The U-shaped Productivity Dynamics of French Exporters

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Abstract

This paper investigates the relationship between export and productivity on a panel of French manufacturing firms. Exporting firms are found to be larger, more capital intensive and more productive than non-exporting firms. This export *premium* echoes those previously found for several OECD countries. However, the French case study reveals a new peculiarity of exporters: the typical productivity path of future exporters is U-shaped. First, the productivity advantage of new exporters over non-exporters temporarily vanishes before entry into export markets. It then reappears contemporaneously with exports. We also document the existence of bounded productivity gains after entry which are related to scale effects rather than learning effects. We conclude that the U-shaped productivity dynamics is a path along which firms first have to pay fixed costs in order to export, to only then harvest the benefits of foreign markets due to sales expansion.

1 Introduction

This paper uses a micro panel data set of French manufacturing firms to examine the relationship between export and productivity at the firm-level. To organize our empirical work, we rely on the emerging theoretical literature that seeks to account for the role of productivity heterogeneity as a determinant of differences

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in export behavior across manufacturing firms. The field of international trade has recently contributed to the analysis of firm heterogeneity through the models by Melitz [31] and Bernard, Eaton, Jensen, and Kortum (henceforth BEJK, [8]) in which the export behaviors that characterize micro data is driven to a large extent by differences in productivity. Both models emphasise the notion of sunk costs to explain the relationship between firm productive efficiency and participation to exports. They contend that only the most productive firms find profitable to serve distant markets while less productive ones concentrate only on domestic market. On the empirical side, Bernard and Jensen [9, 10], Clerides, Lach et Tybout [14], Bernard and Wagner [11] and Aw, Chung and Roberts [5] have initiated a series of papers documenting the superior productive efficiency of exporting firms as compared to non exporting ones.

The main purpose of this paper is to explore whether the firm's export behaviour is related to productivity differences at the firm level, as suggested by new models in international trade theory. In particular, we focus on productivity differences between exporting and non exporting French manufacturing firms over the period 1990-2002. The paper makes the following contributions to the literature. First, it adds another national perspective to the growing body of evidence based on firm, or plant, level productivity. Since France is one of the largest exporter of merchandize globally, it is clearly an interesting case to compare with other industrialized countries which have been the subject of similar scrutiny. Second, it provides an evaluation of the causality between export and productivity which improves on existing methodologies in two respects: first, it traces the performance of future exporters on a longer time span prior to export, namely five years. Surprisingly, this minor change will have a considerable qualitative impact on our results. Second, it goes one step further in the test for learning-by-exporting effects by controlling for the growth of real output following entry into export markets, similar to controlling for the presence of economies of scale. Specifically, if exporting allows firms to expand and take advantage of latent economies of scale in production, then exporters will be observed to have a larger increases in productivity than non-exporters. In this paper, we control explicitly for a scale effect.

To a large extent, our results chime with the broader literature. French exporting firms are larger, more capital intensive and more productive than non exporting firms. The productivity export *premium* is documented both in terms of labour productivity (LP) and in terms of total factor productivity (TFP). Two original findings are the following. First, new exporters are found to experience a sharp decline in their relative TFP performance prior to entry into export markets. The typical TFP path of a new exporting firm is one along which its advantage (over non exporting firms) temporarily vanish during a run-up phase of on average three years, to appear again as a contemporaneous effect of entry into export market. A similar pattern, albeit less pronounced, is found for labour productivity, where future exporters maintain their significant advantage over non-exporters during the run-up phase. Such U-shaped Productivity patterns have not yet been documented in the literature and tentative explanations of why they are observed on French data are proposed in the paper. Second, we

find evidence in favor of a second order effect in the sense that exporting firms experienced ex-post productivity gains. As has been found previously, these gains are bounded in time and larger for firms with a high export intensity. We however add to the set of available evidence that scale effects rather than learning effects play the major role in driving ex post productivity gains.

The rest of the paper is organized as follows. After a short review of the literature in Section 2, Section 3 presents the dataset used in this paper and provides preliminary evidence on exports by French manufacturing firms. In Section 4, we investigate econometrically the direction of he causality between exports and productivity. A summary of the main findings is then presented in Section 5.

2 Literature Background

Since the pioneering works by Bernard and Jensen [9, 10, **?**], a growing body of empirical evidence shows that firms which participate in export markets are more productive, larger, survive longer and pay higher wages, than firms which focus exclusively on domestic markets. Two main mechanisms have been proposed to explain the positive relationship between exporting and productivity. First, it reflects the fact that only the most productive firms are able to cope with highly competitive export markets. If the fixed costs of selling to foreign markets are higher than for the domestic market, only high productivity firms will find it profitable to enter into export markets in the first place. This hypothesis of self-selection has been recently incorporated into models of international trade with firm heterogeneity and sunk costs of exporting[1]. Second, the positive relationship can reflect productivity improvements that result from knowledge and expertise which the firm gains as a direct result of its export market experience. It has been argued that firms which participate to export markets have privileged access to technical expertise, including both new product designs and production methods. This hypothesis of learning-by-exporting, advanced by Westphal [38], Pack and Page [34], Evenson and Westphal [17] and Nelson and Pack [33] among others, has been integrated into a theoretical model of the decision to export by Clerides, Lach and Tybout [14].

An increasing number of studies attempt to evaluate the relative importance of the self-selection and the learning mechanisms in explaining the positive correlation between productivity and exports. All these studies have in common to use large scale longitudinal micro data-sets and to apply advanced microeconometrics techniques to investigate the issue[2]. They use a large variety of methodologies to address the relationship between export and productivity, which range from panel data regressions to binary choice models of the decision to export. In addition, matching methods and difference in difference techniques have been applied in order to explore more accurately whether an exporting firm can reap additional improvements from exposure to foreign markets (see Girma, Greeneway and Kneller [18] for a presentation of these alternative methodologies).

Lopez [29], Greenaway and Kneller [20] and Wagner [37] are recent surveys attempting to list the country case studies which have been the subject of such micro-level investigation into the export-productivity relationship.[3] Overall, the papers collected in those surveys support quite unanimously the self-selection hypothesis although they confirm that the strength of selection forces may vary a lot depending on the country. In general, these studies agree on a three-year lag prior to entry as being the relevant time lag to estimate the pre-entry export *premium*. Other studies also report the differences for shorter time lags. The strongest effects have been found for the US, Colombia, Canada[4]. In the UK and Spain, future exporters are unambiguously found more productive than non-exporters before first exports begin (see Girma et al. [18] and Delgado et al. [15]). These results contrast with the much weaker evidence that has been produced, for instance, for Germany and Italy. In both countries, no significant LP and/or TFP advantage for future exporters is to be found[5]. Finally, two studies explicitly fail to validate the self-selection hypothesis. In Korea, Aw et al. [5] invoke the specific role government investment subsidies may have played in weakening the market selection forces. They argue that in the presence of such policies, the decision by South Korean producers to enter, continue or exit the export market may have been less closely connected to productive efficiency and more closely linked to whether they have access to the necessary finance, contacts, or insurance provided by the government. In Sweden, Greenaway, Gullstrand and Kneller [19] invoke the high participation rate of Swedish firms into export markets to explain the lack of self-selection mechanisms. They argue that with a high degree of international exposure, non-exporters already compete with firms engaged in export activity and through import penetration. As a consequence of this, there may be far smaller differences in firm characteristics than in economies where a smaller proportion of the population of firms export[6].

