Exporter dynamics and productivity growth

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Abstract

Using a large firm-level database containing information on export flows of French firms, by destination, over the period 1995-2005, we study the impact of exporter dynamics on their future productivity growth. Our empirical strategy allows to control for reverse causality problems that arise when considering the export-productivity relationship. We first find that neither entry on the export market, nor the capacity of firms to remain exporters have a significant impact on productivity growth. Second, we show that the dynamics of the exporting activity, i.e. post-entry export growth, has a positive impact on future productivity growth. Third, this positive impact of exporting is only observed in more dependent sectors upon external finance. We therefore provide suggestive evidence that a positive export dynamics affects productivity growth because it acts both as (i) a means to innovate, by relaxing liquidity constraints; (ii) an incentive to innovate, by increasing the return to innovation. Finally, by showing that only a few successful, dynamic exporters may enjoy important productivity gains through entry into the export market, our results explain why past empirical studies generally failed to find a significant effect of export participation on firms' productivity.

1 Introduction

Why do exporters perform better than domestic firms? Does entry into export markets positively affect productivity growth? These questions have recently been at the center of lively debates among economists, as many empirical studies document that, across a wide range of countries and industries, exporters are larger and more productive than firms only serving their domestic market.

Two potential channels have been proposed to explain this strong empirical regularity. The first is the presence of a self-selection effect: because of the existence of (fixed) trade costs, firms that perform better ex-ante have a stronger propensity to export than other firms.[1] The second possibility is that the productivity premium is a consequence of the export status. Some reasons have been evoked early to explain this possible causality. Exporters may benefit from knowledge spillovers from foreign buyers and competitors, or be exposed to a stronger competition in international markets than their domestic counterparts. Exporting activity may also allow firms to increase in scale and to use their potential excess capacity. The literature often refers to these possibilities as the presence of "learning-by-exporting". The empirical literature has extensively tried to assess the direction of the causality between exporting and within-firm changes in productivity. Empirical evidence largely suggests that a self-selection is at work: the most productive firms decide ex-ante to export. On the contrary, empirical evidence of ex-post learning-by-exporting effects is rather weak (see Wagner, 2007 for a survey).

While the authors testing the existence of learning-by-exporting have mainly concentrated on how export market participation may increase the level of productivity in the short-run, we will argue that export-related productivity gains may be more of a long-run nature, and related to the *dynamics* of the exporting activities. Recent research has shown that exporting activities and innovation (or investment in new technologies) may be complementary. The basic mechanism behind this complementarity is intuitive: when a firm starts to export, its investments in technology raise its profits both on the domestic and the foreign markets. As a consequence, the return to such investments increases with entry into the export market.

Lileeva and Trefler (2007) show for instance that some firms induced to export from Canada to the US because of tariffs cut then start to innovate. Aw *et al.* (2007) also find that R&D and investing are simultaneous decisions.[2] In addition, Greenaway *et al* (2008) show that firms starting to export enjoy an ex-post better financial health. If the export activity relaxes the financial constraints firms are facing, it should ease the possibility of making further investments in new technology. We could therefore suppose that the exporting activity may also foster innovation through this indirect channel.

[1] The main reason to motivate this channel is the presence of additional costs associated with the exporting activity. These costs, related to the gathering of information on foreign markets, the establishment of a distribution system, or more generally the adaptation of products to foreign tastes and environment work as entry barriers, and explain why only the most productive firms export.

[2] See also Costantini and Melitz 2007, Bustos 2007, Javorcik and Iacovone 2009.

This paper builds on this recent evidence to show that the *dynamics* of exporting activities affects innovation, and in turn future productivity growth. Indeed, if exporting raises the return to innovation and relaxes financial constraints, productivity *growth* directly depends on the way in which firms *perform* on the export market, and not only on whether they enter or not. Put differently, a positive export dynamics, i.e. expansion in export markets, may affect future productivity growth. The reason is twofold, and directly comes from the evidence discribed above. First, export growth reduces the liquidity constraints that firms may face when they want to innovate. Second, export growth increases the incentives to innovate, as the possibility of reaching more destination markets increases the return to innovation. Therefore, a positive export dynamics both acts as a means and as an incentive to innovate.

Our main objective is to provide empirical evidence supporting these channels. By doing so, we depart from past literature by focusing on export-related long-run gains in terms of productivity growth. We use a large firm-level database combining trade and balance-sheet data on French firms over the period 1995-2005. Our database contains yearly destination-specific information on export flows, as well as balance-sheet variables which allow to obtain estimates of TFP. We use this data to assess how entry into the export market and post-entry export dynamics affect long-run productivity growth. Importantly, the fact that our firm-level trade data is destination-specific allow us to construct instruments for export market participation and export growth, therefore taking into account the potential reverse causality between productivity and exporting activities.

We first find that entry into export market per se does not have a significant effect on productivity growth, even if the firm is successful in remaining an exporter for a large number of years. Second, we find that past export growth has a strong effect on productivity growth: entrants which did experience on average a positive growth of their exports in the past (for a given level of export value) enjoy a significantly higher productivity growth than non-exporters. On the contrary, contemporaneous export growth does not have any effect on productivity growth once accounting for endogeneity. Put together, these results strongly suggest that incentives to innovate play an important role. Third, we find that the positive effect of past export growth is only observed in sectors which are more dependent upon external finance, supporting the idea that export dynamics acts as a means to innovate.

These results explain why it is difficult to find an effect of exporting activities on productivity. We show that to enjoy a higher productivity growth, a firm has to be successful (i.e. has to manage to stay on the export market for an important number of years) and to expand (to grow in terms of export value after entry). In practice, however, very few firms satisfy these conditions. Only a small fraction of exporters is successful (around 15 percent in our data). Only a part of them grow continuously after entry. If these firms are the only one enjoying important productivity gains, it is no surprise that past literature, by looking at entrants as a whole, failed to find signifant export-related productivity gains. However, precisely because they are growing, dynamic exporters may contribute importantly to aggregate trade growth, and eventually

represent a significant share of total exports.

