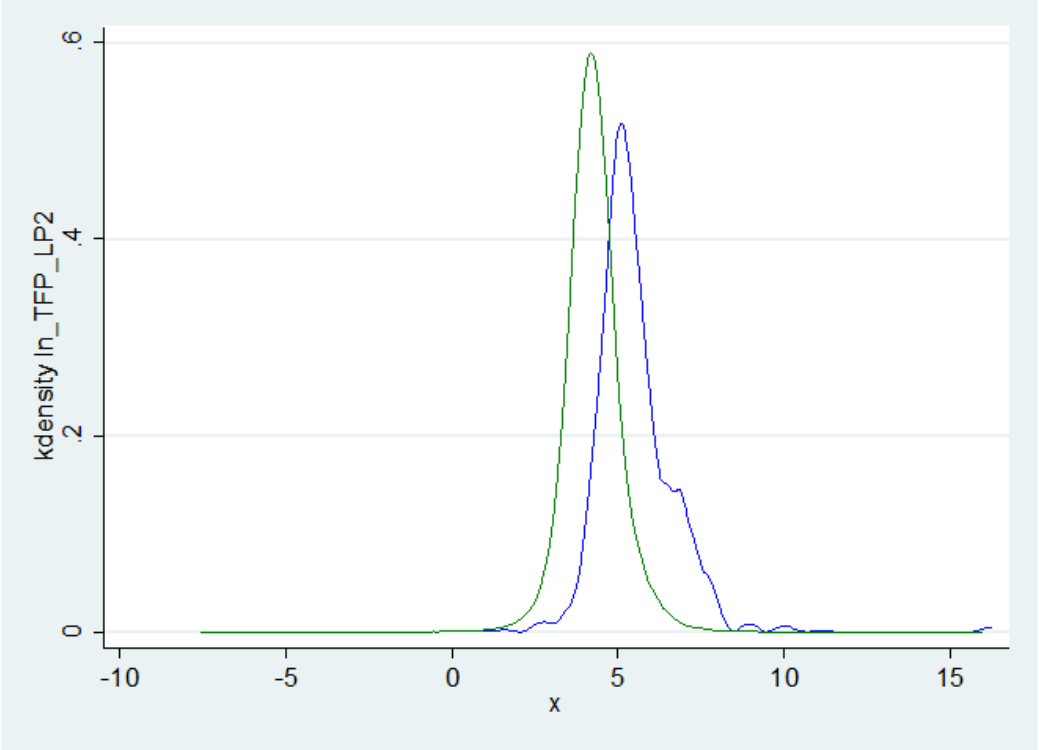
Nace 2 (rev.2)	corr(TFP_OP, TFP_LP)	corr(TFP_OLS, TFP_OP)	corr(TFP_OLS, TFP_LP)
10	0.91	0.55	0.55
11	0.70	0.93	0.43
12	0.99	0.49	0.52
13	0.88	1.00	0.86
14	0.91	0.99	0.86
15	0.91	0.97	0.80
16	0.99	1.00	1.00
17	0.48	1.00	0.49
18	0.92	1.00	0.91
19	-0.01	0.65	0.08
20	0.84	1.00	0.84
21	0.76	0.99	0.75
22	0.53	0.99	0.53
23	0.32	0.99	0.35
24	0.97	1.00	0.96
25	0.89	1.00	0.89
26	0.92	0.99	0.89
27	0.85	1.00	0.82
28	0.87	1.00	0.87
29	0.98	1.00	0.98
30	0.70	1.00	0.67
31	0.95	0.93	0.91
32	0.87	1.00	0.85
33	0.96	1.00	0.96

Using TFP index estimated through the LP procedure we map the productivity distribution of our sample, distinguishing innovators from non innovators and exporters from non exporters. Finally we interact the innovators and exporters dummies to separate firms engaged in exporting activities only, in

innovating activities only, both or none of the above.

Notice that we considered all sectors together to have the overall picture of the economy [6]. The same graph has been drawn sector by sector in order to check for specific characteristics and results are robust across sectors [7].