Turning to learning effects, the literature is far less homogeneous. Overall, learning-by-exporting has been more difficult to grasp, in the case of either industrialising or industrialised countries. Concerning the former, the first analysis by Clerides, Lack and Tybout [14] on Colombia, Mexico, and Morocco, investigates whether the productivity of exporters relative to never-exporters diverges after entry into export markets. The paper fails to find any evidence in favour of this diverging process. A similar conclusion is reached by Aw et al [5] for Taiwan and Korea and by van Biseibroeck [36] for Sub-saharian countries. Alvarez and Lopez [2] find inconclusive results while only Kraay (1999) find significant post-entry productivity gains for New Chinese Exporters. Considering industrialised countries, evidence against the learning-by-exporting assumption can be found in Bernard and Jensen [10], Bernard and Wagner [11], and Kimura and Kiyota [27]. Delgado et al. [15] find inconclusive results [7] while more supportive evidence of the learning hypothesis can be found for Italy, the UK and Canada (see, Castellani [12], Girma et al. [18], and Baldwin and Gu [7] respectively). For Italy and the UK,ex post productivity gains are nonetheless found to depend on firm export intensity and to be bounded in time.

Considering the still open questions on both the working of self-selection

mechanisms and the effectiveness of learning effects, it seems worthwhile to pursue the analysis of these effects in each country where comprehensive micro-datasets on export and productivity are available. In this respect, the present paper adds to the literature by presenting the first investigation on France. Strange as it may seem, France has not yet been included in the set of available evidence. As the fifth largest exporter of merchandises in the world, this country is clearly a non trivial case to investigate. The lack of empirical evidence for France can be explained by the fact that the (small) literature on the export behavior of French firms have been dedicated to Economic Geography related issues (see in particular Eaton, Kortum and Kramarz [16] and Koening [28]).[8] While these studies add useful new insights on the relationship between trade, agglomeration and firm structure, none of them has yet investigated the relationship between export and productivity dynamics in France specifically, as is done hereafter.

In this paper, we use micro data for French manufacturing firms to examine the relative importance of the selection and learning-by-exporting forces. We construct an index of total factor productivity for each firm following Aw et al [5, 4, 6] and examine how it varies across firms with different degree of exposure on export markets. Particular attention is devoted to productivity differences between the group of firm which never export and the group of firm which start exporting, i.e. new exporters. Tracing in time the relative performance of these two groups of firms allows us to address the relationship between export and productivity. We also propose to control for scale effects when evaluating the magnitude of productivity gains. Indeed, we want to discriminate between learning effects and other factors that could alternatively explain the presence of ex post productivity gains. Specifically, we ask how much of the improvements in time is due to scale effects rather than other effects including learning effects.

3 The export *premium* in France

In order to characterise the relative performance of exporting firms within French manufacturing, we use the firm data set collected by the French Ministry of Industry (SESSI). The French Census for Manufacturing (called EAE) is a unique census gathering information on the financial statements and balance sheets of all individual manufacturing firms of strictly more than 19 employees, starting from 1990 to 2002. This total of 23,000 firms represents 25% of all manufacturing firms in France, accounting for 75% of employment and 80% of value added in French manufacturing. Having information on nominal gross output, a series of inputs (such as investments, the number of employees and materials), and exports, we are in the position to study how exporting relates to productive efficiency in France.

[Table 1 about here.]

Table 1 displays the number of firms for all manufacturing and by sector at the 2-digit level, together with the participation rate, i.e. the % of exporting

firms, and export intensity. We compute export intensity at two levels: industry and firm. The export intensity of the industry is calculated by summing sales and exports for all manufacturing firms and then computing the ratio at the industry level. The export intensity at the firm level is produced by computing for every firm the ratio of export over sales and then computing the arithmetic average exclusively for exporting firms. The last column presents the size of of exporters relative to non exporting firms. We observe that in all manufacturing sectors, there is a substantial number of firms which devote a share of their production to foreign markets (73%). The participation rate is high in all aggregate sectors, suggesting that exporting and non exporting firms coexist in all types of productive activities[9]. Second, we note that the arithmetic mean of firm export intensity is half of that of sector export intensity for all manufacturing. Looking at the last column on size of exporters relative to non exporters, we conclude that export concentrate on fewer but very large firms, boosting exports at the sectors level.

This broad picture conceals significant sectoral differences in terms of inter-firm distribution of exports. For example in pharmaceuticals where almost all firms participate to international trade (92%), the average value of firm export intensity approaches sector export intensity. This implies that firms exports are reasonably similar share of their sales, i.e. exports relative to sales are evenly distributed across firms. Conversely in automobiles, firm export intensity is half of that of the sector, implying that exports are unevenly distributed across firms. These remarks suggest that the export behaviour of firms is highly heterogeneous across sectors and across firms, with the general pattern being that firms which exports are considerably larger than their non exporting counterparts. This pattern is very pronounced for sectors such as Automobile, Transportation Machinery, Electrical and electronic components and equipments.

[Table 2 about here.]

Broadly taken, these figures confirm that manufacturing firms in France participate substantially to international trade, since more than two thirds of them export a share of their production and that 40% of French manufacturing goods are exported. But how do these figures compare with other OECD countries? Table 2 compiles the participation rate and export intensity for other countries[10]. The general pattern reveals the following: France exports are significantly larger than the US in terms of participation rate and firm export intensity; French manufacturing firms participate more to export than their British and Spanish counterparts and less than Swedish firms; firm export behaviour is generally similar to that of Italian firms, both in participation and intensity; with the exception of the US, the mean value of export intensity at the firm level is lower for France than for other countries.

In order to compare countries more easily, we set arbitrarily the participation rate equivalent to another country and for a similar period, and look at the value of the export-to-sales ratio. For example in order to compare French and British firms, we set the participation rate arbitrarily to 66% (as in Great

Britain in 1995) and exclude firms located in the left tail of the distribution. We observe that the export intensity reaches 21.9% for French firms in 1995, which remains significantly lower than the actual export intensity of British firms (25%). A similar exercise for Spain (1991-1996) shows that the export-to-sales ratio of the top 41% French manufacturing firms correspond to an export intensity of 31.3%, which is significantly higher than the observed Spanish figure (25%). Now setting export intensity first and then looking at the participation rate, we observe that a 24% export-to-sales ratio as in Italy between 1994-1997 equates with a 62% participation rate, far from the 73% of Italian manufacturing firms. Lastly, in order to reach an export intensity of 36% as in Sweden, the participation rate of French firms in 1999 must drop down to 42%, which is less than half of that observed in Sweden. These results suggest that the high rate of participation of French manufacturing firms to exports triggers the distribution of the export-to-sales ratio to the left, which in turn lowers the average value of export intensity. However, there is a more pronounced pattern than export intensity is pervasively low in France: with the exception of Spain, French firms export less of their sales in general, as compared to other major players such as Great Britain, Italy and Sweden.

[Table 3 about here.]

In order to identify the source of the distribution of the export-to-sales ratio, Table 3 reports the mean export intensity by size classes. We find that small firms have an export-to-sales ratio which is less than half of that of larger firms (16.3% versus 34.4%). Export intensity of small firms in French manufacturing is similar to small firms in Italy (see Castellani, 2002) and lower than that of Spanish firms[11] (around 20%). Instead, large firms do not exhibit weaknesses in their export intensity as compared to both Italian and Spanish ones. Table 3 also reports the participation rates according to different export intensity thresholds, by size class. For example for all manufacturing firms, we observe that the participation rates over the 1990-2002 period drops from 71.5% to 47.1% if one only includes firms with an export-to-sales ratio higher than 5%, to 37.0% for firms with an export-to-sales ratio higher than 10%, down to 9.3% for firms with an export-to-sales ratio higher than 50%. Looking at size classes, we note that small and medium entreprises export (SMEs, 20 to 249 employees) have a significantly lower participation rate than larger firms across all export intensity threshold. For example, only 27% (20-49 employees) and 45% (50-249 employees) of SMEs have an export-to-sales ratio higher than 10%, which differs greatly from larger firms (65% and 75% for large and very large firms, respectively). These results suggest that the main reason for a lower average value of export intensity in France is found in SMEs, whereas both the participation of large firms to international trade and their export intensity is substantially high as compared to other studies ([10];[15]; [12]).

