Financial Constraints and Firm Export Behavior

Flora Bellone[*] Patrick Musso[†] Lionel Nesta[‡] Stefano Schiavo[§]

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Abstract

The paper analyzes the link between financial constraints and firm export behavior exploiting a rich dataset of French firms. We use data from two main sources. The first (*Enquête Annuelle d'Entreprises – EAE*) is an annual survey conducted by the Ministry of Industry, which gathers balance sheet information for all manufacturing firms with at least 20 employees. The second source of information is the *DIANE* database published by Bureau van Dijk, which collects data on over 1 million (French) firms. *DIANE* contains many financial variables absent from the *EAE* survey. Merging the two datasets yields around 170,000 firm/year observations, stemming from an unbalanced panel of over 25,000 manufacturing enterprises followed over the period 1993 – 2005. The actual number of observations used in the empirical analysis varies according to the specific econometric exercise. Our main finding is that firms enjoying better financial health are more likely to become exporters. The result contrasts with the previous empirical literature which found evidence that export participation improves firm financial health, but not that export starters display any *ex-ante* financial advantage. On the contrary, we find that financial constraints act as a barrier to export participation. Better access to external financial resources increases the probability to start exporting and also shortens the time before firms decide to serve foreign customers. This finding has important policy implications as it suggests that, in presence of financial markets imperfections, public intervention can be called for to help efficient but financially constrained firms to overcome the sunk entry costs into export markets and expand their activities abroad.

Keywords: Export; Firm heterogeneity; Financial constraints; Sunk costs

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[*] University of Nice-Sophia Antipolis, GREDEG UMR n° 6227, e-mail: flora.bellone@gredeg.cnrs.fr

[†] University of Savoie, IREGE (IMUS) and CERAM Business School, e-mail: patrick.musso@univ-savoie.fr

[‡] Observatoire Français des Conjonctures Economiques, Département de Recherche sur l'Innovation et la Concurrence (OFCE-DRIC), e-mail: lionel.nesta@ofce.sciences-po.fr

[§] Corresponding author. University of Trento, Department of Economics, and OFCE-DRIC, e-mail: stefano.schiavo@unitn.it

1. INTRODUCTION

The paper analyzes the link between financial factors and firm export behavior exploiting a large dataset on French manufacturing firms. There are several reasons making this a relevant issue. With the rise of the 'global economy' export performance is increasingly perceived as a key aspect of economic performance, both for firms and for the entire macroeconomic outlook. In the meantime, academics have been paying increasing attention to firm level studies. Wider access to firm level data, greater computational capabilities, as well as theoretical advances that depart from the representative agent framework have led economists to recognize that aggregate dynamics are the result of microeconomic behavior. Thus, a clear grasp of the latter becomes crucial to understand the former and to design appropriate policies.

In this paper we refer to export behavior in terms of both export participation and export intensity. A vast empirical literature documents a substantial heterogeneity across firms with respect to foreign markets penetration (ISGEP, 2008). This has mostly been explained in terms of systematic differences between firms in productivity levels. We claim that financial constraints represent an additional source of heterogeneity that can help to account for different in export behavior across firms.

Our theoretical background is casted in terms of the recent 'new-new' trade theory (Melitz, 2003) which emphasizes both firm heterogeneity and the relevance of sunk entry costs into export markets.[1] Once extended to allow for imperfect capital markets, these models show that financial variables can play a key role in determining firm export behavior (Chaney, 2005; Manova, 2006). Indeed, the existence of sunk entry costs into export markets brings about the question of the financing of such expenditures that, by their very nature, are not matched by contemporaneous revenues. In the presence of financial market imperfections, it may well be —and this is the main research question from which we start— that only those firms that can successfully overcome this financial problem become exporters. In fact, this would be consistent with the evidence of internationalized firms outperforming non exporters in several dimensions as shown in the large literature triggered by Bernard and Jensen (1995).

Rather than supporting this prior, the scant empirical evidence on the topic suggests that exporting improves firm access to financial markets either by reducing informational

[1]The assumption that entry into foreign markets involves large sunk costs is not a novelty in the trade literature: see for instance Baldwin (1988); Roberts and Tybout (1997). This assumption is supported by an expanding empirical literature (see, among others, Bernard and Wagner, 2001; Das et al., 2001; Tybout, 2001; Bellone et al., 2008*b*).

asymmetries or by reducing exposure to demand-side shocks through diversification (Ganesh-Kumar et al., 2001; Campa and Shaver, 2002; Greenaway et al.,2007). In what follows we present an evaluation of the *self-selection* and *ex-post* effects based on a large panel of French manufacturing firms. Our contribution is twofold. First, we propose a new way to measure the degree of financial constraint (based on the multivariate index proposed by Musso and Schiavo, 2008), which we believe is superior to existing methodologies. Second, we shed light on the role played by access to external financial resources in shaping firm export behavior. In so doing, we do not limit ourselves to export participation, but we also look at export intensity.

We can summarize our main findings as follows. First, firms starting to export display a significant *ex-ante* financial advantage compared to their non exporting counterparts. This is consistent with the idea that limited access to external financial funds may prevent firms from selling their products abroad. Second, we do not find significant improvement in the financial health of firms entering into export markets. Hence, in our sample foreign markets penetration is not associated with easier access to external financial resources, contrary to the evidence presented in other works (see for instance Greeneway et al., 2007). When we dig deeper into the relation between financial factors and the decision to start exporting, we find that better access to financial markets increases the probability of firm internationalization, and also shortens the time before that happens. Finally, among the subsample of export starters, there is a negative relationship between export intensity and financial health. Considering the former as a proxy for the number of destinations served, our results suggest that entering simultaneously into many different markets entails larger sunk costs and results in a deterioration of a firm financial position.

The rest of the paper is organized as follows. We next present an overview of the literature on financial constraints and firm export behavior. Section 3 presents the data, discusses the shortcomings of usual strategies employed to measure financial constraints, and illustrates the methodology adopted here. In Section 4, we test the two hypotheses that less constrained firms self-select into exporting, and that selling abroad improves firm financial health. We then look more in details at the role played by financial variables in shaping the decision to export: these results are discussed in Section 5. Section 6 concludes and draws some policy implications.

2. A GLANCE AT THE EXISTING LITERATURE

In presence of imperfect capital markets, one can figure out at least two reasons why exporting firms should be less financially constrained than non exporting firms.

First, if firms have to incur large sunk costs to enter into export markets, then enterprises unable to secure enough funds may have difficulties to reach foreign customers. This implies that only less constrained firms will be able to start exporting: such an idea is formalized by Chaney (2005) which adds liquidity constraints to a model of international trade with heterogeneous firms (in the spirit of Melitz, 2003). In fact, the new-new trade theory postulates that a large part of trade barriers faced by firms take the form of fixed costs to be paid up-front. The empirical literature documents significant hysteresis effects associated with firm export participation and interprets this as signaling the relevance of sunk entry costs: see for instance Roberts and Tybout (1997) for Colombia, Bernard and Wagner (2001) for Germany, Campa (2004) for Spain, Bernard and Jensen (2004) for the US. Das et al. (2001) estimate a structural model to quantify sunk costs and conclude that entry costs into export are substantial. In the business literature, Moini (2007) reports results form a survey among US non exporters, where firms claim their primary obstacle to initiate an export program is the presence of high up-front costs.