Figure 2 . Innovators versus non innovators (Kernel density)



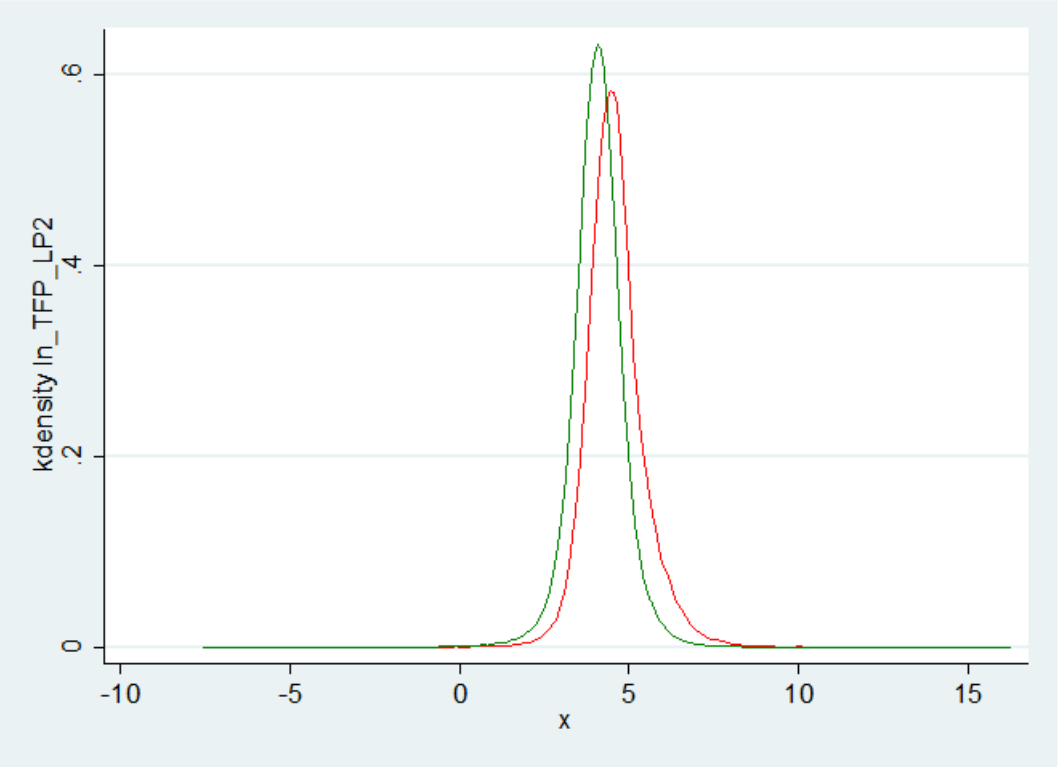
Kernel Density TFP_LP expressed in logarithms. Legend: blue curve= innovators; green curve=non innovators

Figure 2 above can be interpreted as depicting the probability of picking up a firm with a certain productivity level, when firms are randomly drawn from each type (innovator versus non innovator). The same is shown in Figure 3 below comparing exporters and non exporters.

[6] When pooling all sectors together, each firm's productivity has been normalized with respect the corresponding sector mean in order to make results comparable.

[7] Sector specific graph are available upon request.