What appears clearly in the previous remarks is that exporting firms are larger than non exporting firms. One may further question the existence of a so-called *export premium*, defined as systematic differences in *some* characteristics

of firms, beyond and above a mere industry effect, a year specific effect and a cohort effect. To test this idea further, we look at a series of variables X_{it}, where subscripts i and t stand for firm i at time t, X is alternatively deflated gross output; mean nominal monthly salary per employee; labour productivity; firm size (in terms of number of employees) and capital intensity. We subtract from all X_{it} the industry fixed effect s_j, a year fixed specific effect d_t and cohort fixed effect v_c in order to obtain $X_{it}^{'} = X_{it} - s_j - d_t - v_c$, where all fixed effect are defined as differences of group means from overall sample mean. Table 4 presents the results for both all firms and each size class, together with the mean number of (non-) exporting firms per year. All reported values for firm characteristics are expressed relatively to non-exporting firms.[12]

[Table 4 about here.]

Looking first at the first column of Table 4 reporting the relative values for the whole sample, we observe an export *premium* for all five characteristics: relatively to non-exporting firms, firms which export are producing 2.5 times more, are twice as large, 40% more labour-productive, 24% more capital intensive, and pay their employees 10% more. This is in line with previous results (e.g. Bernard and Wagner [11], Castellani [12]), who found systematic differences in firm characteristics which reveal the presence of an export *premium*. Note that the systematic labour-productivity advantage for exporters is explained by their higher capital-intensity only partially, suggesting that a good deal of the productive efficiency of their workforce must be explained by factors other than *mere* capital intensity.

It is worth noting that the extent of the export *premium* diminishes systematically when controlling for firm-size classes, confirming that exporting firms are larger than non-exporting firms. Interestingly, differences in terms of wage per employee, number of employees and capital intensity disappear for very large firms, whereas gross output and labour productivity remain significantly higher for exporting firms. The persistent labour productivity advantage of exporters suggest that explanations of the export *premium* in terms of economies of scale (i.e. firm size) and capital intensity is not enough. How much of the export *premium* is due to intrinsic differences in productive efficiency across firms? How important is learning from the participation of firms to international trade? Next Section explores these issues by looking at the direction of the relationship between exports and total factor productivity (TFP) in French manufacturing.

4 The Sources of The Export Premium

The preceding Section has revealed the presence of several export *premia*, in terms of gross output, wage per employee, labour productivity, number of employees and capital intensity. With the exception of real output, we have also observed that these differences are sharper for small and medium firms than for larger firms, revealing that gains from international trade are inversely related to firm size. Yet, we remain uninformed on the mechanisms generating these

export *premia*. One way to go forward is to study the relationship between firm productive efficiency and firm export behaviour. By export behaviour we mean both the participation to international trade and the export-to-sales ratio, also called export intensity.

4.1 Measuring Total Factor Productivity

We measure firm productive efficiency using Total Factor Productivity (TFP). TFP should be more precise an indicator than *mere* labour productivity for it accounts for both capital intensity and capital productivity, two elements of firm heterogeneity which should affect labour productivity on its own. To do this, we follow Caves, Christensen and Diewert [13] and Good, Nadiri and Sickles [21], and compute the TFP index for firm i at time t as follows:

$$\begin{aligned} \ln TFP_{it} = \ln\ Y_{it} - \overline{\ln\ Y_t} + \sum_{\tau=2}^{t} \left(\overline{\ln\ Y_\tau} - \overline{\ln\ Y_{\tau-1}}\right) \\ - \left[\begin{array}{l} \sum_{n=1}^{N} \frac{1}{2}\left(S_{nit} + \overline{S_{nt}}\right)\left(\ln\ X_{nit} - \overline{\ln\ X_{nt}}\right) \\ + \sum_{\tau=2}^{t}\sum_{n=1}^{N} \frac{1}{2}\left(\overline{S_{n\tau}} + \overline{S_{n\tau-1}}\right)\left(\overline{\ln\ X_{n\tau}} - \overline{\ln\ X_{n\tau-1}}\right) \end{array} \right] \end{aligned} \quad (1)$$

where Y_{it} denotes real gross output produced by the firm i at time t using the set of n inputs X_{nit}, where input X is alternatively capital stocks (K), labour in terms of hours worked (L) and materials (M). S_{nit} is the cost share of input X_{nit} in the total cost. Symbols with upper bar correspond to measures for the reference point (the hypothetical firm), computed as the means of the corresponding firm level variables, over all firms in year t.[13] Subscripts τ and n are indices for time and inputs, respectively. This methodology is particularly well suited for comparisons within firm-level panel data sets across industries as it guarantees the transitivity of any comparison between two firm-year observations by expressing each firm's input and output as deviations from a single reference point for each year. Moreover, the index measures the proportional difference of TFP of any firm i with the reference firm. The latter is computed once for the whole sample, implying that productivity measures at the level of the firm also embody productivity differences across sectors. Lastly, TFP measures are not bounded, i.e. TFP$\in]-\infty;+\infty[$, and first differences of their logarithmic values can be interpreted as gaps in percentage points if they remain small.

Table 4 present the mean TFP values for four types of firms found in our dataset: those which always export (Always Exporters) over the whole time period, those which do no export initially but become exporters between 1990 and 2002 (New Exporters), those which from one year to another either enter into or exit from international markets (Switchers), those which concentrate exclusively on the domestic market (Never Exporters)[14]. The reported average values have been computed as follows. First, we computed the arithmetic mean

value of all never exporters (NE). Next, we computed relative TFP of firm i as the difference between the log value of firm i's TFP and the mean value of never exporters: $\ln TFP^r_{ijtc} = \ln TFP_{ijtc} - \overline{\ln TFP^{NE}_{jtc}}$, where subscripts j, t, and c denote industry, time and cohort, respectively. Finally, we computed the mean values $\overline{\ln TFP^r_{jtc}}$, to which Table 5 adds one and multiplies by a hundred for clarity.

[Table 5 about here.]

In the first column, we report the computed TFP mean values for all firms in the sample (export-to-sales ratio ≥ 0) according to the four categories defined above. By definition, the mean TFP value of Never Exporters is 100, which represents the benchmark. We observe that those firm which participate to international trade are on average more productive than Never Exporters. This very broad finding is consistent with the existence of the export *premium* for other firm characteristics as done in the previous section. Note that this productivity *premium* changes with the four categories of firms. Switchers are found to be less productive than New Exporters, which themselves are less productive than Always Exporters. Again, this is broadly consistent with the existence of a TFP *bonus* for exporters. It is noteworthy to mention that this *bonus* is increasing with the firm's commitment to international trade, as grasped by the export-to-sales ratio. In other words, the productivity *premium* relative to Never Exporters widens as the firm's share of sales dedicated to international markets expands. However, the TFP *premium* with respect to other exports (Switchers and New Exporters) fades away as all these firms increase their export-to-sales ratio. An simple (unreported) t-test reveals that the distinction between Always Exporters and *Prima*-Exporters is no longer relevant above an export intensity of 29%.