Second, the very fact of exporting could improve firm access to external financial funds. Again there are different candidate explanations for such an effect. Exporting firms should in principle enjoy more stable cash flows, as they benefit from international diversification of their sales. Hence, under the assumption that international business cycles are only imperfectly correlated, exporting reduces vulnerability to demand-side shocks. This is the argument put forward by Campa and Shaver (2002) and Bridges and Guariglia (2008). Alternatively, selling in international markets can be considered as a sign of efficiency and competitiveness by domestic investors. In a context of information asymmetries —which lie at the heart of financial markets imperfections— exporting would thus represent a clear signal sent by the firm to external investors. Since only the best firms export —as we know very well by the large body of empirical literature triggered by Bernard and Jensen (1995), and as demonstrated theoretically by Melitz (2003) — then exporting represents by itself a sign of efficiency and a costless way for creditors to assess the potential profitability of an investment. Ganesh-Kumar et al. (2001) find that this kind of mechanism is especially relevant in an emerging market such India, characterized by low institutional quality. Finally, exporting is likely to open up access to international financial markets as well, at least those

pertaining to the destination countries. In anything, foreign exchanges revenues represent a better collateral to access external funds in foreign financial markets. Once again this channel probably applies more directly to emerging economies, as postulated by Tornell and Westermann (2003).[2]

Empirically, Campa and Shaver (2002) show that investment is less sensitive to cash flow for the group of always exporters compared to the group of never exporters. Since in presence of perfect capital markets investment and cash flow should not be correlated, investment-cash flow sensitivity is often regarded as a measure of financial constraints (more on this below). Also, when the two authors consider firms that move in and out from export markets, they find these are more constrained when they do not sell abroad. Hence, they conclude that exporting can help firms to reduce their financial constraints. One possible weakness of the paper lies in the fact that export intensity has no role in the play. In fact, if the diversification and the signaling channels were actually at work, one would expect a positive correlation between the export to sales ratio and its ability to reduce financial constraints. Yet, Campa and Shaver fail to find such a relationship.

Two recent papers provide further evidence backing the idea that exporting exerts a positive effect on firm financial health. Working with a large panel of UK manufacturing firms Greeneway et al. (2007) look for a causal nexus between the two variables, and conclude that causality runs from export to financial health. In other words, they find no evidence in favor of the hypothesis of less constrained firms self-selecting into export activities, but rather strong evidence of a beneficial effect of the latter on financial health.[3] In particular, they find no significant difference in the average liquidity (or leverage) ratio of export starters and never exporting firms. On the contrary, when comparing continuous exporters and starters, they find the former to enjoy a better average financial health over the sample period. Hence, they conclude that exporting does improve firm financial status, since participating to export for longer periods makes enterprises more liquid and less leveraged.

Bridges and Guariglia (2008) focus on survival among UK firms. More specifically, they look at the interrelations between global engagement (of which export is just one possible manifestation), financial health, and survival. They find that lower collateral and higher

[2]The relevance of the institutional context is witnessed by a recent work by Espanol (2006) who find exporting firms in Argentina more financially constrained than their competitors only serving the domestic market. This can be explained by the appreciation of the local currency in the early 1990s, which resulted in a profit squeeze for exporters, and weakened their balance sheets.

[3]We will discuss the issues related to the measurement of financial constrained in Section 3 below. For the moment, it suffices to say that Greeneway et al. (2007) use the liquidity ratio and the leverage ratio to proxy for financial constraints.

leverage do result in higher failure probabilities, but only for purely domestic firms. They interpret this as evidence that international activities shield firms from financial constraints or, to put it in the terminology used so far, that internationalization is beneficial from a financial point of view.

Despite this body of literature, we claim that the issue is not fully settled yet. We base this statement on different considerations. First, the way financial constraints are identified and measured remains largely debated. As discussed below, the usefulness of investment cash flow sensitivity as a measure of financial constraints is increasingly challenged and recent theoretical works cast doubts also on other widespread proxies. Second, the role played by export intensity has been largely disregarded so far and remains to be determined. Last, the econometric specifications used in the literature appear not always consistent with the stated goal of testing the relevance of self-selection into export markets and of the existence of a beneficial effect of internationalization on firm financial health.

3. DATA AND METHODOLOGY

We use data from two main sources. Both of them collect information on French firms, though their coverage is somehow different. The first (*Enquête Annuelle d'Entreprises – EAE*) is an annual survey that gathers balance sheets information for all manufacturing firms with at least 20 employees.[4] The second source of information is the *DIANE* database published by Bureau van Dijk, which collects data on over 1 million French firms. It provides us with many financial variables absent from the *EAE* survey. Merging the two datasets yields around 170,000 firm/year observations, stemming from an unbalanced panel of over 25,000 manufacturing enterprises followed over the period 1993 – 2005.

The actual number of observations used in the empirical analysis varies according to the specific econometric exercise. When testing for self-selection effects or *ex post* benefits, we restrict our attention to export starters and never exporting firms exclusively, reducing the number of firms to 5,700 (900 when we use models with a longer lag structure, see Section 4). The duration analysis (Section 5*a*) also focuses on never exporters and starters only, but the absence of any lag in the econometric model grants us with a dataset of 12,000 firms. On the contrary, our analysis of the decision to export (Section 5*b*) pools all firm types together and

[4]The survey is conducted by the French Ministry of Industry. The surveyed unit is the legal (not the productive) unit, which means that we are dealing with firm-level data. To investigate the role of financial constraints on growth and survival, firm, rather than plant level data seem indeed appropriate.

therefore exploits the entire dataset: there the number of observations ranges between 19,800 and 22,000.

a. Measuring financial constraints

The way financial constraints are measured is a very sensitive issue in the literature investigating the link between financial factors and firm behavior. Theory offers only limited guidance in this domain, so that a clear-cut consensus has still to emerge. Under perfect capital markets, internal and external sources of financial funds should be perfectly substitutable (Modigliani and Miller, 1958), so that the availability of internal funds should not affect investment decisions. Yet, when a standard investment equation is augmented with cash flow availability, the fit of the equation improves. The most common proxy for financial constraints is thus the sensitivity of investment to cash flow. This methodology builds on Fazzari et al. (1988) who first define firms as financially constrained or unconstrained based on their dividend payout ratio, then show that likely constrained firms (low dividend payout) display higher investment-cash flow sensitivity. A number of subsequent studies find supporting evidence using different variables to identify constrained firms (see for instance Bond and Meghir, 1994; Gilchrist and Himmelberg, 1995; Chirinko and Schaller, 1995).

On the contrary, Devereux and Schiantarelli (1990) find that larger firms (less likely to be constrained) exhibit a higher cash flow coefficient in the regression equation, even after controlling for sector heterogeneity. But it is only with the work by Kaplan and Zingales (1997) that the usefulness of investment-cash flow sensitivity as a measure of financial constraint has been definitely questioned. Since then, other authors have reported evidence of a negative relation between investment-cash flow sensitivity and financial constraints (for instance Kadapakkam et al., 1998; Cleary, 2006).

Alternative strategies consist of simply classifying firms according to various proxies of informational asymmetries (as these represent the main source of financial markets imperfections). Hence, variables such as size, age, dividend policy, membership in a group or conglomerate, existence of bond rating, and concentration of ownership are used to capture ways to cope with imperfect information, which hinders access to capital markets (see for instance Devereux and Schiantarelli, 1990; Hoshi et al., 1991; Bond and Meghir 1994; Gilchrist and Himmelberg, 1995; Chirinko and Schaller, 1995; Cleary, 2006). Other papers (e.g. Becchetti and Trovato, 2002) use survey data where firms give a self-assessment of their difficulty to obtain external financial funds.