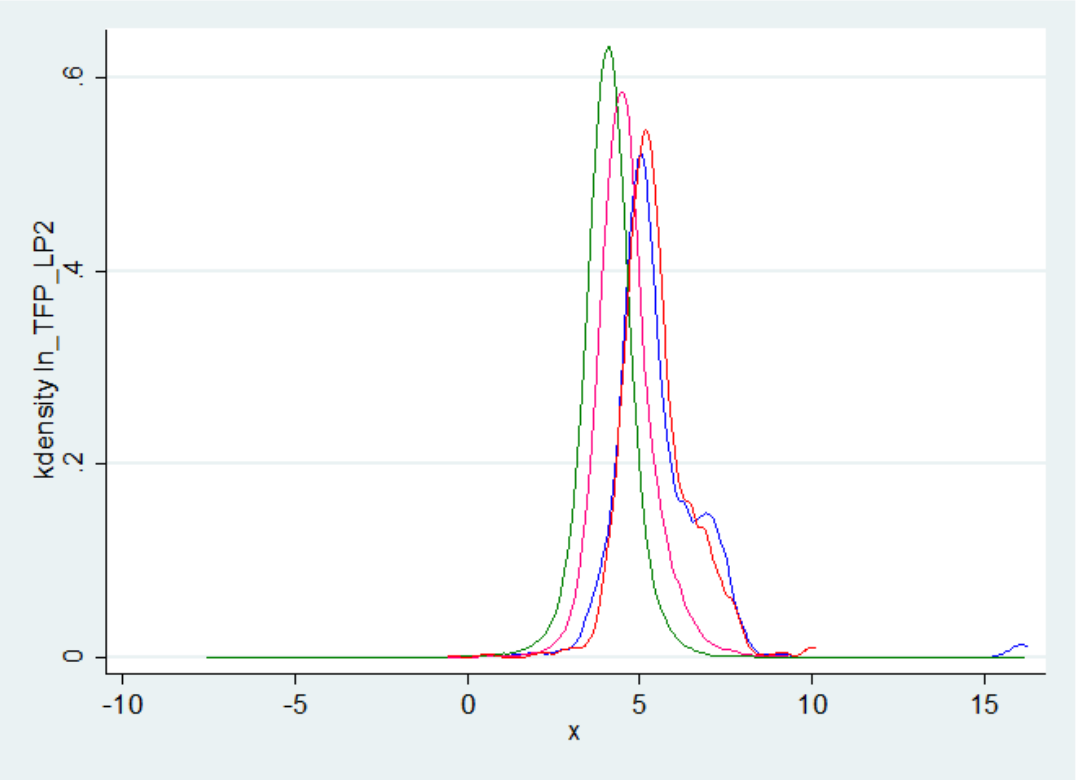
Figure 3 . Exporters versus non exporters (Kernel density)



Kernel Density TFP_LP. Legend: red curve= exporters; green curve=non exporters

As expected an innovator is more likely to be more productive than a non innovator and an exporter is more likely to be more productive than a non expoter, with the former difference being sharpeer than the latter. When combining the two cathegories, though, the picture becomes blurred. What we expect from previous analysis would be that, when isolating firms engaged in both innovating and exporting activities, they show outstanding levels of productivity. Moreover, from previous literature we would expect this link between innovation and export decision being almost necessary: firms that had been able to register a patent, being already winners in terms of productivity, would almost for sure decide to expand their market through exports. However, this is not what seems to emerge from data, as it is clear form Figure 4 below.

Figure 4 . Exporters and Innovators (Kernel density)



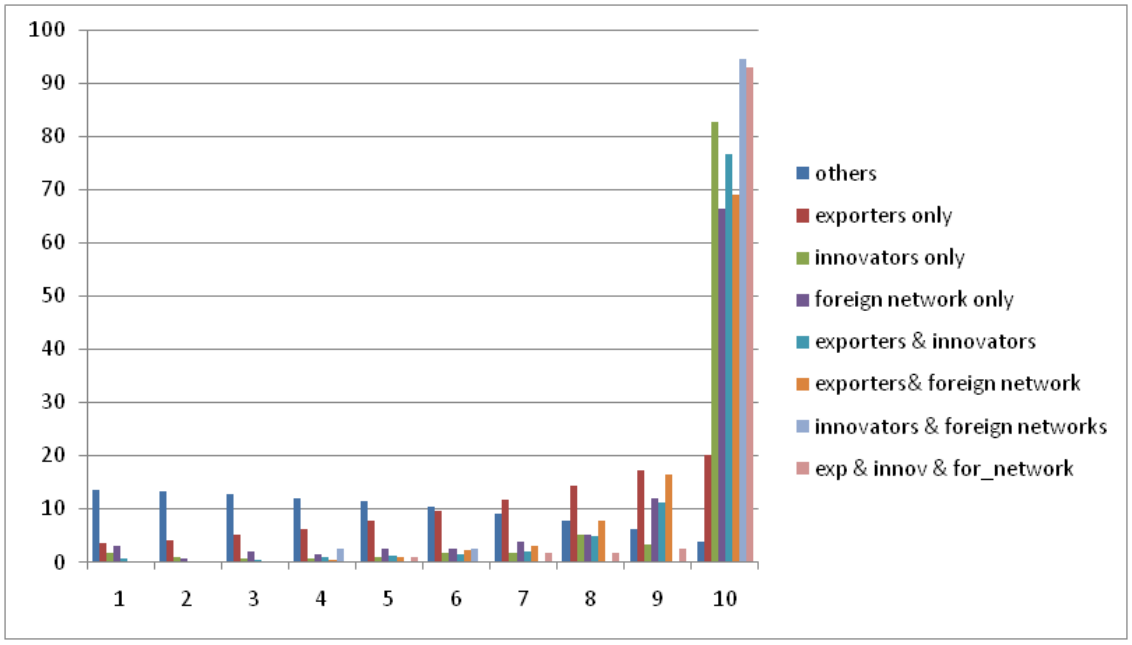
Kernel Density TFP_LP. Legend: red curve= exporters and innovators; pink curve= exporters only; blue curve= innovators only; green

