Financial Factors and Manufacturing Exports:Theory and Firm-level Evidence From Egypt

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Abstract

This paper focuses on the effects of financial factors on manufacturing firms' export participation. Using a simple dynamic discrete choice model, we first present the intuition according to which financial constraints reduce the probability of exporting. Then, based on a panel of Egyptian manufacturing firms over the 2003-2008 period, we estimate the impact of financial constraints on export market participation. Our main results show that, unlike financial liquidity, financial constraints reduce the export participation of Egyptian firms. In addition, financial constraints equally have a negative impact on alternative measures of the export activity, namely the export intensity and the time firm take before starting to export.

Key words : Financial Constraints, Exports, Firm-Level Evidence, Sunk Costs

Codes JEL / JEL codes : D24, F10, D92

1. Introduction

The recent financial crisis and the ailing recovery in economic growth plunged the global economy into a dilemma : the need for developed countries to shrink current account deficits, particularly by reducing imports, and the urgency for developing countries to boost their exports to sustain growth (Rodrik, 2009). This context outlines the importance of the export activity for economic performance, both at macroeconomic and firm level ; indeed, exporters may perform better than non-exporters, particularly because of exposure to increased foreign competition.

However, export market participation may be constrained by a number of factors ; in particular, why some firms, although wishing to export, cannot participate in the international market ? Firms' export participation may depend not only on their characteristics, those of the macroeconomic environment (for example, government export-enhancing expenditures), but also on sunk entry costs, i.e. fixed costs that cannot be recovered (Melitz, 2003), which cannot be supported by the least productive firms or by those firms that do not have a certain financial health. One of the policies designed for export promotion focuses on improving the liquidity of domestic firms that engage in exports, by making credit available for trade, setting up guarantee funds or subsidizing financial institutions. [1] However, in most of developing and emerging countries, where financial systems are still crude, the problem of access to finance appears as a major barrier to firms' growth and investment. In addition, the literature on international trade shows that this problem is exacerbated for exporting activities, which involve large sunk costs. Consequently, this raises the question of the role of financial constraints in exporting decisions. Furthermore, there is no common accepted evidence on the interaction between financial factors and firms export market participation. For example, while Greenaway *et al.* (2007) and Bellone *et al.* (2010) emphasize that financial factors affect exports, Stiebale (2011) finds no evidence for such a relationship.

The present paper provides a link between two important strands of literature usually considered in isolation. On the one hand, the impact of financial constraints is often limited to their effect on firms' investment and growth (see for instance Ayyagari *et al.*, 2005; Beck & Demirgüç-Kunt, 2006; Beck *et al.*, 2008), with no reference to export activities. On

1. Other factors, including innovation and intellectual property rights, may also influence the development process (see for instance Hudson & Minea, 2013).

the other hand, recent studies that investigated the determinants of firms' export behavior focused on firms' productivity (see for example Aw & Hwang, 1995; Delgado *et al.*, 2002; Aw *et al.*, 2007), with little reference to financial constraints. Consequently, the study of the role of financial constraints for the export activity remains remarkably scarce.

On a theoretical level, to our knowledge, only three studies highlight the role of financial constraints on the firm's decision to participate in the export market (Chaney, 2005; Manova, 2006; Muuls, 2008), in a "new-new trade theory" setup coined by Melitz (2003). [2] Chaney (2005) expands the Melitz (2003)'s model to take into account capital market imperfections, and shows that sunk costs associated to export activities, as learning about foreign markets, administrative standards, and establishing distribution networks, are likely sensitive to financial variables. Subsequently, Manova (2006) goes beyond Chaney (2005) by explicitly modeling the financial constraints of firms and by highlighting inter-sectoral differences in terms of liquidity. She finds that in the presence of credit constraints the productivity threshold required for entry into exporting is relatively low in financially developed countries, and within each country this threshold is higher in financially constrained sectors. Finally, Muuls (2008) incorporates external financing into Chaney (2005)'s model and shows that firms are more likely to be exporters when they enjoy higher productivity and lower credit constraints. In particular, financial constraints appear to be strongly associated with the extensive but not the intensive margin of trade in terms of destinations.