Altogether, these preliminary findings point to two different dimensions according to which TFP differences interact with the export behaviour of firms. The first dimension is qualitative: TFP differences across firms are positively related to the decision of the firm to enter export markets. The second dimension is quantitative: TFP differences across firms are related to the decision of the firm on how much of its production to sell on foreign markets. For both dimensions however, we remain uninformed regarding the mechanisms generating the TFP *bonus* in favor of exporting firms, whereas our aim is to evaluate the causality which generates the observed export *premium*. Are initially more productive firms those who can bear the sunk costs related to expanding the range of activities to foreign markets? Are initially more productive firms those who choose to dedicate a larger share of their production to foreign markets? Or do exporters benefit from international trade in various ways, i.e. learning from exporting, scale economies or others factors, which eventually translates into higher levels of TFP? If yes, are those benefits from international trade larger the higher is the export intensity of the firm?

4.2 Firm Performance *Before* Entry into Export

In a first step, we test the idea that firms which become exporters are more productive before they enter into foreign markets. Should this be the correct causality, future exporters should outperform non exporting firms in their productive efficiency *some* years before entry into foreign markets. To validate this proposition, we follow Bernard and Wagner [11] and Bernard and Jensen [10] and select only those firms which do not exports in $t-\tau$, $t-\tau-1$, $\cdots$, $t-2$ and $t-1$, but *may* export in t. Parameter τ takes alternatively values $\{3;5\}$, controlling for different time lags on the productivity *premium* for future exporters. The reason for expanding the time lag up to 5 years lies in the absence of TFP *premium* for future exporters as observed 3 years prior to exporting, as is commented later. Thus, we select New Exporters (which do not export for at least τ years) and Never Exporters. We then regress the (log) value of TFP at time $t-\tau$ on the export status at time t:

$$\begin{aligned} \ln TFP_{i,t-\tau} = \alpha + \beta \times E_{it} + \sum_j \delta_{1j} \times S_j + \\ \sum_t \delta_{2t} \times D_{t-\tau} + \sum_c \delta_{3c} \times C_c + \varepsilon_{i,t-\tau} \end{aligned} \tag{2}$$

where E_{it} is a dummy variable set to unity if firm i starts exporting at time t (i.e. New Exporters), and S_j, $D_{t-\tau}$ and C_c are vector of dummy variables controlling for sector, time and cohort specific effects, respectively[15]. Moreover, as TFP is the joint product of real output as a function of capital stocks, labour and materials, we also present results when using the log values of Y (real output), K (real output), L (labour) and M (materials) as dependent variables, together with labour productivity as an additional dependent variable for robustness checks

The idea that New Exporters self-select should translate into a significant and positive sign of β in Eq.(2). Such a finding on French data would exactly replicate the test of the self-selection hypothesis previously provided by Bernard and Jensen [10] on US data and Bernard and Wagner (1997) on German data. Non significance would imply no self-selection, rejecting the view that only efficient firms can bear the sunk costs associated with foreign market penetration. This finding would be compatible with the idea that in some countries trade policy may interact with market selection forces in a sense that it allows the less efficient firms, besides the more productive ones, to enter foreign markets (see Aw et al [5] for an argument on this line about South Korea). Negative significance would be harder to interpret, as it would entail adverse selection. One would then have to explain why less efficient firms have more incentives than more efficient ones to enter foreign markets. As far as we know, no paper has yet documented such adverse selection effects, even works based on micro-datasets from the less developed countries which are likely to be subject to strong market distortions(see for instance van Biesebroeck [36] on Sub-saharian countries).

Besides differences in levels (i.e. in the log value of variables), we also find interest in examining the run-up phase to exporting in terms of whether and how firms prepare for international markets. Thus, we consider the growth performance of firms by regressing the TFP growth rates of New Exporters and Never Exporters on the same vector of explanatory and control variables as follows:

$$\begin{aligned}\Delta \ln TFP_{i,\frac{t}{t-\tau}} &= \frac{1}{\tau} \times (\ln TFP_{i,t} - \ln TFP_{i,t-\tau}) \\ &= \alpha + \beta \times E_{it} + \sum_j \delta_{1j} \times S_j \\ &+ \sum_t \delta_{2t} \times D_t + \sum_c \delta_{3c} \times C_c + \varepsilon_{i,\frac{t}{t-\tau}}\end{aligned} \tag{3}$$

where E_{it}, S_j, $D_{t-\tau}$ and C_c are defined as before and Parameter τ takes the alternatively values $\{3; 5\}$. Eq.3 tests whether the mean annual growth rate between $t-\tau$ and t is significantly different for New Exporters, as opposed to Never Exporters. In this case, a significant and positive sign of β implies that *Prima* Exporters have enjoyed higher TFP growth rates in percentage points, as compared with Never Exporters. Again, a null or negative β would be inconsistent with the previously detected export *premium*.

In order to grasp more accurately the timing of the run-up phase, we also introduce the TFP growth rate between time $t-3$ and time $t-1$, that is, one year before foreign market penetration:

$$\begin{aligned}\Delta \ln TFP_{i,\frac{t-1}{t-3}} &= \frac{1}{2} \times (\ln TFP_{i,t-1} - \ln TFP_{i,t-3}) \\ &= \alpha + \beta \times E_{it} + \sum_j \delta_{1j} \times S_j \\ &+ \sum_t \delta_{2t} \times D_t + \sum_c \delta_{3c} \times C_c + \varepsilon_{i,\frac{t-1}{t-3}}\end{aligned} \tag{4}$$

The comparison of Eq.4 with Eq.3 is useful to detect whether an observed change in TFP growth rate is contemporaneous to the entry into the export market (Eq.3) or whether it is due to a *mere* phase of preparation (Eq.4), i.e. prior to foreign market penetration. Again, we introduce the growth rates of Y, K, L and M as dependent variables, both between $t-3$ and t, and $t-3$ and $t-1$, in order to grasp the source of variation in the TFP growth rate between New Exporters and Never Exporters.

[Table 6 about here.]

Table 6 reports estimates for β for Eq.2, Eq.3 and Eq.4. Two main results appear. Looking first at the results for Eq.2, we find that three years before entry ($\tau = 3$), future exporters face a significant and negative TFP disadvantage,

for they appear to be 2% less productive than Never Exporters (the sign of β in $t-3$ is negative). This result contrasts strongly with the earlier literature. Recall that Bernard and Jensen (1999) observe that future US exporters are 6% more productive (in terms of TFP) than Never Exporters, three years before exporting. We then test Eq.2 for $\tau = 5$ and β in $t-5$ is significantly positive. In other words, future exporters displays a productivity advantage of more than 3% over Never Exporters five years before they enter foreign markets. Thus, exporting firms in France experiment a sharp decrease in their TFP *some* years prior to exporting, corresponding to the incurring of the fixed costs associated with entry into export markets.

This interpretation provides further support to two additional results of table 6. First, the TFP disadvantage of New Exporters in $t-3$ is principally due to the fact that New Exporters display capital stocks more than 20% larger than Never Exporters. In turn in terms of labour productivity, New Exporters keep a small but significant advantage over Never Exporters for the whole time span. This finding could then validate the idea that New Exporters have to pay some fixed costs in terms of building specific capital stocks before exporting. These specific investments are intrinsically time-consuming and may help in explaining the lag in the productivity-export relationship.