Among non innovating firms, exporters seems to be more productive than domestic companies and at the same time exporters only are less productive than innovators. However, the difference between innovators only and innovators-exporters is difficult to track. Note in particular that there is a mass of domestic innovators placed in the extreme right of the graph, which is a clear sign that a number of innovating firms displaying among the highest productivity levels recorded in the sample have decided not to export. This result rises a fundamental question: why? why does a firm that win the race for innovation and reaches outstanding productivity levels would decide not to engage in exporting activities?

Our interpretation goes in two directions that we will try to argue in the rest of the paper. The first intuition is that exporting is not the only internationalization strategy a firm can adopt. Consider indeed the popular result in firm hetherogeneity analysis, stating that FDI-maker are even more productive than exporters (Mayer & Ottaviano, 2007). If a firm is already part of an in-

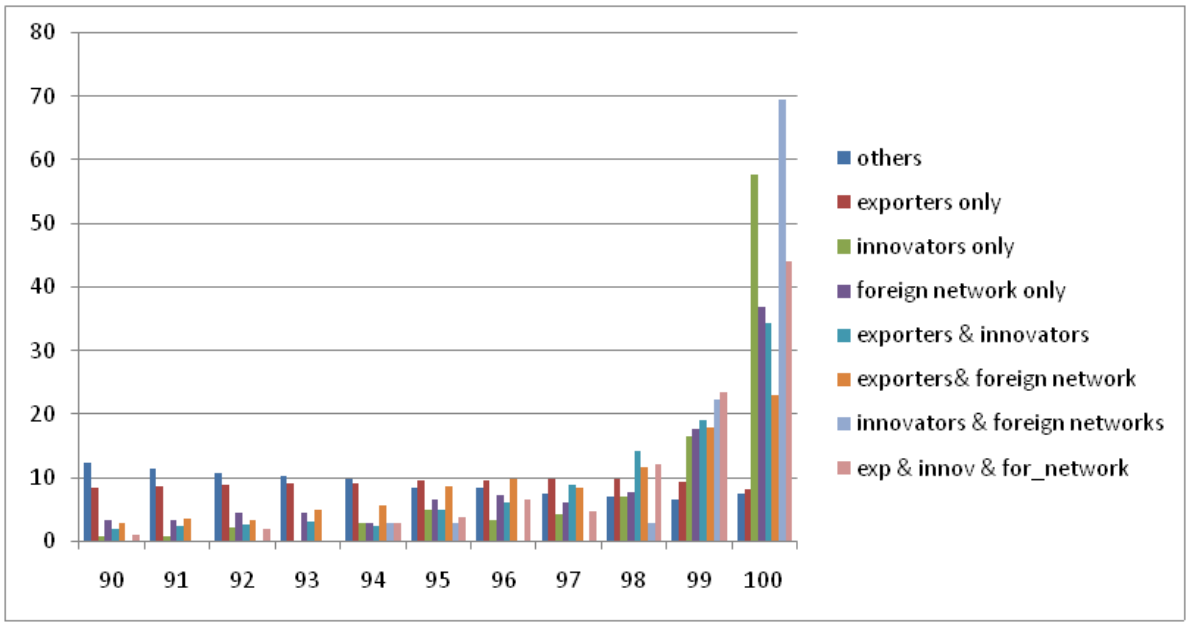
ternational network it may not need to export to expand its sales market. To check for this interpretation we introduce a new dummy that assumes value 1 if the firm is in a foreign network and 0 otherwise. A firm is in a foreign network if it is a foreign company (owned by at least 51% by a foreign owner) or if it has a foreign subsidiary (controlled at 51% by that firm). Results are presented in Figure 5 and 6 below.