The major weakness of these strategies —as already noted by Hubbard (1998) — is that most of the criteria tend to be time invariant whereas one can imagine that firms switch between being constrained or unconstrained depending on overall credit conditions, investment opportunities and idiosyncratic shocks. As a further potential problem, we add that all the abovementioned works rely on a unidimensional definition of financial constraint, i.e. they assume that a single variable can effectively identify the existence of a constraint, which is viewed as a binary phenomenon either in place or not. Notable exceptions are the works by Cleary (1999), Lamont et al. (2001) and Whited and Wu (2006). The first paper derives a financial score by estimating the probability of a firm reducing its dividend payments (viewed as a sign of financial constraints) conditional on a set of variables that are observable also in the case of unlisted firms. Lamont et al. (2001) build a multivariate index by collapsing into a single measure five variables weighted using regression coefficients taken from Kaplan and Zingales (1997). The main problem here rests with the need to extrapolate results derived from a small sample of US firms and apply them to a larger and different population.[5] Based on a structural model, Whited and Wu (2006) use the shadow price of capital to proxy for financial constraints.

In the paper, we experiment different measures of financial constraints. The first two are the liquidity ratio and the leverage ratio as employed by Greeneway et al. (2007).[6] We find two main shortcomings in these measures. First, they only capture one dimension of access to financial markets: a firm may be liquid but nonetheless present a bad financial situation; on the other hand, strong fundamentals may compensate for a temporary shortage of liquid assets. Second, both ratios may suffer from some endogeneity. In other words, there are no clear-cut theoretical priors on the relation between either liquidity or leverage and financial constraints. While liquidity is generally regarded a sign of financial health, firms may also be forced to withhold cash by the fact that they are unable to access external funds. In fact, a recent theoretical contribution by Almeida et al. (2004) shows that financially constrained firms tend to hoard cash, so that liquidity would be associated with financial constraints, not lack thereof. In a similar vein, a high leverage, while signaling potential dangers, suggests

[5]Furthermore, one of the variables needed to compute the index is Tobin's Q, whose use as a proxy for investment opportunities has often been criticized.

[6]The liquidity ratio is defined as a firm's current assets minus its short-term debt over total assets; the leverage ratio as a firm's short-term debt over current assets.

also that the firm has enjoyed, at least in the recent past, wide access to external financial funds. Hence, one could argue that highly leveraged firms are not financially constrained.[7]

To account for these potential problems, we build two other measures of financial health according to the methodology first proposed by Musso and Schiavo (2008). They exploit information coming from seven variables: size (total assets), profitability (return on total assets), liquidity (current asset over current liabilities), cash flow generating ability[8], solvency (own funds over total liabilities), trade credit over total assets, and repaying ability (financial debt over cash flow).[9]

For each variable, we scale each firm/year observation for the corresponding 2-digit NACE sector average and then assign to it a number corresponding to the quintiles of the distribution in which it falls.[10] The resulting information for each of the seven variables (a number ranging from 1 to 5) is then collapsed into a single index in two alternative ways: (i) a simple sum of the seven numbers (*Score A*); (ii) a count of the number of variables for which the firm/year lies in the first or second quintiles (*Score B*).[11] In both cases the index is then rescaled to lie on a common 1–10 range.

[Insert Table 1 here]

The correlations between the four measures of financial constraints are presented in Table 1. Both the Pearson's and the Spearman's correlation coefficients are reported, respectively below and above the main diagonal of the correlation matrix. Leverage and liquidity are strongly negatively correlated: more liquid firms are also less leveraged, meaning that these two measures of financial health go hand in hand. Something similar happens for the two multivariate scores: irrespective of the way information is combined firms are ranked in a very similar order in terms of access to external financial resources. This results in a

[7]A further problem is that leverage and liquidity appear as the financial variables best discriminating between exporting and non exporting firms in the sample analyzed by Greeneway et al. (2007). Therefore, one runs the risk of ending-up with some sort of a built-in relation between these two financial variables and export status (see Greeneway et al., 2005, for details on the choice of the financial variables).

[8]This is the maximum amount of resources that a firm can devote to self-financing, and corresponds to the French *capacité d'autofinancement*.

[9]They are selected on the basis of their performance in existing studies, and their perceived importance in determining ease of access to external financial funds.

[10]Sectoral averages are subtracted to account for industry-specific differences in financial variables. Furthermore, to limit the effect of outliers we trim observations lying in the top and bottom 0.5% of the distribution for each the seven variables.

[11]We have tried also other ways to combine the information, with identical results. Additional details are available upon request.

Spearman's ρ correlation of 0.90, while Pearson's correlation coefficient reaches 0.91. Hence, Table 1 suggests that the two ratios, and the two scores provide very similar information. On the other hand, measuring financial constraints by means of a ratio or of a multivariate index provides us with a different picture of the phenomenon at stake. In what follows we will concentrate on the liquidity ratio and on *Score A* only: both measures are increasing in financial health (contrary to leverage), which simplifies the discussion. Results are qualitatively unchanged if one uses the leverage ratio and *Score B*.[12]

b. Firm productivity

In the following empirical analysis we will often use measures of total factor productivity (TFP) to control for the existing heterogeneity among firms. TFP is computed using the so-called *multilateral productivity index* first introduced by Caves et al. (1982) and extended by Good et al. (1997). This methodology consists of computing the TFP index for firm *i* at time *t* as follows:

$$TFP_{it} = y_{it} - \bar{y}_t + \sum_{\tau=2}^{t}(\bar{y}_\tau - \bar{y}_{\tau-1}) - \left[\sum_{n=1}^{N}\frac{1}{2}(S_{nit} + \bar{S}_{nt})(x_{nit} - \bar{x}_{nt}) + \sum_{\tau=2}^{t}\sum_{n=1}^{N}\frac{1}{2}(\bar{S}_{n\tau} + \bar{S}_{n\tau-1})(\bar{x}_{n\tau} - \bar{x}_{n\tau-1})\right] \quad (1)$$

where Y_{it} denotes the real gross output of firm *i* at time *t* using the set of *N* inputs X_{nit}, where input *X* is alternatively capital stocks (*K*), labor in terms of hours worked (*L*) and intermediate inputs (*M*). S_{nit} is the cost share of input X_{nit} in the total cost.[13] Subscripts τ and *n* are indices for time and inputs, respectively, upper bars denote sample means, and small letters stand for the logs of the variables (e.g. $y_{it} = \ln Y_{it}$). This index makes the comparison between any two firm-year observations possible because each firm's inputs and outputs are calculated as deviations from a reference firm. The reference firm is a hypothetical firm that varies across industries with outputs and inputs computed as the geometric means of outputs and inputs over all observations and input cost-based shares computed as an arithmetic mean of cost shares over all observations.[14] This non parametric measure of relative productivity has been

[12]This second set of results is not reported but remains available upon request.

[13]See Bellon et al. (2008*a*) for more details on the method and a full description of the variables.

[14]Firms are allocated to one of the following 14 two-digit industries: Clothing and footwear; Printing and Publishing; Pharmaceuticals; House equipment and furnishings; Automobile; Transportation Machinery; Machinery and Mechanical equipment; Electrical and electronic equipment; Mineral industry; Textile; Wood and paper; Chemicals; Metallurgy, Iron and Steel; Electric and Electronic components.

popularized in the export-productivity literature by the contributions of Aw et al. (2000), and Delgado et al. (2002).