Now looking at growth rate in the three last Columns of table 6 (Eq.3 and Eq.4), we find that future exporters enjoy faster mean annual TFP growth rates by 0.8 percentage points and labour productivity by 3.6 percentage points between $t-3$ and t. These positive trends are mainly due to a significant increase in real gross output (+4.1%), compensating the observed growth of materials (+7.0%). Looking at the third Columns of table displaying estimates during the run-up phase between $t-3$ and $t-1$, we find that with the exception of labour, none of the firm's characteristics experience significantly different growth rates as compared to Never Exporters. This means that the observed changes in the growth rates of real output and materials concentrate on the year of first exports. In other words, firms starting to export experience salient productivity improvements *contemporaneous* to the year of first export. This suggests that exporting firms may potentially enjoy TFP growth rates larger than Never Exporters *after* their entry into foreign markets. This issue is investigated in the next section.

4.3 Firm Performance *After* Entry into Export

In the case of examining firm performance after entry into export markets, we should expect New Exporters to outperform Never Exporters. Recall first that we have found a TFP *bonus* for exporting firms and second that this *bonus* vanishes for New Exporters during the run-up phase preceding the entry into export markets. One would then expect to observe at least a recovery of the productivity advantage of exporters in the years after their entry into the export markets. To evaluate precisely the magnitude of ex-post productivity gains, we first examine the TFP performance of exporters relative to non exporters n years after entry into export markets at time t. With n set arbitrarily to 5

years, we have:

$$\ln TFP_{i,t+5} = \alpha + \beta_1 \times E_{it} + \beta_2 \times EI_{it} + \sum_j \delta_{1j} \times S_j + \sum_t \delta_{2t} \times D_{t-3} + \sum_c \delta_{3c} \times C_c + \varepsilon_{i,t+5} \tag{5}$$

where again E_{it} is a dummy variable set to unity if firm i starts exporting at time t (i.e. New Exporters), and S_j, D_{t-3} and C_c are vector of dummy variables controlling for sector, time and cohort specific effects, respectively. As done in Castellani [12] and Girma et al. [18], we augment the baseline specification using export intensity as an additional explanatory variable. The reason behind it is simply to test whether beyond the decision to export lies another driving force of productive efficiency related to the share of production dedicated to export markets.

In fact, the justification for a positive association between TFP and export intensity is twofold. First, a high share of sales dedicated to foreign markets could be achieved at constant *domestic* sales. A rise in sales could entail economies of scale, translating into a positive growth rate for TFP. Second, a high share of sales dedicated to foreign markets could be achieved at constant *overall* sales. In this latter case, a positive TFP growth rate would be interpreted as the result of learning-by-exporting. This implies that the structures of market destinations in terms of domestic and foreign markets may play an important role. In order to control for changes in the structure of market destinations, we first regress the mean annual TFP growth rates between t and $t+3$ as follows:

$$\begin{aligned} \Delta \ln TFP_{i,\frac{t+3}{t}} &= \frac{1}{3} \times (\ln TFP_{i,t+3} - \ln TFP_{i,t}) \\ &= \alpha + \beta_1 \times E_{it} + \beta_2 \times EI_{it} + \gamma \times \Delta \ln Y_{i,\frac{t+3}{t}} \\ &+ \sum_j \delta_{1j} \times S_j + \sum_t \delta_{2t} \times D_t + \sum_c \delta_{3c} \times C_c + \varepsilon_{i,\frac{t+3}{t}} \end{aligned} \tag{6}$$

where E_{it}, S_j, D_{t-3} and C_c are defined as before. Eq.6 tests whether the mean annual growth rate between t and $t+3$ is significantly different for New Exporters, as opposed to Never Exporters. In this case, a significant and positive sign of β_1 implies that *Prima* Exporters have enjoyed higher TFP growth rates in percentage points, as compared with Never Exporters. Moreover, we augment the model in two ways. First, we follow Castellani [12] and Girma et al. [18] by including export intensity (EI). By doing this, we wish to test whether the source of TFP growth is due to the mere participation to international trade or is increasing with, or proportional to, the export-to-sales ratio. Previous results suggest that β_2 be significantly positive. Second, we include the growth rate of real output in order to control for TFP gains due to economies of scale.

In this context, the estimated parameter γ should be significant and positive, indicating that an increase in real output is associated with higher productive efficiency. It should be stressed that the inclusion of the growth of real output allows us to separate explicitly TFP gains due to static efficiency (economies of scale) and TFP gains due to dynamic efficiency (learning-by-exporting).

In order to investigate more accurately the timing of the *post* entry period, we introduce the TFP growth rate between time $t+3$ and time $t+5$ as the dependent variable:

$$\begin{aligned}\Delta \ln TFP_{i,\frac{t+5}{t+3}} &= \frac{1}{2} \times (\ln TFP_{i,t+5} - \ln TFP_{i,t+3}) \\ &= \alpha + \beta_1 \times E_{it} + \beta_2 \times EI_{it} + \gamma \times \Delta \ln Y_{i,\frac{t+5}{t+3}} \\ &+ \sum_j \delta_{1j} \times S_j + \sum_t \delta_{2t} \times D_t + \sum_c \delta_{3c} \times C_c + \varepsilon_{i,\frac{t+5}{t+3}}\end{aligned} \tag{7}$$

Eq. (7) allows us to examine whether the effect of penetrating foreign markets has a long term influence on the TFP growth rate, if any, or whether this effect is all the more transient. For the former effect, we should observe either β_1 or β_2 to be positive and significant, if not both. For the latter case, we should witness non significance for both.

[Table 7 about here.]

Table 7 displays the results for Eqs.(5) to (7). The first two columns presents the results where TFP is introduced in levels. We observe a significant and positive effect for the export-to-sales ratio (β_2), whereas the export dummy (β_1) is at the borderline of significance. At 10% level, New Exporters are 2% more productive that Never Exporters three years after their first exports. Moreover, firms which devote a larger share of their sales to exports are more productive. A 10 percentage-point rise in their export-to-sales ratio equates with almost a 1% increase in the TFP differential relative to Never Exporters (0.83%)[16]. Likewise, a 10-percentage-point increase in their export-to-sales ratio equates with more than a 2% increase in labour productivity relative to Never Exporters (2.38%). It is interesting to note that productive efficiency is sensitive to export intensity, not to whether the firm participates to interactional trade. However, these results conceal sharper differences between both types of firms in all their characteristics. Three years after first exports, New Exporters produce almost 50% more than Never Exporters (43.5%) and are 13% larger in labour force (in hours worked, 13.1%), and 50% larger in their capital stocks. The magnitude of these differences suggests that firms becoming exporters experience spectacular changes in their size of operations after entry into export markets.

We investigate further the timing of these changes in the last 6 columns of Table 7. Looking first at changes between t and $t+3$ reveals interesting insights. Although the value of β_1 is at the borderline of significance (insignificant at 5% but significant at 10% level), the sign of the parameter estimate is negative.

This implies that the decision to enter into export markets bear negatively on future productivity improvements relative to Never Exporters, suggesting the presence of *post* entry sunk costs. However, the coefficient for β_2 is positive and significant, implying that a 10 percentage-point increase in exports intensity entails an increase of 0.17 percentage points in the TFP growth rate, relative to Never Exporters. Note that in order for β_1 and β_2 to cancel out, the value of the export-to-sales ratio must reach 0.28, which equates with its 89^{th} percentile of our sample.