We do not focus on the reasons why some export starters expand. Various reasons may be put forward. Some firms may benefit from positive idiosyncratic productivity shocks, may discover their high profitability once they enter the export market, or may simply be lucky, receiving some positive demand shocks (Atkeson and Burstein, 2009, Albornoz *et al.,* 2009, Eaton *et al* 2009). As mentioned before, these firms may also have already made some investments in innovation. Whatever the reason, some firms durably increase in size thanks to their new export activity, and this durable increase in size is the main factor fostering innovation and so productivity gains.

More precisely, we show that firms being able to expand on average in the export market for fours years will benefit from a higher productivity growth the fours years after. This result holds only if the firm is able to stay in the export market during the whole period. Indeed, we show that firms enjoying a temporary expansion in size through exports (because they leave the export market before the end of the period) do not benefit from a significantly higher productivity growth. In other words, enjoying a short export experience doesn't create enough incentives to invest in technology upgrading. We also show that the simple presence of the firm on the export market is not a sufficient condition for creating important incentives to innovate, even if the firm persist in this activity for years. Being an exporter, in short run or in the long run, does not constitute a sufficient condition for observing future productivity gains.

We do not specifically reject the alternative explanations put forward by the literature to explain some learning-by-exporting effects. One interesting regularity in the empirical papers aiming at testing the relevance of the learning by exporting hypothesis is that most studies finding a positive effect of the export status use data from developing countries (see Aw, Chung and Roberts, 2000 for Korea and Taiwan, Kraay, 1999 for China, De Loecker, 2007 and Damijan and Kostec 2006, for Slovenia, Van Biesebroeck, 2005 for sub-saharian countries). This would suggest that the scope for learning by exporting is greater for firms from developing countries exporting towards more developed regions. This argument is made explicit in De Loecker, 2007 who estimates the productivity gains by destination. The export activity would therefore help to catch up the technological frontier through knowledge and information flows from foreign buyers and competitors. Importantly, our estimations are based on French data for which this argument should be less important. As a robustness check, we also test and confirm that the destination pattern of exporting firms does not play a role.

Few other studies have found an impact of the decision to export on future productivity for the few next years after entry, but this positive effect disappear quickly (see Greenaway and Kneller, 2008, Damijan and Kostevc, 2006). This finding could be interpreted as the increase in scale or the utilization of excess capacity. We focus on the medium to long-run effects of the exporter dynamics on productivity growth. Our evidence could therefore hardly be interpreted as a result of some scale economies that are realized immediately.

Finally, some studies have argued that learning-by-exporting is specific to young exporters (see Delgado

et al 2002, Fernandes and Isgut, 2005). The argument is that young exporters able to stay few years consecutively on the export market may benefit from their experience and some information flows. This is why we always add a dummy variable indicating successful exporters, i.e. exporters that after entry continuously export until 2005. Once we control for the export dynamic of the firm, the variable is no more significant and is never significant when it is instrumented. The leads us to consider the export dynamics of the firm (rather than the persistence in the exporting activity) as the main driver of future productivity gains.

This paper contributes to the literature at various level. First, by explaining why studies often failed to find an effect of exporting on productivity growth: only a small part of firms, those experiencing a positive dynamics in the foreign markets, will exhibit productivity gains. Second, by specifically emphasizing the important role of export dynamics on productivity growth, and by showing that exporting, while not necesarily associated with a higher level of productivity in the short-run, may allow some firms to reach a higher productivity growth path in the long-run.

The remainder of the paper is organized as follows. In section 2, we provide a detailed description of our data and some descriptive statistics about export pattern. In sections 3 and 4, we present our empirical methodology and results. Section 5 concludes.

2 Data and stylized facts

2.1 Data

We use a large database on French firms, which merges two different sources:

1) the French customs for firm-level trade data, which contains exports for each firm, by destination and year. The French customs report the volume and value of exports by 8-digit product (combined nomenclature) and destination, for each firm located on the French metropolitan territory. For each flow, the customs record values and quantities. The database does not report all export shipments. Inside the EU, firms are required to report their shipments by product and destination country only if their annual trade value exceeds the threshold of 150,000 euros. For exports outside the EU all flows are recorded, unless their value is smaller than 1000 euros or one ton. Even though the database is not comprehensive, in practice, those thresholds only cut a very small proportion of total exports.

2) A balance sheet dataset called BRN which contains other relevant firm-level information, including firms' total turnover, size, sector, and other balance-sheet variables. We use this data to compute value added per worker and total factor productivity. The time span covers the 1995-2005 period. The BRN database is constructed from mandatory reports of French firms to the tax administration, which are in turn transmitted to INSEE (the French Statistical Institute). The customs database is virtually exhaustive, while

the BRN contains between 650,000 and 750,000 firms per year over the period - around 60% of the total number of French firms. A more detailed description of the database is provided by Eaton, Kortum and Kramarz (2004). After merging the two sources, more than 90% of French exporters are still present in the database.

Unfortunately, our data do not contain proxies for firms' innovation or R&D expenditures. Therefore, our approach here will be to assess the effect of exporters' dynamics on their productivity growth, and to provide evidence consistent with the fact that this effect indeed comes from innovation, in particular through a relaxation of liquidity constraints. Future work should intend to directly test the effect of export dynamics on innovation.

We want to assess the impact of *post-entry* exporter dynamics on their long-run productivity growth. We therefore keep in the sample the firms which are in the database the during the whole period. We also drop the ones that always export, as we need to isolate the moment of entry into the export market.

[Table 1 about here]

Table 1 contains some descriptive statistics for four categories of firms, namely non-exporters (firms that never export over the 1996-2005 period), successful entrants (firms that appear in the trade data for the first time between 1997 and 2000, and stay until 2005), unsuccessful entrants (firms that enter between 1997 and 2000 but definitively exit before 2005) and temporary exporters (firms that enter several times between 1996 and 2000). Note that we do not consider entry in the year 1996 as we only have information from 1995: a firm appearing in the trade data for the first time in 1997 (so being absent in 1995 and 1996) can be more surely considered as an entrant.