4. EXPORT AND FINANCE: SELF-SELECTION OR EX-POST BENEFIT?

We start our econometric analysis by explicitly testing the two hypotheses mentioned above, namely that less constrained firms self-select into export, and the possibility that exporting improves financial health.

a. Descriptive statistics

Table 2 presents descriptive statistics for the whole sample and also for different types of firms. We classify firms according to their export status separating those which export throughout the sample period (Continuous Exporters), those not exporting initially but entering foreign markets between 1993 and 2005 (Export Starters), and those always serving the domestic market only (Never Exporters).

Consistently with the large empirical literature on export and performance (see Bernard et al., 2007, for a recent overview) we find that exporters tend to be larger and more productive, as well as to pay higher wages. Similarly, exporting firms appear more liquid and display easier access to external financial funds as measured by *Score A*. Export starters lie somewhat in the middle of the two groups. The last column of the Table reports a *F*-test for equality of means across the three groups. The *F*-statistics are always larger than the 1% critical values, thus rejecting the null hypothesis of equal means across the different types of firms.

[Insert Table 2 here]

On average, continuous exporters are double the size of non exporting firms in terms of employees, they pay salaries that are 17% higher, and are 33% more liquid. The difference between starters and never exporters are much lower and in terms of productivity the equality of means cannot be rejected.

b. The ex-ante financial advantage of future exporters

We start by comparing *ex-ante* financial health for exporters and non exporters. This tells us whether future exporters were less financially constrained than their non exporting counterparts even before entering foreign markets. The comparison is performed with firms belonging to the same industry and sharing similar characteristics in terms of size and

efficiency. The econometric specification is adapted from the literature on export and performance (Bernard and Wagner, 1997; Bernard and Jensen, 1999), where this kind of empirical exercises are routinely performed. We focus our attention only on non exporting firms and export starters, and compare their financial health 1 and 3 years before the latter group begins to export. The resulting sample is comprised of 5,727 firms when we lag observations one year *(t-1)*, and 2169 firms when we lag observations three years *(t-3)*. Hence, *t* is the year of entry into foreign markets (in the case of export starters), while we set it equal to the median year for never exporters (a similar solution is adopted in Bellone et al., 2008*b*; ISGEP, 2008). Specifically, we estimate:

$$FIN_{i,t-s} = \alpha + EXP_{it} + \gamma Z_{i,t-s} + \varepsilon_{it} \quad (2)$$

where *FIN* is either *Score A* or the liquidity ratio, *EXP* is the dummy for export status, and *Z* a vector of controls that comprises *Size* (captured by the log of Employment, measured in terms of total hours worked), productivity (*TFP*), and a set of industry-year dummies. It must be emphasized that equation (2) does not test for a causal relationship. Rather, it allows us to evaluate the strength of the pre-entry premium —i.e. to see to what extent firms that export in time *t* were already less financially constrained 1 and 3 years before entering foreign markets— by means of a simple *t*-test on the significance of the β coefficient. Results are presented in Table 3.

[Insert Table 3 here]

When access to financial resources is measured using of *Score A*, the coefficient of the export dummy is positive and significantly different from zero both in *t-1* and in *t-3*. Although the point estimate for the β coefficient is larger in $\tilde{t}$-3, we cannot reject the hypothesis of the two being equal, so that the difference in the estimated β in *t-1* and *t-3* is not statistically significant. The better financial health of future exporters is less pronounced in terms of liquidity: exporters appear more liquid one year before entry, but not 3 years before.

As discussed above, we claim that liquidity captures just one aspect of firm ability to access external financial resources, and suffers from potential endogeneity since higher liquidity may signal the need for the firm to hoard cash due to its difficulties in accessing external financial funds. Therefore we give more credit to results obtained using *Score A*.

Overall, Table 3 suggests that firms deciding to enter into foreign markets enjoy better financial health *ex-ante*.

Equation (2) is estimated using never exporters and export starters alone; moreover, we include both successful exporters (i.e. those firms that keep exporting ever since their entry into foreign markets) and firms that stop exporting after a few years. This reduces potential sample selection biases and reinforces our results since it works against the hypothesis of self-selection.

Our conclusions differ sharply from those reported in Greeneway et al. (2007): such difference can be imputed both to the introduction of a new way to measure financial constraints, and to the econometric methodology. In particular, while Greeneway et al. (2007) look at the average liquidity of firms prior to entry into foreign markers, here we look at different points in time as normally done in the literature on export and productivity (Bernard and Jensen, 1999).

c. Detecting ex-post effects

The results from the previous Section suggest that less constrained firms tend to become exporters. This does not rule out the possibility that internationalization further boosts firm financial health. Here we look at the extent to which this happens while disregarding the specific reason behind the phenomenon: this is to say that we do not ask whether it is a diversification rather than a signaling effect that matter.

Once again we stick to an empirical specification taken from Bernard and Jensen (1999). The idea is very simple and consists in running a regression of the change in financial variables on initial export status and initial firm characteristics. From the previous Section we know that exporters enjoy better access to external funds: if export participation is beneficial, then we should observe a differential in the way financial variables move after exporting firms have started to serve foreign markets. We focus on a subsample made of newly internationalized firms (export starters) and purely domestic enterprises, and we estimate the following equation:

$$\Delta\%FIN_{i,t+s/t+q} = \alpha + \beta EXP_{i,t} + \gamma Z_{i,t} + \varepsilon_{i,t} \qquad (3)$$

where $\Delta\%FIN_{i,t+s/t+q}$ identifies the growth rate of the financial variable between time $t+s$ and $t+q$ computed as log differences. As before, t is the first year of export for starters, whereas it

identifies the median year of observation in case of never exporters. The coefficient β represents the increase in the growth rate of exporting firm financial health relative to non exporters. If export is truly beneficial then we expect β to be significantly different from zero.

[Insert Table 4 here]

As highlighted by estimated coefficients in Table 4 we do not find any evidence to support the idea that exporting improves firm access to external financial funds. We look at the growth of financial variables over a very short time span, namely between the first year of entry and the following year, and also over 3- and 5-year periods. In none of the cases is the export dummy significant. Arguably, this does not necessarily means that exporting does not affect financial health, but simply that beneficial effects do not appear within a 5-year horizon. Data limitations prevent us from looking at longer horizons, since we would end up with too few observations.

Equation (3) is estimated on the sample comprising export starters and never exporting firms only, restricting the first group to successful entrants, i.e. only those firms that do not exit from foreign markets (this explains the drop in the number of observations when moving from Table 3 to Table 4. Results are qualitatively unchanged if they are included: their exclusion should make easier to find an *ex post* benefit since the sample is biased in favor of the most successful firms.

In Section 2 above we have discussed two possible reasons why exporting may exert a positive effect on firm financial health, namely a diversification effect and a signaling effect. In both cases one could argue that the mere fact of selling part of the production above is not sufficient to trigger those beneficial effects, but that there is a sort of threshold effect below which export does not count. In other words, it seems natural to look at whether export intensity plays a role in the game or not. As already mentioned, Campa and Shaver (2002) fail to find a relation between the share of sales to foreign customers and financial constraints, while Greeneway et al. (2007) disregard the issue.