Figure 5 . Exporters, Innovators and Foreign Networks (1)



The histogram in Figure 5 can be interpreted similarly as the kernel density above: it maps productivity deciles and in particular it shows what is the probability of picking up a firm belonging to each productivity decile, when firms are randomly drawn from each type. In this case there are 8 cathegories: from firms engaged in a foregin network which are also exporters and innovators to non innovating domestic firms. Note that in the last productivity decile the highest probability is for innovators engaged in foreign networks, followed by companies being innovators, exporters and engaged in a foreign network, followed then by innovators only. This partially confirms our intuition that high productive innovating firms are engaged in internationalization activities through foreign networks rather than exporting. If we split the latter decile into ten percentiles, results are even more marked, as it is clear from Figure 6 below.

Figure 6 . Exporters, Innovators and Foreign Networks (2)



Note indeed that the highest probability of picking up a firm belonging to the last productivity percentile is for firms being innovators and belonging to a foreign network, followed by innovators only. This ranking suggest the idea that innovating effectively is the crucial element that goes along with most successful firm performance in terms of productivity. Internationalization strategies seem to be less important in this regard. For this reason we propose also a second interpretation of our results.

4.2 Econometric results

The second part of our reasoning argue that a firm that is a winner both in terms of innovative capacity and in terms of productivity may decide not to expand abroad because it is able to make high enough profits in its domestic market and does not want to face the risk that internationalization entails.

Table 7. Estimates

	exporters (1)		exporters (2)	
Innovator	-0.116	***	-0.119	***
	-6.49		-6.60	
Innovator(t-1)	-0.138	***	-0.140	***
	-8.76		-8.87	
Foreign	-		0.04505	***
Network	-		3.46	
TFP	0.087	***	0.086	***
	58.94		58.91	
L	0.096	***	0.095	***
	135.63		134.96	
K	-0.022	***	-0.023	***
	-4.60		-4.72	
PCM	-0.005	***	-0.004	***
	-2.78		-2.76	

Pooled Probit including dummies for year and nace2 industry

(average marginal effects reported with robust standard error)

***=significance at 1% level, **=significance at 5% level, *=significance at 10% level

As it is clear from the estimates in Table 7 being an innovator decreases the probability of being an exporter. Moreover the higher its capital intensity (measures as capital inputs over revenues) and the higher the mark-up it applies, the lower the probability that the firm is engaged in exporting activities. On the contrary the higher productivity and the grater the size, the higher the probability a firm is an exporter. These results are confirmed even when we take into account the possibility that a firm belongs to an international network.

5 Conclusions

This paper is meant to shed some light on the joint role of innovation and exporting activities in shaping productivity patterns for a representative sample of around 100000 French manufacturing firms over the period 2000-2006. To our knowledge, this is the first micro-level study that is able to exploit a direct measure of output of the innovation process across all manufacturing sectors such as accepted patent applications made by each firm belonging to the sample. Using dummies to distinguish firms engaged in exporting activities only,

innovating activities only or both, we find evidence that, in almost all sectors, slight productivity improvements are mainly driven by innovation rather than firms' selection through internationalization. Indeed first results suggest the idea that innovating effectively is the crucial element that goes along with most successful firm performance in terms of productivity. Internationalization strategies seem to be less important in this regard. We argue that firms that are winners both in terms of innovative capacity and in terms of productivity may decide not to expand abroad because they are able to make high enough profits in French domestic market and do not want to face the possible risks that internationalization entails.

6 Bibliography

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7 Appendix

Table A1

CODE	Sector	CODE2	Sector2
10	FOOD	22	RUBBER & PLASTIC
11	BEVERAGES	23	NON-METALLIC MINERAL PRODUCTS
12	TOBACCO	24	BASIC METALS
13	TEXTILES	25	FABRICATED METALS
14	WEARING APPAREL	26	COMPUTER, ELECTRONIC & OPTICAL PRODUCTS
15	LEATHER &RELATED PRODUCTS	27	ELECTRICAL EQUIPMENT
16	WOOD (NO FORNITURE)	28	MACHINERY & EQUIPMENT n.e.c.
17	PAPER	29	MOTOR VEHICLES, TRAILERS & SEMI-TRAILERS
18	PRINTING OF RECORDED MEDIA	30	OTHER TRANSPORT EQUIPMENT
19	COKE & REFINED PETROLEUM	31	FURNITURE
20	CHEMICALS	32	OTHER MANUFACTURING
21	PHARMACEUTICALS	33	REPAIR & INSTALLATION