Most of entrants (around 85%) are unsuccessful or temporary. Successful entrants are much less numerous, but larger and more productive both in terms of TFP (computed using Olley and Pakes (1996) methodology) and labor productivity. They also serve more destinations on average than other entrants. Their average labor productivity growth is also slightly higher.

2.2 Stylized Facts

The fact that most firms entering the export market eventually fail to export permanently has important implications. In particular, past empirical works, by focusing generally on entry into the export market only, i.e. without differentiating between successful and unsuccessful exporters, may have underestimated the effect of exports on productivity growth: if productivity gains are only enjoyed by a few *successful* exporters, the correlation between export status and productivity growth may indeed be very low.

A crude way to look at this issue is to compute the correlation between entry into the export market and post-entry productivity growth for these different types of entrants. More precisely, we estimate the

following cross-section specification:

$$\overline{\Delta\varphi_{i,2005/t_o}} = \alpha_1 S_{i,t_o} + \alpha_2 U_{i,t_o} + \alpha_3 T_{i,t_o} + \beta A_{i,t_o} + \psi_k + \epsilon_{it} \quad (1)$$

where $\overline{\Delta\varphi_{i,2005/t_0}}$ is the average productivity growth of firm i over the period $t_0 - 2005$. S_{it_o}, U_{it_o}, and T_{it_o} are dummies which equal 1 if the firm has entered the export market in t_0 and has been respectively a successful, unsuccessful or temporary exporter, as defined above. The period considered differs across firms. For firms that never export, $t_0 = 1997$. For entrants, t_0 denotes the year of entry, comprised between 1997 and 2000. We therefore consider post-entry average productivity growth, i.e. the average growth between the year of entry and 2005. Note that continuous exporters are dropped from the sample, since we cannot isolate their entry into the export market. A_{it_o} is a set of controls, including the logarithms of initial productivity and size (in terms of employees), and the age of the firm, and ψ_k is a set of sector dummies.

Table 2 presents the results. Columns (a) to (d) use value added per worker as a proxy for productivity; columns (e) to (h) use TFP. Of course, what is shown in table 2 is only a correlation, as productivity growth obviously affects the probability for a firm to enter the export market, as well as its success once it has entered. Interestingly, we find that productivity growth is positively correlated with successful entry only: unsuccessful entrants display a lower average productivity growth, while temporary entrants do not differ from permanent non-exporters. Therefore, on average, entrants do not display a higher productivity growth than non-exporters (columns (d) and (h)).

Correlations shown in Table 2 strongly suggest that entrants are highly heterogenous in terms of productivity growth. Considering them as a whole may not yield clear-cut conclusions about the impact of export on productivity. Our econometric analysis below will therefore intend to concentrate on potential productivity gains for successful exporters. However, we will show that, even for these firms, once accounting for endogeneity, productivity gains may be quite low, or even insignificant. Positive export dynamics, on the other hand, will be found to have important effects for future productivity growth. The correlation between successful entry and productivity growth shown in Table 2 is likely to be the result of (1) reverse causality (2) positive export dynamics experienced only by a subsample of firms.

[Table 2 about here]

Table 2bis and Figure 1 show the dynamics of export for successful exporters. Over time, if they are successful, entrants clearly grow in terms of sales. However, the increase is more pronounced in the first years. Total exports display a clear concave shape (Figure 1).

[Table 2bis and Figure 1 about here]

Figure 2 provides a first overview of the potential effect of export dynamics on productivity growth. More precisely, it compares the TFP of firms entering the export market in 1997[3] and experiencing positive export growth between 1997 and 2001, with the TFP of continuous non-exporters. While both groups of firms experience an overall positive trend in TFP, the evolution of TFP strikingly differs among the two groups. This already suggests that there is something specific in the evolution of TFP that comes from a positive export dynamics. The productivity gap between the two types of firms first widens after entry. This pattern echoes the one highlighted by De Loecker (2007) for Slovenian firms, who found that exporters enjoyed productivity gains immediately after entry. However, as export growth may be a consequence of productivity growth, it is not possible to assess from this first sequence the role of a positive export dynamics on the productivity growth path. After 2000 however, the productivity gap then stagnates and even shrinks for several years, before widening again from 2003. These descriptive statistics, although very crude, are consistent with our main assumption: if a positive export dynamics stimulates innovation, and as innovation may take time, it is not surprising that the export-related productivity gains are only observed after an important number of years. This is also what our empirical analysis will suggest.

[Figure 2 about here]

3 Empirical Methodology

Basic specification. We want to study how the dynamics of exports affect future productivity growth. As mentioned before, previous studies generally failed to find a significant effect of exporting *per se* on productivity growth. The so-called learning-by-exporting hypothesis was supported only in a few cases, in particular for firms exporting to high-income countries, i.e. technologically more advanced. There is therefore little chance this effect to be present and important for French firms. On the contrary, a positive export dynamics - i.e. the growth on the export market - may both act as a means (through a relaxation of liquidity constraints) and as an incentive (by increasing the returns to R&D) to innovate. If this channel is relevant, we therefore expect productivity growth to be positively correlated to *past* export growth.

Our empirical strategy should therefore identify (i) the effect of successful entry into the export market on productivity growth; (ii) the effect of a positive export dynamics, i.e. *post-entry export growth* on productivity growth; (iii) whether this effect indeed comes from a relaxation liquidity constraints. As mentioned before, data constraints prevent us from assessing the effect of export dynamics on innovation, which is left for future research.