Hence, we substitute the export dummy with the log of export intensity (defined as export over sales). Results presented in Table 5 are qualitatively unchanged: a higher share of sales

in foreign markets is not associated with higher growth in financial health, regardless of the way this is measured.[15]

Our conclusion is confirmed when we re-estimate equation (3) on a subsample comprising only non exporting firms and those export starters characterized by an export intensity larger than the sector median. Results (not reported) mimic those already presented in Table 4 and therefore do not provide any support to the existence of a beneficial effect of exporting on financial health. Thus, overall we do not find any compelling evidence that export participation is associated with improved financial health in the years that follow entry into foreign markets.

[Insert Table 5 here]

5. MODELLING THE DECISION TO EXPORT

Firm export behavior must ultimately be conceived as a series of decisions regarding both participation to export markets and the firm's commitment to international trade. These decisions can be modeled as the outcome of a variety of factors. Heterogeneity of firm productivity levels is the utmost explanation for the observed differences in export behavior across firms. Because firms are heterogeneous in their productive efficiency, they all have an idiosyncratic ability to cope with the sunk entry costs associated with exporting. Yet this may not exhaust the explanation. The firm's ability to access external financial resources may well constitute another important part of the story. In this Section, we first investigate the factors driving the decision to export in a standard binary choice framework (Roberts and Tybout, 1997; Bernard and Wagner, 2001). Then we focalize on those firms entering for the first time foreign markets since, in presence of sunk costs, financial constraints should be particularly relevant for first-time exporters. Finally, we look at the determinants of export intensity. Taking stocks of our previous findings, we expect financial constraints to be an important driver of export behavior by firms, controlling for other relevant factors such as productivity, human capital and firm size.

[15]The message does not change if both the export dummy and export intensity are included among the regressors, as well as when we add additional controls such as a dummy for multi-plan firms and wage per employee.

a. The decision to export

In this Section we follow closely Roberts and Tybout (1997) and Bernard and Wagner (2001) and estimate a reduced form econometric specification whereby the probability of exporting at time *t* is considered as a function of firm characteristics at time *t-1*. These include firm size, productivity, wage per employee, along with industry and year dummies. We augment this standard specification with our two alternative measures of financial constraints, so that we end up estimating the following equation:

$$EXP_{it} = \alpha + \beta_1 Size_{i,t-1} + \beta_2 Wage_{i,t-1} + \beta_3 TFP_{i,t-1} + \beta_4 Subsid_i + \beta_5 FIN_{i,t-1} + industry + year + \varepsilon_{it} \quad (4)$$

where the subscript *i* indexes firms and *t*, time. *EXP* is a dummy variable equal to 1 if firm *i* exports in year *t*, and 0 otherwise. *Size* is the log of employment (total hours worked), *Wage* is the log of the ratio between the firm total wage bill and the number of hours worked, *TFP* is our index of relative productivity (in logs), *Subsid* is a dummy variable equal to 1 if the firm has multiple business units, and 0 otherwise. *FIN* denotes alternatively *Score A* or the Liquidity ratio.

In first instance equation (4) is estimated by means of a random effect probit model. Then, taking stock from the previous literature that stresses the importance of hysteresis in export markets, we augment the model with lagged export status. The dynamic specification is then estimated again using both a random effect probit model and a Dynamic GMM estimator (Bernard and Wagner, 2001; Greeneway et al. 2007). Results are presented in Table 6.

[Insert Table 6 here]

In the static model of Columns (1) and (2) financial variables have the expected sign and are significant: more liquid firms are more likely to export in the next period, as well as firms enjoying a better financial health (as measured by *Score A*). Results do not change when we introduce lagged export status, suggesting that financial constraints remain a significant determinant of export strategy also for firms that already operate in foreign markets. However, once the lagged dependent variable is included among the regressors, potential endogeneity biases arise, which must be taken care of. This is done by means of the panel GMM estimator developed by Arellanoo and Bond (1991): results obtained using this methodology are presented in Columns (5) and (6). These show that once endogeneity biases

are corrected for, past export status captures the effect of all other controls. Only size retains a significant effect on the probability of exporting, whereas all other variables —including financial constraints— seem irrelevant for firms that are already selling abroad.

Hence, results from Table 6, while broadly consistent with the prior of financial variables being relevant for the decision to export, are not unambiguously supporting this intuition. The likely cause is that in estimating equation (4) we are pooling together new exporters and firms that already operate in foreign markets. But since the main reason why external financial resources are relevant is because of the need to cover sunk entry costs into destination countries, then it is likely that financial variables affect very differently first-time exporters and firms already accustomed to selling abroad. To investigate this issue further, we now focus our analysis only on those firms faced with the decision to start exporting for the first time. This is done mobilizing two econometric methodologies that account for time duration and selection biases, respectively.

b. Accounting for time duration to export markets

To model firm entry decision into foreign markets in terms of time duration is tantamount to equating firm growth with entry into export markets. Although export is a relatively rare activity (Bernard et al., 2007), it becomes extremely widespread for larger firms: for instance, French data reveal that 70% of firms with more than 20 employees (with represent our unit of analysis) will ultimately penetrate foreign markets; this proportion increases to 95% for firms with more than 500 employees[16]. This suggests that entry into export markets is a necessary —yet significant— step for growth. Hence, the relevant issue is not so much whether firms enter into export market, but rather the time it takes for a firm to eventually start serving foreign customers. This Section tackles this issue explicitly using discrete-time duration models.

We estimate a duration model for grouped data following the approach first introduced by Prentice and Gloeckler (1978). Suppose there are firms $i = 1,\ldots,N$, that enter the industry at time $t = 0$. The hazard rate function for firm i at time t and $t = 1,...,T$ to start exporting is assumed to take the proportional hazard form: $q_{it}=q_0(t)\times X'_{,it}b$, where $q_0(t)$ is the baseline hazard function and X_{it} is a series of time-varying covariates. More precisely, let $X = \{Size; Wage; TFP; Subs; FIN\}$, where *Size* stands for employment weighted by the numbers of hours worked, *Wage* is the wage bill per employee in order to control for systematic differences

[16]Data for all firms, on the contrary, tells that less then one fifth of manufacturing firms exports, a figure well in line with the literature.

between firms in terms of human capital, *TFP* is total factor productivity, *Subs* is set to unity if firms has one or more subsidiaries and *FIN* is a measure of financial constraints. In line with the theoretical literature, a clear assumption of the empirical model is that two firms of the same age and with similar characteristics should start exporting after the same number of years from start-up. The discrete-time formulation of the hazard rate of first export for firm *i* in time interval *t* is given by a complementary log logistic function such as:

$$h_t(X_{it}) = 1 - \exp\left\{-\exp\left(X'_{it}\beta + \theta(t)\right)\right\} \quad (5)$$

where $\theta(t)$ is the baseline hazard function relating the hazard rate $h_t(X_{it})$ at the t^{th} interval with the spell duration (Jenkins, 1995). Importantly, our sample includes companies of different age, which in turn may harm the estimation of the non-exporting spell. To deal with the issue of left censoring, we augment vector *X* with a full vector of dummy variables controlling for firm age. We also add a full set of year fixed effects in order to control for the business cycle. Hence, controlling for both firm age and year-specific effects will allow us to interpret the hazard function as the result of the mere passage of time on the probability to expand activities abroad. Finally, we model the baseline hazard function by using the log-transformed of $\theta(t)$, an integer counting the number of years of presence in the market. This choice is the discrete-time counterpart of a continuous-time specification with a Weibull hazard function.[17]

This model can be extended to account for unobserved heterogeneity —or 'frailty', to account for systematic differences between firms.[18] In a way, the inclusion of unobserved heterogeneity is a generalization of a pooled specification ignoring it. It controls for both the omitted variable bias and measurement errors in observed survival times and regressors (Jenkins, 1995). Suppose that unobserved heterogeneity is described by a random variable e_i independent of X_{it}. The proportional hazard form with unobserved heterogeneity can now be written as:

[17]It is important to distinguish between the time variable $\theta(t)$ and year specific effects. Variable $\theta(t)$ is an integer counting the number of years of observations in the dataset for a specific company, and year dummies control for macro-economic shocks which pertain to all companies. Moreover, we have experimented for alternative specifications if Time, namely the semi-parametric, polynomial specification using time together with its squared $\theta(t)^2$ and cubic values $\theta(t)^3$, and a fully non-parametric approach using duration-interval-specific dummy variables. Because this choice does not affect the conclusions, we do not report the results from these specifications, but they are available on request.