Table 7 reveals that the main cause for TFP growth rates is due to scale economies. The γ coefficient shows that holding *foreign* sales constant, a 1 percent growth rate in real output is associated with a 0.2 percentage-point increase in the TFP growth rate, relative to Never Exporters. By comparison, a 1 percentage-point increase in exports intensity entails an increase of 0.017 percentage points of TFP growth rate, holding *overall* sales constant. Thus there is more than a one-to-ten ratio in the benefits due to learning-by-exporting as compared with the benefits from scale economies. More fundamentally, the limited effect of learning-by-exporting is consistent with our view that exporting firms, first, encounter a decrease in their relative performance during the run-up period, and then, in a second step, benefit from the specific investments they made in order to enlarge their scale of production and serve new distant markets.

4.4 A *U-shaped* Productivity pattern for New Exporters

The findings in Sections 4.2 and 4.3 above lead us to emphasis the specific TFP dynamics a typical French manufacturing firm experiences when it decides to expand its activities towards foreign markets. The typical Productivity path of a New Exporter is U-shaped. In a first run-up phase, the firm incur specific fixed costs which mainly consist in capital deepening preparing the company to foreign markets (for instance updating plants or building new ones in order to adapt the production to the specificities of foreign markets); during this phase, its relative TFP decreases sharply while its labor productivity remains relatively high. In a second phase, its relative TFP increases as the firm recovers the benefits of its prior investments. This recovery is not instantaneous however. TFP increases occur not only the very first year of entry into the export markets (i.e. the contemporaneous effect) but also during the first three years after entry. Further TFP gains look more uncertain three years after entry into export markets.

Such a U-shaped dynamics is illustrated on figure 2 below, which plots the TFP dynamics of New Exporters and Never Exporters over a period of 10 years, including 5 years before the entry into the export markets and 5 years after. The construction of the graph is based on the mean TFP values of New Exporters and Never Exporters after subtracting from all TFP_{it} the industry fixed effect s_j, a year fixed specific effect d_t and cohort fixed effect v_c in order to obtain $X'_{it} = X_{it} - s_j - d_t - v_c$, where all fixed effect are defined as differences of group means from overall sample mean. Remarkable in figure 2 is the sharpness of the decrease in Relative TFP in the run-up phase.

[Figure 1 about here.]

We complete the picture by plotting the dynamics of labour productivity over the same time span and for the same set of companies. Figure **??** display a similar U-shaped path but with a flatter pattern. The difference between figures 2 and **??** helps us elucidate the nature of fixed costs associated with the entry into export markets. The more pronounced patterns of TFP implies that fixed costs are primarily related to capital deepening. Nonetheless, part of them consist of increasing labour, e.g. hiring people to run the new capital facilities specifically dedicated to foreign markets, taking the required contact on foreign markets, etc. Overall, the U-shaped productivity dynamics is robust to the choice of the productivity measure. One must then question whether such U-shaped Productivity dynamics would emerge for other countries. Exploratory explanations are provided below.

[Figure 2 about here.]

First, one may conjecture that the U-Shaped productivity dynamics is is the outcome of using firm-level data as opposed to plant-level data. Imagine a non-exporting company comprising several establishments decides to export a share of its production to foreign markets. As has been documented here, the firm will cope with as series of fixed costs which enter the balance sheets at the consolidated level via an above-normal increase in investments. The resulting increase in capital stock K should however not lead to a corresponding increase in real output Y, temporarily depress the firm's productive efficiency. Imagine further that these sunk costs cover a series of investments which may consist of building additional productive capacities (i.e. a new plant), consolidating the distribution networks (i.e. set up an international office overseas), affecting the balance sheet of the parent company but not that of those plants within the firm. Most, if not all, productive plants constituting the firm will have their balance sheets unaffected by such sunk costs. Should this depict correctly the nature of sunk costs related to exports, the use of firm-level data is likely to detect sunk costs more easily than when using plant level data. An interesting avenue for future research would be to investigate the relationship between the relative performances of plants and firms within a unique dataset. Unfortunately, French micro-level data do not allow to carry out such type of investigation as the required inputs and output information at not available at the plant-level.

A second explanation stipulates that the U-Shaped productivity dynamics is the rule - i.e. is persistent across databases - but cannot be depicted if ones focuses exclusively on a unique point estimate, typically three years before entry into export markets. The TFP dynamics can only be grasped by pushing the point estimates both further back in time and nearer the time of entry. In the absence of comparable studies, we can only conjectures that previous results would equally depict a U-Shaped path, where the gap between New Exporters and Never Exporters narrows prior to entry. Further studies must not ask how wide the gap between exporters and non exporters is, but in what direction and how fast this gap changes before entry. To detect the presence of sunk costs is

not a matter of relative productive efficiency at any point in time, but a matter of time lag between specific export investments and returns from exports.

A third explanation for the presence of lower TFP values for future exporters is the high rate of participation of French firms to international trade. If one accepts the proposition that a larger participation rate equates with less efficient firms entering into export markets, the end result would be to lower all annual mean points down to values where on average Never Exporters outperform New Exporters prior to entry. This view does not preclude other countries from having a similar productivity dynamics, whereas it is compatible with the presence of a TFP bonus three years before entry. In other words, the pattern observed in figure 2 would be similar to other countries, the difference being that in France, the sunk costs endured by future exporters inverse the usual ranking between New Exporters and Never Exporters in t-3.

Overall, the U-shaped TFP dynamics which has been depicted on French data is not at odds with the self selection hypothesis, for only "good" firms can cope with an increase fixed costs. Nonetheless, it suggests that a good deal of the fixed costs to enter export markets have to be paid before entry actually occurs. Those costs weight negatively, although temporarily, on the relative performance of exporting firms. Finally, the U-shaped Productivity pattern documented for French exporting firms bears important policy implications. Indeed, Tybout [35] and others have warned against using export promotion tools as those policies could have the bad side-effect of aiding in the preservation of "low quality" firms. Our findings open a new case in favor of export promotions tools which can help efficient firms to overcome temporary difficulties due to the time lags between fixed export costs and the returns from exports.

5 Conclusion

The Trade and Productivity relationship traditionally investigated within macroeconomic frameworks has been recently renewed by micro-econometric studies. This renewal has been based on the increasing availability of large scale firm-level datasets. This paper contributes to this new strand of empirical analysis in bringing new evidence about the French economy. It has investigated the relationship between export and productivity on a panel of *circa* 20,000 French manufacturing firms over the period 1990-2002. It has been found that a strong export *premium* exists in France which echoes those recently found for other OECD countries. Exporting firms have been found to be larger, more capital intensive and more productive than non-exporting firms. However, New Exporters in France display *higher* labour productivity but significantly *lower* total factor productivity than Never Exporters three years before entry into export markets. Still, we find a significant TFP advantage of exporting firms if we expand the lag further back in time. Most changes on employment, capital, materials and productivity growth appear to be contemporaneous to the entry up to three years after entry. We also document the existence of further productivity improvements shortly after entry which are principally due to a scale

effect.

We tentatively conclude that the typical productivity path of a French firm which decides to enter the export market is U-shaped. It is a path along which firms first have to pay fixed costs in order to export, to only then harvest the benefits due to the expansion in their sales in foreign markets. Consistently with this interpretation, we further conclude that French data could be supportive of the recent theoretical advances in international trade theory which emphasise market selection as the main factor that leads to higher productivity of exporters with respect to non-exporters. Nonetheless, French data point to the need to refine models of the decision to export with technological, policy and/or institutional factors that could explain a more or less pronounced decrease in productivity for New Exporters. Further empirical works could also be devoted to micro-level datasets which feature long enough time-series in order to test if a U-shaped Productivity path exists for other countries. Those cross-countries comparisons could be of specific use to policy makers who have to design appropriate tools to assist efficiently exporting firms.

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Notes

[1]See in particular Melitz [31], Helpman, Melitz and Yeaple (2004) [24], Yeaple [39], Melitz and Ottaviano [32], BEJK [8], Jean [26], Medin [30].