To show how current exporting behavior affects future productivity growth, we separate the sample into two different periods, $T-1 = 1997-2001$ and $T = 2001-2005$. We define a successful entrant as a firm

[3] The same kind of patterns are observed for firms entering after 1997: productivity increases substantially after six years.

which enters in our trade database for the first time between 1997 and 2001, and has positive export flows until 2005. We do not consider here unsuccessful or temporary entrants. Letting $\overline{\Delta\varphi_{iT}}$ denoting the average productivity growth of firm i during period T, we have:

$$\overline{\Delta\varphi_{iT}} = \kappa S_{i,T-1} + \theta S_{i,T-1} \times \overline{\Delta X_{i,T-1}} + \psi_k + \varepsilon_{iT} \tag{2}$$

where $S_{i,T-1}$ is a dummy which equals 1 if the firm successfully enters during period $T-1$, $\overline{\Delta X_{i,T-1}}$ is the average growth of the firm i's export value during period $T-1$, ψ_k is a full-set of sector dummies, and ε_{iT} is a mean-zero error term. We estimate how productivity growth between 2001 and 2005 is affected by (i) successful entry between 1997 and 2001 ($X^S_{i,t-1}$); (ii) export growth between 1997 and 2001 ($\overline{\Delta X_{i,t-1}}$). The estimated coefficient θ gives the impact, beyond the fact of being a successful exporter (captured by κ), of having experienced a positive export dynamics in the past, i.e. to have grown in terms of export sales. Whether the inclusion of this variable affects the value of κ gives an idea of the importance of export dynamics on overall productivity gains related to export status *per se*.

Reverse causality issues. Specification (4) is plagued with a number of potential endogeneity biases which can make the use of OLS inappropriate. First, as mentioned before, the probability of being successful on the export market is likely to be affected by productivity growth over the whole period 1997-2005. Second, export growth over the period $T-1$ is likely to be correlated with export growth over the next period T, which is also possibly affected by our left-hand side variable. We will therefore include export growth over T in the estimation. To account for the reverse causality biases, we need instruments for $S_{i,T-1}$ and $\overline{\Delta X_{i,T-1}}$, i.e. variables that, without being affected by firms' productivity, affect (1) entry into the export market; (2) success on the export market (the probability to remain an exporter over the next period); (3) export growth over the period.

We make use of the time varying, destination-specific information contained in our dataset. As we have data on firm-level export flows by destination and year, we can compute firm-specific demand shocks based on macro data that are likely to be correlated with firm-level exports but exogenous to firm-level behavior. More precisely, we compute, for the two periods 1997-2001 and 2001-2005, indexes of aggregate demand shocks faced by firms depending on the initial geographical composition of their exports. For a given year t we compute:

$$\Delta Shock_{it}(D) = \sum_{j=1}^{N} \Delta \log(D_{jt}) \times \alpha_{ij0} \tag{3}$$

where α_{ij0} is the share of firm i's exports to destination j in its total exports during the year of entry; D_{jt} denotes either the real GDP per capita, the real bilateral exchange rate (an increase means an depreciation of country j's currency) or the consumption share of real GDP per capital of country j during year t. The data comes from the Penn World Tables. These three variables reflect aggregate demand shocks, and are therefore likely to impact exporting behavior as a whole. We use as instruments for $S_{i,T-1}$ and $\overline{\Delta X_{i,T-1}}$ the

average of these variables over the two periods 1997-2001 and 2001-2005. We are thus left with six outside instruments (i.e. the average of $\Delta Shock_{it}(D)$ for each period, and for each demand variable). Robust to heteroskedasticity and clustering, Hansen's J statistics of overidentifying restrictions are unable to reject our set of instruments. The Durbin-Wu-Hausman test provides a diagnosis on endogeneity. As the null hypothesis of exogeneity cannot be rejected in some specifications, we will report both OLS and 2SLS estimates.

Table 3 shows the correlation between exporting behavior and these instruments for the first period, 1997-2001. All variables are highly significant and have the expected signs. Experiencing positive demand shocks in the markets initially served is highly correlated with the probability of entering the export market (column (a)), with the probability of success after entry (column (b)), as well as with the growth of export value (column (c)). This conforts us with the choice of these variables as instruments for exporting behavior.

[Table 3 about here]

Omitted variables. Another issue is that the effect of export growth on future productivity growth may be affected by a number of firm-specific characteristics. We therefore include a set of firm-specific controls in our basic specification. Moreover, it is necessary to include the TFP growth in $T-1$ for two reasons. First, our estimates could be biased if there is some persistence in productivity growth and that productivity growth drives the export growth. Second, export growth could affect contemporaneous productivity growth. In that case, we would not be able to isolate the impact of export growth on future productivity growth. We therefore include past productivity growth to account for these possible bias. Our estimated specification takes the form:

$$\overline{\Delta\varphi_{iT}} = \kappa S_{i,T-1} + \theta S_{i,T-1} \times \overline{\Delta X_{i,T-1}} + \delta \overline{\Delta\varphi_{iT-1}} + \gamma U_{i,01} + \psi_k + \varepsilon_{iT} \tag{4}$$

where $U_{i,01}$ is a set of controls which includes the logarithm of TFP, of the number of employees, and firm's age in 2001. We control for past average productivity growth ($\overline{\Delta\varphi_{iT-1}}$) to capture firm-specific persistent productivity shocks.

Liquidity constraints. As mentioned before, one of the reasons why we expect export growth to affect future productivity growth is that it should relax liquidity constraints, therefore facilitating innovation. To assess the the role of liquidity constraints, we further estimated equation (4) on two different subsamples, characterized by high vs. low external financial dependence (as computed by Rajan and Zingales, 1998). We expect our variables of interest to have a larger impact on the first subsample.

4 Results

4.1 Basic Results

The OLS results of the basic specification are presented in Table 4. Columns (a) to (d) show the results using TFP[4] as a measure of productivity; columns (e) to (h) show the results using labor productivity (computed as the value added per worker). Table 5 replicates the same structure, but show the 2SLS estimates. Note that Hansen's statistics of overidentifying restrictions are unable to reject our set of instruments in Table 5. As endogeneity seems to be a concern only in some specifications, we report both OLS and 2SLS estimates.

[Tables 4 and 5 about here]

Some results emerge. First, in Table 4, the fact of being a successful exporter has a positive and significant effect on productivity growth (columns (a) and (e)). The effect becomes however insignificant for TFP once endogeneity is accounted for (Table 5, column (a)), while it is still significant for labor productivity. The correlation found before seems to be at least partly the result of endogeneity.