[18]The term 'frailty' comes from medical sciences where it represents the unobserved propensity to experience an adverse health event.

$$h_t(X_{it}) = 1 - \exp\left\{-\exp\left(X'_{it}\beta + \theta(t)\right) + \varepsilon_i\right\} \quad (6)$$

where ε_i is an unobserved individual-specific error term with zero mean, uncorrelated with the *X*'s. Model (6) can be estimated using standard random effects panel data methods for a binary dependent variable, under the assumption that some distribution is provided for the unobserved term. In our case, we will assume that the ε_i are distributed Normal and Gamma (see Jenkins, 1995 for more details). Note that our comments will focus on the Gamma distribution exclusively, and other estimates are provided as robustness checks.[19] Lastly, we perform a likelihood ratio test between the unrestricted model (with unobserved heterogeneity) and the restricted model (without unobserved heterogeneity) to test for the relevance of unobserved frailty. The reported estimates are chosen from the log likelihood ratio test (LR test).

[Insert Table 7 here]

The results are displayed in Table 7, where *Score A* and the liquidity ratio have been used as proxies for financial constraints. The first two columns provide estimates for pooled data and columns (3) to (6) display estimated parameters controlling for unobserved heterogeneity.[20] Generally speaking, all specifications exhibit strong consistency in the direction and significance of the parameter estimates. Since the LR test confirms the importance of unobserved heterogeneity, we exclusively comment on the specification controlling that controls for it.

Particularly satisfactory is the consistency and significance of the two measures of financial constraints, despite the fact that, with a critical probability value of 7% in model (5), *Score A* appears somewhat less significant. Both suggest that financially healthy firms find it easier to start exporting. To put it differently, availability of financial resources shortens time leading to first export. In a way, this should come as no surprise. Both the theoretical and empirical literature insist on the sunk costs implied by the expansion of activities abroad.

[19]This choice is arbitrary. As of today, there is no particular reason to prefer the assumption of a Gamma-distributed frailty over the normal distributed one. This choice is mainly motivated by the fact that the Gamma distribution is particularly convenient to manipulate and has thus been the most popular. As displayed in Table 7, results under the alternative assumption are in all respect consistent with the Gamma assumption.

[20]In columns (3)and (4) unobserved heterogeneity is assumed to be normally distributed, while in columns (5) and (6) the assumption is a Gamma distribution.

Hence firms with stronger financial resources should be in a better position to cope with the extra costs —with no immediate compensation— associated with first exports. One surprise comes from the counter-intuitive sign of *TFP*, implying that more productive firms are less likely to enter into export markets. Although apparently at odds with the theoretical literature (Melitz, 2003), this results is consistent with Bellone et al. (2008*b*), where a U-shaped productivity pattern is revealed for future French exporters.[21] Lastly, both size and human capital, i.e. respectively employment and wage per employee, have the expected sign. These estimates imply that large firms intensive in human capital are more likely to go abroad.

[Insert Table 8 here]

Using model (5), Table 8 displays the estimated baseline hazard function for the representative firm. Note that in using a discrete-time duration specification, hazard rates can be interpreted as probabilities of entry into export markets. First, we observe that the hazard rate function is monotonically decreasing in time. This suggests that as time goes by, firms will find it increasingly difficult to start exporting. We observe that the probability of entry into export markets is 35% at the year of entry into the industry, to reach 24% after year 13. Second, Table 8 also displays the hazard function for firms located in the 1^{st} and 9^{th} decile of each significant explanatory variables, holding all other firm characteristics constant. For simplicity, we choose to comment year 5 exclusively. We observe the followings: with respect to the first decile of the size distribution, firms located at the 9^{th} decile are 30% more likely to enter into export markets (the probability rises from 24 to 32%); firms paying higher salaries (in the 9^{th} decile of the distribution) are 7 times more likely to enter into export markets than firms in the first decile; firms located at the 9^{th} decile of financial constraints (*Score A*) are 6% more likely to enter into export markets.

This important role for average wage suggests that the variable is probably serving as a proxy for some unobserved firm characteristic, that are relevant in the decision to export, such as human capital. Turning to the effect of financial constraints, its limited magnitude (+6%) leads us to conclude that if their effect is statistically significant, its economic relevance is somewhat limited as compared with other variables. Using the liquidity ratio of model (6), the

[21]The paper shows that future exporters outperform their non exporting counterparts five years prior to entry into export market. But in their preparation to first export, firm productivity is found to temporarily decrease to then recover contemporaneously with entry. The interpretation is that the benefits from sales to foreign markets accrue at the time of entry, boosting the firm's level of productivity.

marginal effect of financial constraints on the probability of exports rises somewhat, with a probability of exporting of 25.8% and 29.0% for firms located at the 1^{st} and 9^{th} decile, respectively. Comparing these values with those of Table 8 shows strong consistency and the conclusion that the effect of financial constraints on the probability to export is limited in scope still holds.

To recapitulate, we find that financial constraints are a significant determinant of firm export decision, but that as firm size, the impact of financial constraints upon the probability of exporting is far less important than the firm's endowment in human capital and skills. Next Section extends the analysis to investigate the role of financial constraints on firm-level export intensity.

c. Accounting for initial export intensity

Here, we tackle the issue of the relationship between financial constraints and export volume at the year of entry. Because positive exports implies that non-exporters be excluded from the sample of analysis, one must first correct for sample selection bias and depict in the qualitative equation the probability of being an exporter. In other words, explaining firm commitment to export markets necessarily calls for a broader investigation explaining why firms choose to expand their activities abroad in the first place. First, firms must decide whether to export and, conditional on this decision, they set the volume of their production to sell abroad. We model these two decisions by means of a Heckman model as follows

$$ei_{it} = \mathrm{X}_{i,t-s}\beta + \sigma'\lambda\left(\mathrm{X}'_{i,t-s}\hat{\beta}'\right) + \upsilon_i \qquad (7)$$

where *i* stands for firm *i*, *t* stands for year *t*, *ei* is log export intensity, *X* is the vector of explanatory variables as previously defined, β is the vector of parameter of interest and υ is an error term.[22]

[Insert Table 9 here]

[22]The Heckman specification augments the model by adding the inverse Mill's ratio $\lambda\left(\mathrm{X}'_{i,t-s}\hat{\beta}'\right)$, where $\hat{\beta}'$ is obtained from the first step probit regression of export decision on *X'*, a vector of variables describing the determinants of export entry, which may or may not be equal to *X*. In the present case, we set $X \equiv X'$. Parameter σ' is then used to estimate ρ, a measure of selection bias correction.