Despite emphasizing the importance of financial constraints for the export activity at inter-country and inter-sectoral levels, these theoretical studies remain silent regarding such effects at the firm level. [3] Empirical studies that tackle this shortcoming can be divided according to the direction of the causality of the relation between financial factors and exports. On the one hand, Campa & Shaver (2001), using a sample of Spanish firms, conclude that exports cause the financial health of firms, due to signaling and diversification effects inherent to being an exporter. A similar conclusion arises from the analysis of Greenaway *et al.* (2007) and Bridges & Guariglia (2008), based on UK firms. In particu-

2. Building on the new trade theory developed by Krugman (1979), Melitz (2003) discusses the relevance of the "love of variety" preferences hypothesis, which seems inconsistent with the observation that some firms export and others do not, suggesting the importance of sunk entry costs for heterogeneous firms in export markets (Greenaway & Kneller, 2007).

3. At the macroeconomic level, several studies, including Beck (2002), Svaleryd & Vlachos (2005), or Becker & Greenberg (2007), highlight a positive impact of financial development on international trade, a result consistent with the findings of Manova (2006) regarding both the ability to export, the variety of exported products and the number of foreign business partners.

lar, Greenaway *et al.* (2007) show that, despite the absence of a significant difference in liquidity between firms that begin to export and firms that export permanently, the latter present better financial health.

On the other hand, Manova *et al.* (2011), using firm-level data from China, show that credit constraints restrict trade flows and influence the pattern of foreign direct investment. Building on alternative indicators of financial constraints on a sample of French firms for the period 1993-2005, Bellone *et al.* (2010) conclude that financial constraints reduce firms' participation in export markets. [4] However, using export intensity instead of the decision to export, Bellone *et al.* (2010) illustrate a negative relationship between firms' financial health and export intensity, due to higher input costs for firms involved in multiple markets simultaneously. Nevertheless, Stiebale (2011) fails to detect statistically significant effects for French firms, suggesting that the influence of financial constraints on exports is not as robust as one may have expected. [5]

The goal of our paper is to contribute to this latter strand of literature as follows. First, we provide a simple theoretical model, showing the intuition through which financial constraints can affect firms' export decision. Second, the problem of the access to financial services is more severe in Africa : according to Figure 1 in the Appendix, African firms appear to be the most financially constrained firms, compared with firms from other continents. Besides, the percentage of firms that export directly (namely, without through a distributor) is equally significantly lower in Africa than in other parts of the world (see Figure 2). Consequently, compared to previous work that focused exclusively on developed countries, [6] we explore in this study a data sample of manufacturing Egyptian firms over the 2003-2008 period. In addition to data availability, a subsequent motivation for considering Egypt is that, according to the in 2008 World Bank Enterprises Survey indicators, roughly 43 percent of the manufacturing firms are financially constrained and 23 percent of them export directly.

Our empirical analysis emphasizes that financial constraints exert a negative and significant effect not only on the decision to export, but also on export intensity and on the length of the period before starting to export. Finally, we show that our results are

4. Unlike Campa & Shaver (2001) and Greenaway *et al.* (2007), they do not detect an *ex post* improvement of the financial health of the firms that export.

5. In addition, Muuls (2008) finds that credit constraints are an important determinant of the export participation decision, but they do not have significant effects on export intensity, which he measures by the number of destinations served.

6. With the notable exception of Manova *et al.* (2011), who analyze Chinese firms.

robust to a wide variety of sensitivity tests, including properly controlling for endogeneity. Consequently, this is one of the first studies outlining a causal effect from the financial sector to the firms' export activity in a developing country. Our findings are particularly important for developing countries, as they (i) draw upon export activities as a crucial vector of economic development, (ii) present poor financial institutions characterized by important financial constraints and credit rationing, and (iii) need to accelerate the process of liberalization after having experienced heavy trade restrictions in the past.

The rest of the paper is organized as follows. Section 2 provides a simple theoretical analysis of the relationship between financial constraints and the export decision, while section 3 describes the methodology and the data. Section 4 presents our main results, section 5 discusses robustness, and section 6 concludes.