This result however vanishes completely once we control for the post-entry export behavior of firms. Indeed, when we include the variable export growth in the estimation, the "successful" variable is no longer significant (columns (b) to (d) and (f) to (h) of each table). Importantly, on the other hand the variable export growth has a positive and significant effect in all specifications. These results clearly suggest that entry into the export market *can* improve productivity growth, but only for firms that experience a positive export dynamics. The export status *per se* is not a significant determinant of future productivity growth. What matters for the future productivity growth is the post-entry export performance of the firm.

These results have implications for aggregate productivity gains generated through exporting activities. Although these gains are likely to be experienced only by a small number of successful, dynamic exporters, it is also worth noting that these firms, precisely because they are expanding over time, will eventually constitute a significant share of aggregate exports and of aggregate productivity gains of exporters.

Finally, the inclusion of additional controls do not modify the results. In particular, the logarithm of the initial export value, which can be correlated with the export growth, does not appear to be significant (columns (d) and (h) of each Table). This also means that we are not capturing a level effect. It is not the increase in size due to the entry into export market which matters but the subsequent export growth. In the same way, controlling for export growth over 2001-2005 does not alter the results. This variable is highly significant in the OLS specification but this significance vanishes as the variable is instrumented. While the endogeneity problem is obvious with this variable, this result comforts us with the quality of our instruments.

[4] TFP is computed using Olley Pakes (1996) methodology.

Without constituting a direct test of our story, this last result is highly consistent with it. Export dynamics matters for *future productivity growth* only: contemporaneous export growth does not affect productivity growth. This is consistent with the view according to which export growth affect firms' innovation, which takes time to translate into productivity gains.

4.2 Robustness

(1) Learning-by-exporting vs export dynamics. Table 6 contains some robustness checks. As mentioned before, previous literature found that learning-by-exporting was particularly likely if a firm exports to large, high-income destinations. The intution behind this result is that the scope for learning is more important for firms exporting to technologically "more advanced" countries, since in that case exporting activities may allow firms to catch-up the technological frontier, by benefiting from information and knowledge spillovers. To ensure that our results are not due to some learning-by-exporting effects, i.e. the possibility that firms growing on export markets are also the ones exporting to specific destinations which may vehicle some productivity gains, we include in our estimations dummies for the main export destination of the firm (columns (a) and (e)). The inclusion of these dummies does not modify the results, suggesting that our findings do not reflect some learning-by-exporting.[5] Note that this does not mean that there is absolutely no learning-by-exporting at work, but rather that the channel we emphasize remains significant and quantitatively important once we control for this possibility. Also, the consequences of some learning-by-exporting and of an export dynamics are conceptually different. While some short-term productivity gains may be observed after entry into the export market, in particular because firms may take advantage of scales economies or adopt more advanced technologies, we are instead focusing here on long-run gains in terms of productivity growth. If the learning-by-exporting may help to adopt a more advanced technology, this may affect the level of productivity (a one shot productivity gain), but it is less clear why this should affect the productivity growth. On the contrary, a positive export growth may have more persistent effects by influencing innovation, and therefore may determine the path of future productivity growth.

[Table 6 about here]

(2) Export dynamics vs firm dynamics. Our results can also reflect the effect of the dynamics of firms in general. If export growth is correlated with sales growth, our results could simply reflect the fact that innovation has been driven by the firms' growth on the domestic market. Our assumption is that, by increasing incentives to innovate, a positive export growth may have a larger effect on future productivity

[5] In unreported estimations, we have also controlled for the average GDP per capita of the firm's export destinations over the period 1997-2001. This left the results unchanged.

growth than domestic sales' growth. To check this, we include in the estimation the mean growth of value added over the period. As shown in columns (b) and (f), the results are unchanged, although the coefficient of the export growth variable slightly declines as compared to our previous estimates. This suggests that the export dynamics has an effect beyond firms' dynamics, potentially through higher incentives to innovate.

(3) Successful vs unsuccessul exporters. So far, only successful exporters and non-exporters were included in the estimations. One can expect that export growth has a lower effect for unsuccessful exporters - firms that entered between 1997 and 2001 but definitively exited before 2005. In columns (d) and (h) of Table 5 we estimate our basic specification only for unsuccessful exporters - thus comparing them with continous non-exporters. Export dynamics does not have a significant effect for these firms. Our interpretation of this result is that even if they experienced important export growth for some years, these firms had lower incentives to use their additional liquidity to innovate as they anticipated their future exit of the export market. This also suggests future productivity is not impacted by a temporary increase in firms' sales through entry into the export market. Instead, firms have to experience a positive export dynamics for several years in order to enjoy future productivity gains. This reinforces our assumption that innovation may play an important role.

4.3 Exporter dynamics and financial constraints

While our results are so far consistent with the view that the exporting behavior may affect future productivity growth through a relaxation of financial constraints, they still do not constitute a direct test of this assumption. To assess the role of financial constraints, we estimate equation (4) separately on two different subsamples, containing respectively sectors characterized by a high or a low external financial dependence (meaning above and below the median of the sample). The sectoral data has been constructed by Rajan and Zingales (1998) from US data. External financial dependence is defined by these authors as the fraction of capital expenditures not financed with cash flow from operations.[6] We expect a positive export dynamics to have a stronger impact in highly dependent sectors. Note that this methodology is only relevant if the two subsamples are similar in terms of the proportion of successful exporters and in terms of export growth. It is indeed the case: the distribution of these variables is not significantly different according to the degree of external finance.[7]

Results shown in Table 7 are consistent with our assumptions.[8] Export growth strongly affects future

[6] The external dependence of US industries is considered as being an optimal one, given the high level of financial development in the US and the low probability of firms to be financially constrained. The level of each industry's external financial dependence in the US should therefore represent the actual demand of external finance by those industries, in each country.

[7] The mean growth of export of successful exporters is 0.35 (respectively 0.32) in sectors highly (resp. lowly) reliant upon external finance.The proportion of firms that are successful entrants is the same (4.6 percents).