Table 9 reports the results for both the selection equation explaining the decision of entry into export markets and the quantitative equation explaining export intensity at the time of first export (firms exporting throughout the sample period are therefore excluded from the analysis). Control variables are set both at time *t-1* and *t-3*. Altogether, the qualitative equation shows consistency with the previous results concerning wage per employee and financial variables, whereas the role of size vanishes. Looking at the quantitative equation at time *t-1*, the striking result is the switch in sign regarding financial constraints. Financially healthy firms are more likely to enter into export markets, but conditional on this decision, firms which commit more to international trade appear to be financially more constrained.

Since the regression analysis is performed only on export starters, export intensity measures the share of sales shipped abroad in the first year of export. Hence, we interpret the results as a signal that export intensity is an indirect measure of sunk entry costs into export markets. Indeed, since these costs tend to be market-specific, high export intensity is most likely associated with a firm entering simultaneously in several foreign markets.[23]

The above remarks should call for caution. Our interpretation suggests that financial constraints suffer from an endogeneity problem yielding this negative association with export intensity. Importantly, the endogeneity problem is essentially caused by the simultaneous relationship between sunk costs of entry into export markets and financial health. Hence in order to control for that, we lag all explanatory variables three years.[24] We find that three years before entry, financially healthy firms find it easier to enter into export markets, but financial variables do not bear any relation with the choice of the share of production which goes abroad.

To recapitulate, financial health is an important determinant of the decision to enter into export markets made by firms. But export intensity is chosen irrespective of financial health. The choices about the volume of export and the number of markets served are not driven by the availability of external financial resources.

[23]We do not have information on the number of markets served by exporting firms in the sample. However, the (Spearman's) correlation between export intensity and the number of export markets served —computed on a different sample of French firms— ranges between 0.53 and 0.65, thus signalling a rather strong relationship between the two variables (we thank Matthieu Crozet for providing us with this information).

[24]We also experimented for a five-year lag but since the results are strictly equivalent to those using a three-year lag, we report the results for a three-year lag exclusively.

6. CONCLUSION

In the last 10 years or so, a large empirical literature has emerged that studies the peculiar characteristics of exporting firms. Two broad stylized facts emerge: exporters perform substantially better than their non exporting competitors; there are wide cross-country differences in firm export behavior. This paper adds to this stream of the literature by looking at financial factors as a key determinant of firm decisions. More specifically, we investigate whether limited access to external financial resources may prevent firms from expanding their activities abroad, and whether internationalization has any positive effect on financial health.

We find strong evidence that less credit-constrained firms self-select into export markets or, from a complementary point of view, that external funds are an important determinant of firm export status. In fact, export starters display better financial health than their non exporting competitors even before starting to operate abroad. On the contrary, the hypothesis that internationalization leads to better access to financial markets finds no support in our analysis. We observe that access to external financial resources is a significant but not crucial determinant of the probability to start exporting, but we find no evidence of a positive relationship between financial health and the share of production sold abroad. This result corroborates the idea that the relevance of financial constraints is due to the presence of sunk entry costs.

All in all, we conclude that our empirical analysis supports recent models of international trade based on firm heterogeneity and sunk entry costs. In this context public intervention can be called upon to help efficient but financially constrained firms expand their activities abroad.

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TABLE 1
Correlations between Financial Constraints indexes

Pearson's r and Spearman's ρ Correlation Coefficients				
	Liquidity ratio	*Leverage ratio*	*Score A*	*Score B*
Liquidity ratio	–	*-0.98*	*0.49*	*0.44*
Leverage ratio	-0.92	–	*-0.53*	*-0.47*
Score A	0.46	-0.44	–	*0.90*
Score B	0.41	-0.40	0.91	–

Notes:
Numbers in italics denote Spearman's ρ correlation coefficients

TABLE 2
Descriptive statistics

	All Firms	*Continuous Exporters*	*Export Starters*	*Never Exporters*	*F-stat*
Employees	88.083	115.839	59.672	56.799	1,477.65***
TFP	0.997	1.003	0.990	0.992	85.57***
Wage per employee	0.103	0.107	0.099	0.091	515.14***
Score A	5.620	5.825	5.448	5.261	1,133.34***
Liquidity ratio	0.293	0.320	0.273	0.240	727.78***
Observations	167,597	85,720	63,402	18,475	

TABLE 3
Self-selection into exporting by less constrained firms

	Score A		*Liquidity ratio*	
	s=1	*s=3*	*s=1*	*s=3*
	(1)	(2)	(3)	(4)
Export	0.146***	0.228**	0.016*	0.009
	[0.052]	[0.094]	[0.010]	[0.016]
log Empl$_{t-s}$	0.188***	0.075	0.006	-0.025**
	[0.041]	[0.067]	[0.008]	[0.012]
log TFP$_{t-s}$	2.794***	2.933***	0.347***	0.443***
	[0.142]	[0.247]	[0.026]	[0.043]
Firms/Observations	5,727	2,169	5,727	2,169
of which: starters†	3,427	1,284	3,427	1,284
non export.	2,300	885	2,300	885
R-squared	0.111	0.159	0.073	0.132

Notes:
† Including firms that later stop exporting

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 4
Measuring ex-post effects

	Score A			*Liquidity ratio*		
	t	*t+1*	*t+1*	*t*	*t+1*	*t+1*
	t+1	*t+3*	*t+5*	*t+1*	*t+3*	*t+5*
	(1)	(2)	(3)	(4)	(5)	(6)
log (Exp/Sales)$_{t=0}$	-0,003	0,036	0,042	0,047	-0,057	-0,052
	[0.013]	[0.022]	[0.034]	[0.033]	[0.057]	[0.090]
log Empl$_{t=0}$	-0,012	-0,001	0,019	-0,035	0,007	-0,003
	[0.009]	[0.014]	[0.018]	[0.026]	[0.038]	[0.053]
log TFP$_{t=0}$	-0.185***	0,065	-0,071	0,066	-0,198	-0,302
	[0.034]	[0.059]	[0.083]	[0.093]	[0.157]	[0.226]
Firms/Observations	4,387	1,823	1,152	3,307	1,448	905
of which: starters†	1,423	833	541	1,144	686	441
non export.	2,964	990	611	2,163	762	464
R-squared	0,056	0,088	0,113	0,043	0,093	0,143

Notes:
† include only firms that keep exporting thereafter
Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 5.
Measuring ex-post effects controlling for export intensity

	Score A			*Liquidity ratio*		
	t	*t+1*	*t+1*	*t*	*t+1*	*t+1*
	t+1	*t+3*	*t+5*	*t+1*	*t+3*	*t+5*
	(1)	(2)	(3)	(4)	(5)	(6)
log (Exp/Sales)$_{t=0}$	0.100	0.054	-0.047	-0.013	-0.166	-0.534
	[0.061]	[0.082]	[0.120]	[0.158]	[0.217]	[0.335]
log Empl$_{t=0}$	-0.013	0.001	0.018	-0.030	0.004	-0.008
	[0.009]	[0.013]	[0.018]	[0.026]	[0.038]	[0.053]
log TFP$_{t=0}$	-0.186***	0.064	-0.070	0.064	-0.191	-0.289
	[0.034]	[0.059]	[0.083]	[0.093]	[0.157]	[0.226]
Firms/Observations	4,387	1,823	1,152	3,307	1,448	905
of which: starters†	1,423	833	541	1,144	686	441
non export.	2,964	990	611	2,163	762	464
R-squared	0,055	0,089	0,115	0,044	0,093	0,140

Notes:
† Include only firms that keep exporting thereafter
Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 6.
Determinants of the decision to export