[2]Nevertheless, these studies differ in a variety of ways: nature of the dataset -sample versus census-; unit of analysis -plant versus firm-; nature of the temporal series -continuous years versus non-continuous years-; time span of the series; productivity measurement- labor productivity versus Total Factor Productivity, parametric approach versus non parametric approach, etc. No attempt has yet been made to evaluate the impact of such differences.

[3]To collect those country-case studies is worthwhile because the actual importance of self-selection mechanisms and learning-by-exporting effects are likely to vary across countries. Two main sources of cross-countries differences are the following: First, countries may differ in their trade and competition policies [35] and this is likely to alter the strength of market selection forces; Second, countries may differ in their relative distance to the technological frontier [1], and this is likely to alter the possibilities for learning.

[4]For US plant data, Bernard and Jensen [10] report a TFP advantage in favor of New Exporters of 6-8% points in average 3 years before first exports markets; Using Colombian plant data, Isgut [25] reports a LP advantage of 20-24% in favor of New Exporters also 3 years before entry; On Canadian plant-level data, Baldwin and Gu [7] report a LP advantage of 15% and a TFP advantage of 7% for future exporters.

[5]In Germany, Bernard and Wagner [11] find a non significant LP difference of 1-2% points three years before first exports. Arnold and Hussinger [3] find significant, although small, differences two years before first exports, but not three years before.

[6]Note that in both countries, further attempts to validate the self-selection hypothesis produce only weak evidence in favour of it: on Korea, Hahn [22] finds a significant positive difference in terms of LP but not in terms of TFP; In Sweden, Hansson and Nan Ludin [23] reports small and significant differences in terms of TFP in $t-2$ and $t-1$ but not in year $t-3$.

[7]Delgado et al. [15] document significant learning effects for only a subsample of young firms.

[8]Doing so, these paper use a valuable specificity of French firm-level data which include information on the destination of exports.

[9]We computed the participation rate for manufacturing sectors at the 4 digit level, yielding more than 286 subsectors. We observed that no subsector is fully

devoted to the national market exclusively, while only a few (less than 5) are characterized by all the firms being exporters. We found that the participation rate is higher than 50% for most subsectors (266).

[10]Figures for plant-level datasets should be interpreted with care, since an exporting firm may have several non exporting plants. Therefore, plant-level datasets introduce a downwards bias in the participation rate.

[11]We thank Jose Carlos Farinas for having provided us with unpublished participation rates of Spanish firms by firm classes.

[12]Relative values for the export *premium* are computed as the ratio of the mean value of exporting firms ($\overline{X'_E}$) over non-exporting firms ($\overline{X'_{NE}}$), multiplied by a 100.

[13]Eq.(1) implies that references points $\overline{\ln Y}$ and $\overline{\ln X}$ are the geometric means of the firm's output quantities and input quantities respectively, whereas the cost shares of inputs of the representative firms $\overline{S}$ is computed as the arithmetic mean of the cost share of all firms in the dataset.

[14]In this case, Never Exporters are different from non-exporting firms as defined previously, in that Never Exporters apply over the whole time span, whereas a non-exporting firm at any given year could well export some other year in the time period.

[15]One could object that the natural departing point is to explain the causality underlying the firm's *decision* to export by firms. This method was followed by Bernard and Jensen [10], Castellani [12] and Alvarez [2] by means of a binary response model, explaining the firm's decision to export as a function of firm characteristics. In our case however, we are interested in whether future exporters are more productive than Never Exporters some years before entry into export markets. Eq.(2) has the advantage of providing a readily available proxy for the productivity gap between New Exporters and Never Exporters in percentage points, controlling for other unobserved specific effects. As emphasised by Bernard and Jensen [10], this estimate is not depicting a causal relationship.

[16]Note that the variable Export Intensity, or export-to-sales ratio, is bounded between 0 and 1.

Table 1: Descriptive Statistics of the Sample (Year 2002)

	Nb. firms	Part. rate[a]	Firm EI[b] (%)	Sector EI[c] (%)	Relative Size[d] (%)
All Manufacturing	20,726	72.8	23.1	41.2	287
Clothing	1,212	69.9	24.8	33.3	186
Printing and publishing	1,667	62.6	8.2	7.1	143
Pharmaceuticals	513	92.0	30.4	33.1	245
House equipment and furnishings	1,303	82.7	24.2	30.7	303
Automobile	559	76.4	24.4	50.6	812
Transportation machinery	307	77.2	34.5	57.7	678
Machinery and mechanical equipment	3,764	70.4	23.6	36.8	264
Electrical and Electronic equipment	1,131	74.6	30.3	48.1	374
Mineral industries	1,189	51.8	21.9	21.0	334
Textile	1,129	80.6	29.4	35.7	176
Wood and paper	1,276	68.6	19.0	28.9	252
Chemicals	2,177	83.8	25.4	37.9	221
Metallurgy. Iron and Steel	3,602	71.7	19.4	32.3	270
Electric and Electronic components	897	78.1	27.3	49.1	448

[a]Part. rate: Participation Rate
[b]Firm EI: Arithmetic Mean of Export Intensity of firms
[c]Sector EI: Export Intensity of sector
[d]Relative size: size of exporters relative to non exporters

Table 2: Participation rates and mean export intensity in OECD countries

Country	Part. rate	Export Intensity	Sources
France	72%	21%	Our dataset Firm-level data (1990-2002) average figures
Germany	44%	40%	Bernard et Wagner (1997) Plant-level data (1978-1992) 1992 figures
Great Britain	66%	25%	Greeneway and Kneller (2005) Firm-level data (1991-1997) 1995 figures
Italy	73%	24%	Castellani (2002) Firm-level data (1994-1997) average figures
Spain	41%	25%	Delgado, Farinas et Ruano (2002) Firm-level data (1991-1996) average figures
Sweden	89%	36%	Hansson and Nan Ludin (2004) Firm-level data (1999 data)
United States	21%	12%	Bernard and Jensen (2004) Plant-level data (1987-1992) 1992 figures

Table 3: Firm Export Behavior, by Size Classes

Size class	Nb. of Obs.(%)	Export Intensity	Part. Rate, According to Export Intensity Threshold					
			$> 0\%$	$\geq 5\%$	$\geq 10\%$	$\geq 15\%$	$\geq 35\%$	$\geq 50\%$
All	100.0	20.5	71.5	47.1	37.0	30.3	15.6	9.3
20-49	57.0	16.3	62.8	36.2	26.8	21.1	9.9	5.8
50-249	34.1	22.3	80.4	56.7	45.5	37.6	19.4	11.8
250-499	4.9	30.1	91.5	76.0	65.5	56.8	33.1	20.2
≥ 500	3.9	34.4	95.6	84.2	75.8	68.1	43.5	26.3

Table 4: The Export Premium, by Size Classes

	All firms	Number of employees			
		20-49	50-249	250-499	≥500
Mean Number of Non Exp. Firms	6,215	4,622	1,462	92	38
Mean Number of Exp. Firms	15,614	7,810	5,986	984	834
Gross Output	257.2	143.8	153.0	134.8	182.4
Wage per employee	110.3	110.1	111.0	105.5	*101.9*
Number of Employees	198.3	103.7	115.1	102.4	*101.8*
Labour Productivity	140.4	138.9	134.2	131.7	127.3
Capital Intensity	124.4	115.3	120.5	115.4	*101.2*

100 = Non exporting firms.
All differences significant at 1% level, except values reported in *italics*.
All values are net from industry, year and cohort specific effects.