[8] The number of observations is much lower here because the financial dependence measure is only available for certain sectors (principally manufacturing sectors).

productivity growth in highly financially dependent sectors (columns (a) to (d)), but has no significant effect in sectors less dependent upon external finance (columns (e) to (h)).

[Table 7 about here]

The next step is obviously to assess the relevance of the core mechanism underlying our results: whether export dynamics affect productivity growth through innovation; this can be done in the future by directly testing the effect of export dynamics on innovation or R&D. However, the results contained in Table 7 are very suggestive about the role of innovation. Contemporaneous export growth never affects productivity growth (columns (c), (d), (g), (h)); only past export growth has an effect, which is consistent with the fact that innovation may take time. Finally, this positive impact of an export growth is only observed in financially dependent industries, clearly suggesting that the interaction between relaxation of liquidity constraints and higher incentives to innovate fosters future productivity growth for dynamic exporters. Note also that the results are unchanged when separating the sample according to the degree of asset tangibility (as computed by Braun, 2003).

5 Conclusion

In this paper we have assessed the impact of exporter dynamics on future productivity growth. Three main results emerge. First, the fact of entering the export market is not a sufficient condition to observe productivity gains, even in the case in which the firm manages to remain an exporter for a long time period. Second, beyond the fact of staying on the export market, the dynamics of the exporting activity explain most of the future productivity gains. Productivity growth is higher only for firms experiencing positive export dynamics, i.e. growing in terms of foreign sales. Third, the positive effect of export dynamics is only observed in industries more dependent upon external finance. This strongly suggests that export-related productivity gains are related to a relaxation of liquidity constraints that allow dynamic firms to innovate.

(To be completed)

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6 Appendix

6.1 Figures

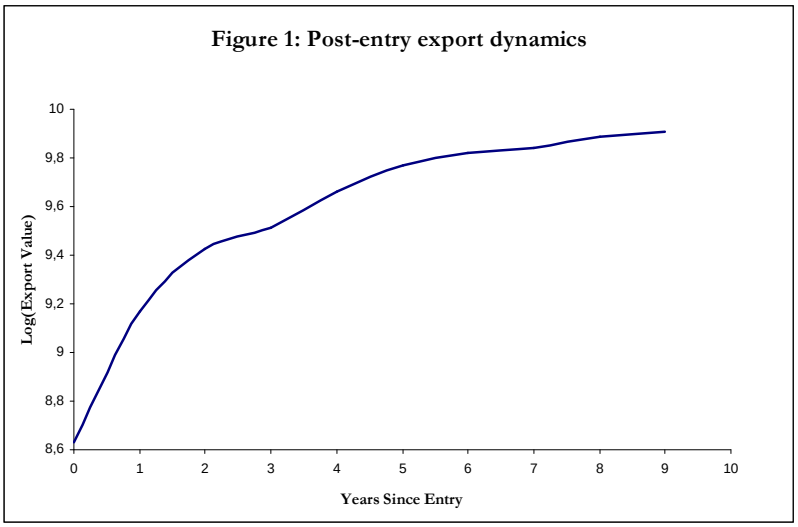
Figure 1: Post-entry export dynamics
Log(Export Value)
10
9,8
9,6
9,4
9,2
9
8,8
8,6
0
1
2
3
4
5
6
7
8
9
10
Years Since Entry

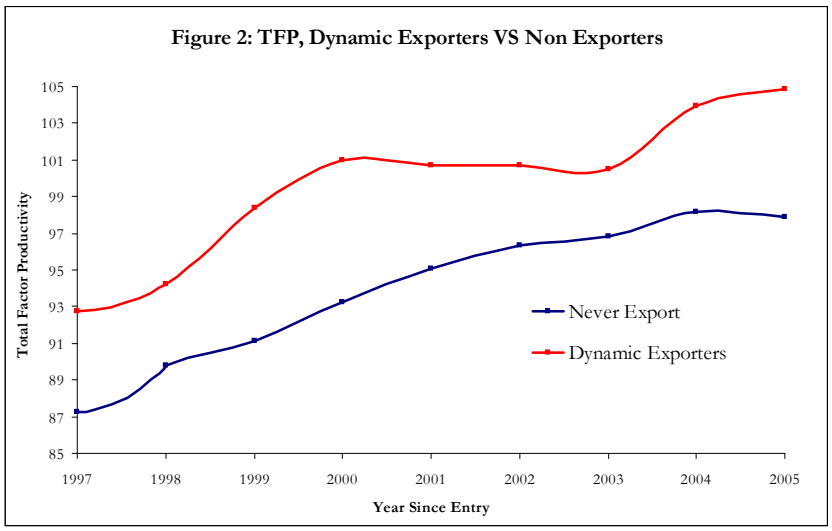
Figure 2: TFP, Dynamic Exporters VS Non Exporters
Total Factor Productivity
105
103
101
99
97
95
93
91
89
87
85
1997
1998
1999
2000
2001
2002
2003
2004
2005
Year Since Entry
Never Export
Dynamic Exporters

6.2 Tables

Table 1: Descriptive Statistics

	Nb. Obs.	Mean	Median	1st quartile	3rd quartile
NON-EXPORTERS					
Nb Employees	1520640	15.8	7	4	13
Labor Productivity	1520640	338.3	261.4	196.7	362.1
Average Labor Prod. Growth	1516240	0.018	0.021	-0.008	0.050
TFP	1520640	107.4	92.7	68.2	125.3
Average TFP Growth	1516240	0.013	0.015	-0.012	0.042
SUCCESSFUL ENTRANTS					
Nb Employees	20185	47	16	8	37
Labor Productivity	20185	374.5	301.9	231.6	411
Average Labor Prod. Growth	20185	0.021	0.022	-0.008	0.052
TFP	20185	112.7	96.8	70.8	130.3
Average TFP Growth	20185	0.011	0.011	-0.017	0.041
Number of destinations	20185	3.65	2.25	1.42	3.77
UNSUCCESSFUL ENTRANTS					
Nb Employees	83622	26.9	10	5	24
Labor Productivity	83622	332.6	264.6	201.6	351.8
Average Labor Prod. Growth	83622	0.016	0.019	-0.008	0.046
TFP	83622	108.1	93.6	71.3	123.6
Average TFP Growth	83622	0.008	0.012	-0.015	0.038
Number of destinations	83622	1.15	1	1	1
TEMPORARY ENTRANTS					
Nb Employees	77814	43.8	14	7	32
Labor Productivity	77814	359.5	281.7	223.0	373.3
Average Labor Prod. Growth	77814	0.019	0.020	-0.006	0.047
TFP	77814	115.3	98.3	75.9	129.5
Average TFP Growth	77814	0.011	0.012	-0.014	0.038
Number of destinations	77814	1.35	1	1	1.5