	RE Probit		*Dynamic RE Probit*		*Dynamic GMM*	
	(1)	(2)	(3)	(4)	(5)	(6)
log Empl$_{t-1}$	0.925	0.931	0.375	0.384	0.155	0.201
	[0.020]***	[0.020]***	[0.012]***	[0.012]***	[0.089]*	[0.092]**
log (Wage/Empl)$_{t-1}$	0.897	0.878	0.564	0.549	-0.004	0.050
	[0.042]***	[0.042]***	[0.028]***	[0.028]***	[0.144]	[0.141]
log TFP$_{t-1}$	-0.097	0.001	-0.203	-0.097	-0.001	0.038
	[0.069]	[0.066]	[0.049]***	[0.047]**	[0.099]	[0.102]
Subsid$_{t-1}$	0.130	0.130	0.126	0.128	-0.130	0.212
	[0.027]***	[0.027]***	[0.018]***	[0.018]***	[3.359]	[2.773]
Score A$_{t-1}$	0.042		0.045		0.003	
	[0.005]***		[0.004]***		[0.012]	
Liquidity$_{t-1}$		0.235		0.195		-0.017
		[0.029]***		[0.021]***		[0.081]
Export$_{t-1}$			1.902	1.898	0.348	0.349
			[0.017]***	[0.017]***	[0.066]***	[0.067]***
Observations	134,926	134,926	134,926	134,926	108,755	108,755
Firms	22,713	22,713	22,713	22,713	19,880	19,880
of which: exporters	11,678	11,678	11,678	11,678	10,241	10,241
starters†	7,938	7,938	7,938	7,938	7,306	7,306
non export.	3,097	3,097	3,097	3,097	2,333	2,333
Sargan J-statistic					0.39	0.54
m2					1.29	1.17

Notes:
† Including firms that later stop exporting
Standard errors in brackets; sector and year dummies included
* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 7.
Estimating the hazard rate of entry into export markets

	Pooled		*Normal RE*†		*Gamma RE*‡	
	(1)	(2)	(3)	(4)	(5)	(6)
log Time	-0.651	-0.652	-0.327	-0.340	-0.189	-0.198
	[0.024]***	[0.024]***	[0.098]***	[0.096]***	[0.096]**	[0.095]**
log Empl.	0.103	0.106	0.172	0.172	0.226	0.226
	[0.018]***	[0.018]***	[0.030]***	[0.030]***	[0.036]***	[0.036]***
log (Wage/Empl.)	0.817	0.825	0.959	0.959	1.002	1.002
	[0.052]***	[0.052]***	[0.073]***	[0.072]***	[0.073]***	[0.072]***
log TFP	-0.454	-0.475	-0.450	-0.465	-0.398	-0.412
	[0.076]***	[0.075]***	[0.092]***	[0.090]***	[0.100]***	[0.098]***
Subsid.	-0.034	-0.033	-0.054	-0.052	-0.069	-0.068
	[0.041]	[0.041]	[0.047]	[0.047]	[0.050]	[0.050]
Score A	0.011		0.014		0.014	
	[0.006]*		[0.007]*		[0.008]*	
Liquidity Ratio		0.137		0.159		0.167
		[0.033]***		[0.040]***		[0.042]***
Observations	35,794	35,794	35,794	35,794	35,794	35,794
Firms			12,193	12,193	12,193	12,193
of which: starters♯			8,133	8,133	8,133	8,133
non export.			4,060	4,060	4,060	4,060
LR test §			19.82***	19.17***	33.05***	33.90***

Notes:
† Random Effect model with Normal distributed frailty
‡ Random Effect model with Gamma distributed frailty
§ Likelihood Ratio test for unobserved frailty; H_0: non significant unobserved frailty
♯ Including firms that later stop exporting
Standard errors in brackets; dummies for firm age, sector and year specific effects included
* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 8.
Estimated hazard rate of entry into export markets by deciles of explanatory variables

Time	*Baseline*	*Size*		*Wage per employee*		*TFP*		*Financial constraints*	
(in years)	*Hazard*	*1st decile*	*9th decile*	*1st decile*	*9th decile*	*1st decile*	*9th decile*	*1st decile*	*9th decile*
1	0.353	0.316	0.410	0.094	0.616	0.379	0.330	0.344	0.363
2	0.318	0.284	0.371	0.083	0.568	0.341	0.297	0.309	0.327
3	0.298	0.266	0.349	0.077	0.541	0.321	0.278	0.290	0.307
4	0.285	0.254	0.334	0.073	0.522	0.307	0.266	0.277	0.294
5	0.275	0.245	0.323	0.070	0.507	0.296	0.256	0.267	0.284
6	0.267	0.237	0.314	0.068	0.495	0.288	0.249	0.259	0.275
7	0.261	0.232	0.306	0.066	0.485	0.281	0.242	0.253	0.269
8	0.255	0.226	0.300	0.064	0.476	0.275	0.237	0.247	0.263
9	0.250	0.222	0.294	0.063	0.469	0.270	0.233	0.243	0.258
10	0.246	0.218	0.289	0.062	0.462	0.265	0.229	0.239	0.254
11	0.242	0.215	0.285	0.061	0.456	0.261	0.225	0.235	0.250
12	0.239	0.212	0.281	0.060	0.451	0.258	0.222	0.232	0.246
13	0.236	0.209	0.278	0.059	0.446	0.254	0.219	0.228	0.243

Notes:
The table uses estimates from model (5) of Table 7

TABLE 9.
Entry and export intensity: Heckman Two-Step model

	s=1				*s=3*			
	Export decision (1)	*Export intensity* (2)	*Export decision* (3)	*Export intensity* (4)	*Export decision* (5)	*Export intensity* (6)	*Export decision* (7)	*Export intensity* (8)
log Empl$_{t-s}$	0.047	-0.032	0.052	-0.038	0.067	-0.007	0.072	-0.02
	[0.031]	[0.069]	[0.031]*	[0.070]	[0.052]	[0.112]	[0.052]	[0.113]
log TFP$_{t-s}$	-0.569	-0.117	-0.531	-0.214	-0.567	-0.946	-0.477	-0.936
	[0.124]***	[0.373]	[0.123]***	[0.355]	[0.232]**	[0.537]*	[0.232]**	[0.505]*
log (Wage/Empl)$_{t-s}$	0.511	0.333	0.514	0.361	0.134	0.555	0.130	0.551
	[0.085]***	[0.297]	[0.085]***	[0.297]	[0.154]	[0.303]*	[0.154]	[0.303]*
Subsid.$_{t-s}$	0.311	0.030	0.312	0.054	0.106	0.135	0.119	0.123
	[0.060]***	[0.198]	[0.060]***	[0.198]	[0.091]	[0.204]	[0.091]	[0.207]
Score A$_{t-s}$	0.028	-0.059			0.044	-0.035		
	[0.010]***	[0.025]**			[0.017]**	[0.041]		
Liquidity ratio$_{t-s}$			0.102	-0.308			0.079	-0.301
			[0.054]*	[0.124]**			[0.099]	[0.196]
Firms/Observations	5727		5727		2169		2169	
of which: starters†	3427		3427		1284		1284	
never exporters	2300		2300		885		885	
Wald c^2	883.60***		881.33***		586.05***		581.03***	
ρ	-0.169		-0.111		-0.046		-0.053	

Notes:
Standard errors in brackets; dummies for sector and time specific effects included
* significant at 10%; ** significant at 5%; *** significant at 1%
† including firms that later stop exporting