Table 5: The TFP *bonus*, by Export Intensity Threshold

	Export intensity					
	$\geq 0\%$	$\geq 5\%$	$\geq 10\%$	$\geq 20\%$	$\geq 30\%$	$\geq 40\%$
Always Exporters	105.0	105.2	105.4	105.7	106.1	106.5
New Exporters	101.6	103.5	104.2	104.8	105.4	105.4
Switchers	101.1	102.3	102.5	103.1	103.7	104.3
Never Exporters	100.0	-	-	-	-	-

Table 6: *Ex Ante* Performance of Exporters

	Eq.(2) $t-3$	Eq.(2) $t-5$	Eq.(3) $\frac{t}{t-3}$	Eq.(3) $\frac{t}{t-5}$	Eq.(4) $\frac{t-1}{t-3}$
TFP	-0.02	0.033	0.008	*-0.005*	*-0.003*
	[3.36]	[2.61]	[4.39]	*[1.79]*	*[1.23]*
Labour Productivity	0.038	0.127	0.036	0.011	*0.005*
	[2.12]	[3.32]	[9.82]	[2.16]	*[1.18]*
Real Output	*0.014*	*0.096*	0.047	0.031	*0.005*
	[0.50]	*[1.54]*	[10.60]	[4.67]	*[1.01]*
Labour (Hours worked)	*-0.023*	*-0.030*	0.012	0.020	*0.000*
	[1.09]	*[0.64]*	[3.73]	[4.07]	*[0.03]*
Capital Stocks	0.182	*0.180*	0.019	0.030	*0.009*
	[4.00]	*[1.82]*	[3.38]	[3.19]	*[1.31]*
Materials	0.131	0.175	0.074	0.060	0.016
	[3.37]	[2.11]	[11.44]	[6.09]	[2.00]

$N = 8,498$ for $\tau = 3$. $N = 2,173$ for $\tau = 5$.
Student t in brackets.
All parameters significant at 5% level, except those in *italics*.

Table 7: *Ex Post* Performance of Exporters

	Eq.(5) $t+5$		Eq.(6) $\frac{t+3}{t}$			Eq.(7) $\frac{t+5}{t+3}$		
	β_1	β_2	β_1	β_2	γ	β_1	β_2	γ
TFP	*0.020*	0.083	*-0.004*	0.017	0.196	*-0.004*	*0.007*	0.219
	[1.76]	[2.61]	*[1.67]*	[2.19]	[26.94]	*[1.15]*	*[0.65]*	[24.30]
Labour Productivity	0.304	0.238	0.013	*-0.005*		*-0.009*	*0.034*	
	[7.75]	[2.12]	[1.97]	*[0.24]*		*[1.13]*	*[1.53]*	
Real Output	0.435	*0.364*	0.031	*0.007*		*-0.002*	*0.028*	
	[6.30]	*[1.84]*	[3.68]	*[0.29]*		*[0.21]*	*[1.08]*	
Labour (Hours worked)	0.131	*0.126*	0.018	*0.012*		*0.007*	*-0.007*	
	[2.56]	*[0.86]*	[2.97]	*[0.70]*		*[1.00]*	*[0.33]*	
Capital Stocks	0.502	*0.359*	0.028	*0.002*		*0.017*	*-0.004*	
	[5.69]	*[1.42]*	[2.95]	*[0.06]*		[2.06]	*[0.16]*	
Materials	0.722	*0.270*	0.029	*-0.013*		*-0.001*	*0.035*	
	[8.45]	*[1.10]*	[2.71]	*[0.41]*		*[0.12]*	*[1.02]*	

N = 1,944
Student t in brackets.
All parameters significant at 5% level, except those in *italics*.

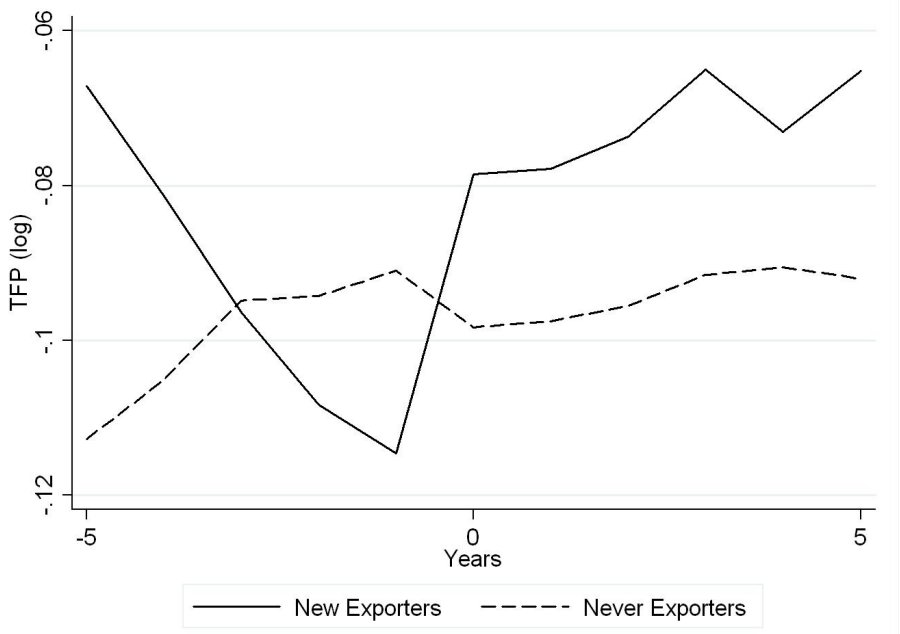

Figure 1: TFP Dynamics of New Exporters and Never Exporters

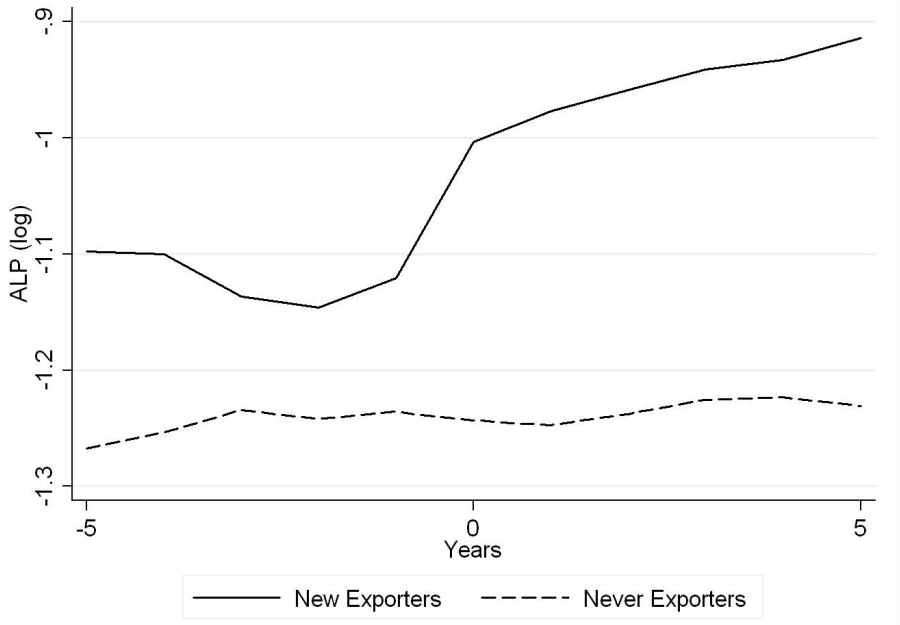

Figure 2: LP Dynamics of New Exporters and Never Exporters