Table 2bis: Post-entry Mean Value of Export (log)

YEAR	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
1995	9.47	0	0	0	0	0	0	0	0	0	0
1996	9.70	8.63	0	0	0	0	0	0	0	0	0
1997	9.83	9.17	8.73	0	0	0	0	0	0	0	0
1998	9.89	9.43	9.21	8.68	0	0	0	0	0	0	0
1999	9.91	9.51	9.41	9.12	8.69	0	0	0	0	0	0
2000	9.99	9.66	9.58	9.36	9.17	8.71	0	0	0	0	0
2001	10.03	9.77	9.71	9.56	9.43	9.20	8.68	0	0	0	0
2002	10.09	9.82	9.73	9.65	9.58	9.46	9.18	8.70	0	0	0
2003	10.13	9.84	9.89	9.75	9.72	9.66	9.47	9.22	8.79	0	0
2004	10.13	9.89	9.90	9.80	9.82	9.68	9.63	9.44	9.22	8.85	0
2005	10.13	9.91	9.96	9.81	9.95	9.73	9.68	9.63	9.52	9.28	8.83

Table 2: Entry into the export market and productivity growth

	a	b	c	d	e	f	g	h
Dep. Var.	Mean Productivity Growth							
Productivity Indicator	Labor Productivity				Total Factor Productivity			
Successful Entrants	0.007***	0.005**	0.006***		0.006***	0.004**	0.005**	
	(0.002)	(0.002)	(0.002)		(0.002)	(0.002)	(0.002)	
Unsuccessful Entrants		-0.004***	-0.003**			-0.005***	-0.004***	
		(0.001)	(0.001)			(0.001)	(0.001)	
Temporary Entrants			0.003**				0.002	
			(0.001)				(0.001)	
All entrants				0.001				0.001
				(0.001)				(0.001)
Observations	154751	154751	154751	154751	153773	153773	153773	153773
R-squared	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

* significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors in parentheses. Mean productivity growth over the 1996-2005 period for non-exporter, and between the year of entry and 2005 for entrants. Cross-section, OLS estimates. All estimations include sector dummies, and controls for firm's initial productivity, number of employees and age. Successful: 1 if firm enters the export market and stays over the period. Unsuccessful: 1 if the firm enters and exits definitively. Temporary: 1 if the firm enters several times over the period.

Table 3: Impact of Shocks on Firms' Export Dynamics

	Entry	Post-entry success	Mean growth export value
Shock Variable (1997-2001)			
Exchange Rate Shock	-1.621***	-1.354***	-1.432***
	(0,071)	(0,024)	(0,024)
GDP Per Capita Shock	2.040***	1.740***	1.839***
	(0,116)	(0,038)	(0,039)
Consumption Shock	4.019***	0.137***	0.057*
	(0,103)	(0,033)	(0,034)
No. Obs	154751	154751	154751
R-Squared	0,17	0,27	0,26

OLS estimations. Average over 1997-2001 for shock variables and mean growth export value
* significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors in parentheses.

Table 4: Export dynamics and productivity growth, OLS

	a	b	c	d	e	f	g	h
Dep. Var.	Mean TFP Growth 2001 - 2005				Mean LP Growth 2001 - 2005			
Successful Entrants 97-01	0.004*	0.000	-0.001	0.016	0.010***	0.008**	0.004	0.010
	(0.002)	(0.004)	(0.003)	(0.016)	(0.002)	(0.004)	(0.003)	(0.015)
Mean growth export value 97-01		0.005*	0.007***	0.005*		0.005**	0.007***	0.006**
		(0.003)	(0.002)	(0.003)		(0.002)	(0.002)	(0.003)
Controls								
Mean growth export value 01-05			0.023***	0.021**			0.023***	0.022***
			(0.008)	(0.008)			(0.008)	(0.008)
Initial Export Value				-0.002				-0.001
				(0.001)				(0.001)
Mean Productivity Growth 97-01	-0.143***	-0.162***	-0.143***	-0.143***	-0.158***	-0.165***	-0.158***	-0.158***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Initial Productivity (2001)	-0.050***	-0.033***	-0.050***	-0.050***	-0.047***	-0.039***	-0.047***	-0.047***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Initital Size (employees) (2001)	0.004***	0.005***	0.004***	0.004***	0.005***	0.006***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	138150	137779	137753	137753	139658	139279	139252	139252
			OLS				OLS	
R-Squaed	0.130	0.110	0.130	0.130	0.150	0.130	0.150	0.150
Sector Dummies			Yes				Yes	

* significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors, clustered by sector, in parentheses. Unsuccessful and temporary exporters dropped from the estimations. All estimations include sector dummies. Variables in level in logarithm.

Table 5: Export dynamics and productivity growth, instrumentation

Dep. Var.	a	b	c	d	e	f	g	h
	Mean TFP Growth 2001 - 2005				Mean LP Growth 2001 - 2005			
Successful Entrants 97-01	0.007	-0.026	-0.029	-0.393*	0.014***	-0.031	-0.035	-0.223
	(0.005)	(0.022)	(0.022)	(0.218)	(0.004)	(0.026)	(0.025)	(0.205)
Mean growth export value 97-01		0.052*	0.054*	0.084**		0.071*	0.073**	0.090**
		(0.031)	(0.030)	(0.034)		(0.040)	(0.037)	(0.041)
Controls								
Mean growth export value 01-05			0.022	0.054*			0.044	0.062
			(0.030)	(0.028)			(0.039)	(0.039)
Initial Export Value				0.034*				0.017
				(0.020)				(0.019)
Mean Productivity Growth 97-01	-0.143***	-0.144***	-0.144***	-0.144***	-0.158***	-0.159***	-0.159***	-0.159***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Initial Productivity (2001)	-0.050***	-0.050***	-0.050***	-0.050***	-0.047***	-0.046***	-0.046***	-0.046***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Initital Size (employees) (2001)	0.004***	0.005***	0.005***	0.004***	0.005***	0.005***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	138150	137779	137753	137753	139658	139279	139252	139252
	2SLS				2SLS			
R-Squared	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14
Sector Dummies	Yes				Yes			
Hansen Stat.	4.783	7.458	3.08	0.798	2.457	2.994	1.75	0.895
p-value	0.443	0.114	0.379	0.671	0.783	0.558	0.626	0.639
Durbin-Wu-Hausman Stat.	2.244	2.599	3.638	5.109	3.153	5.256	5.071	4.941
p-value	0.134	0.273	0.3032	0.276	0.076	0.072	0.167	0.293

* significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors, clustered by sector, in parentheses. Unsuccessful and temporary exporters dropped from the estimations. All estimations include sector dummies. Variables in level in logarithm.
Instrumented variables: Successful, Mean Export Growth 97-01, Mean Export Growth 01-05, Initial Export Value
Instruments: RER, CGDP and Consumption shock variables for 97-01 and 01-05 used as instruments in 2SLS estimations.

Table 7: Export dynamics and productivity growth, Sectoral Decomposition

Dep. Var.	a	b	c	d	e	f	g	h
	Mean TFP Growth 2001 - 2005							
	High External Financial Dependence				Low External Financial Dependence			
Successful Entrants 97-01	0.006	-0.043	-0.043*	-0.046	0.012	0.001	-0.005	-0.12
	(0.006)	(0.031)	(0.024)	(0.204)	(0.012)	(0.016)	(0.019)	(0.088)
Mean growth export value 97-01		0.081**	0.077**	0.077**		0.006	0.011	0.019
		(0.040)	(0.031)	(0.033)		(0.023)	(0.024)	(0.019)
Controls								
Mean growth export value 01-05			0.036	0.036			0.03	0.042
			(0.059)	(0.052)			(0.043)	(0.037)
Initial Export Value				0.000				0.011
				(0.021)				(0.010)
Mean TFP Growth 97-01	-0.128***	-0.135***	-0.135***	-0.135***	-0.160***	-0.165***	-0.165***	-0.165***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.012)	(0.013)	(0.013)	(0.013)
Initial TFP (2001)	-0.057***	-0.056***	-0.056***	-0.056***	-0.046***	-0.046***	-0.046***	-0.046***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)	(0.005)
Initital Size (employees) (2001)	0.003***	0.004***	0.004***	0.004***	0.003***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	8340	8305	8303	8303	10456	10395	10391	10391
			2SLS				2SLS	
R-Squared	0.11	0.09	0.1	0.1	0.11	0.11	0.11	0.11
Sector Dummies			Yes				Yes	

* significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors, clustered by sector, in parentheses. Unsuccessful and temporary exporters dropped from the estimations. All estimations include sector dummies. Variables in level in logarithm.
Instrumented variables: Successful, Mean Export Growth 97-01, Mean Export Growth 01-05, Initial Exports
Instruments: RER, CGDP and Consumption shock variables for 97-01 and 01-05 used as instruments in 2SLS estimations.

Table 6: Export dynamics and productivity growth, robustness

Dep. Var.	a	b	c	d	e	f	g	h
	Mean TFP Growth 2001 - 2005				Mean LP Growth 2001 - 2005			
Successful Entrants 97-01	-0.06	-0.03	0.008		-0.063	-0.036	0.013***	
	(0.042)	(0.023)	(0.005)		(0.047)	(0.026)	(0.004)	
Unsuccessful Entrants 97-01			-0.018**	-0.014			-0.014	-0.005
			(0.009)	(0.013)			(0.011)	(0.013)
Mean growth export value 97-01	0.091**	0.055**		0.034	0.104*	0.074**		0.052
	(0.046)	(0.028)		(0.055)	(0.055)	(0.037)		(0.056)
Mean Growth Value Added		0.024***				0.022***		
		(0.005)				(0.004)		
Controls								
Mean growth export value 01-05	0.002	0.02		0.087	0.026	0.044		0.189
	(0.033)	(0.030)		(0.155)	(0.040)	(0.039)		(0.181)
Mean Productivity Growth 97-01	-0.145***	-0.158***	-0.135***	-0.144***	-0.159***	-0.170***	-0.148***	-0.159***
	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Initial Productivity (2001)	-0.050***	-0.051***	-0.050***	-0.050***	-0.046***	-0.047***	-0.047***	-0.046***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Initital Size (employees) (2001)	0.005***	0.004***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	137753	137753	143830	137685	139252	139252	145418	139173
	2SLS				2SLS			
Main Destination Dummies	Yes	No	No	No	Yes	No	No	No
R-Squared	0.13	0.13	0.13		0.14	0.14	0.14	0.14
Sector Dummies	Yes				Yes			
Hansen Stat.	1.945	3.125	1.993	2.392	4.943	1.688	0.579	1.313
p-value	0.584	0.373	0.737	0.4951	0.176	0.639	0.965	0.726
Durbin-Wu-Hausman Stat.	3.49	3.714	2.67	4.711	2.809	5.055	1.168	6.305
p-value	0.322	0.2941	0.263	0.1942	0.422	0.167	0.557	0.097

* significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors, clustered by sector, in parentheses.
Temporary exporters dropped from the estimations. All estimations include sector dummies. Variables in level in logarithm.
Instrumented variables: Successful, , Unsuccessful, Mean Export Growth 97-01, Mean Export Growth 01-05
Instruments: RER, CGDP and Consumption shock variables for 97-01 and 01-05 used as instruments in 2SLS estimations.