2. A simple theoretical model of export decision with financial constraint

We place our theoretical analysis in the setup coined by Roberts & Tybout (1997), who develop a discrete dynamic model to show how sunk costs affect the export participation decision of a profit-maximizing firm. We extend this model in two ways. First, we allow the firm's decision to be more flexible, by assuming that it exports if profits from export are greater than those generated by the domestically-oriented production. [7] Second, following Stiglitz & Weiss (1981), we assume the presence of financial market imperfections that could lead to credit rationing of certain potentially exporting firms. Indeed, the liquidity constraint is more crucial for exports, particularly because export activities are riskier than domestically-oriented activities. Thus, we allow the model to take into account the financial stance of the firm.

2.1. Internal versus external liquidity and the financial constraints

Following Chaney (2005), we assume that the production for the domestic market is not subject to financial constraints. Assuming that capital (K) is the only production factor and that the firm has two financing sources for its investments, namely internal

7. Alternatively, Roberts & Tybout (1997) and Bernard & Wagner (2001) assume that the firm decides to export if expected profits from export are greater than zero.

and external financing, the investment of the firm i in period t is

$$I_{it} = I_{it}^{I} + I_{it}^{E} \tag{1}$$

and

$$I_{it}^{I} = I_{it}(\varphi, \pi) + S_{it}, \tag{2}$$

where I^I and I^E represent the share of investment financed by internal and external funds respectively, S is the part of revenues (π) that is distributed to the firm's stakeholders, and φ is a productivity shock.

If the firm has access to loanable funds market, additional capital will be financed such as to equalize the marginal revenue from each financing source to its marginal cost, and the two financing sources have the same cost. However, when the firm is financially constrained, these two financing sources become imperfect substitutes. In this case, in line with the empirical literature on the firm's financial stance (see for example Rahaman, 2011), we assume that external finance is more expensive than internal finance ($r_i^E > r_i^I$), mainly due to the presence of information asymmetries and agency costs in the loanable funds market. Thus, the financial situation of the firm i can be written as

$$h_{it} = \begin{cases} 1, & \text{if firm } i \text{ is financially constrained } (r_i^E > r_i^I) \text{ in period } t \\ 0, & \text{otherwise} \end{cases} . \tag{3}$$

2.2. Financial constraints and the export participation decision

Compared to Roberts & Tybout (1997), who consider the export decision as the introduction of a new good, we assume that firms decide to produce either for the foreign or the domestic market. In period t, a profit-maximizing firm i has the choice between producing for exporting and producing for the domestic market with riskless return $\bar{\pi}$. Let $u_{it} = 1$ if firm i exports in period t and $u_{it} = 0$ otherwise. In the single period case, if we assume the absence of fixed sunk costs related to the export activity and to financial constraints, the firm i exports in period t if its profits from exports (π_{it}) are greater than the return of the domestically-oriented production ($\bar{\pi}$)

$$\pi_{it} > \bar{\pi}_i. \tag{4}$$

However, in the presence of fixed sunk costs (z_i) and of costs related to financial constraints (h_i), the firm i exports if current and expected profits are greater than domestic product

return ($\bar{\pi}_i$), increased by the sunk cost and the cost differential between external and internal financing (h_i)

$$u_{it} = \begin{cases} 1, & \text{if} \quad \pi_{it} > \bar{\pi}_i + z_i(1 + h_{it} - u_{i(t-1)}) \\ 0, & \text{otherwise} \end{cases} . \tag{5}$$

In the following, we develop Roberts & Tybout (1997) in the multiple periods case by showing that, in addition to sunk entry costs, the financial constraint equally affects the decision of the firm to export. Indeed, denoting by $0 < \delta < 1$ the discount term, the expected present value of firm i from period t to T is

$$V_{it}[u_{i(t-1)}, h_{it}] = \underset{u_{it} \in [0,1]}{\text{Max}} \, E_t \sum_{t}^{T} \delta^{s-t}[(1 - u_{is})\bar{\pi}_i + u_{is}\pi_{is} - z_i(h_{is} - u_{i(s-1)})]. \tag{6}$$

Using Bellman's equation

$$V_{it}[u_{i(t-1)}, h_{it}] = \underset{u_{it} \in [0,1]}{\text{Max}} (1 - u_{it})\bar{\pi}_i + u_{it}E_t\pi_{it} - z_i(h_{it} - u_{i(t-1)}) + \delta V_{i(t+1)}[u_{it}], \tag{7}$$

the optimization program yields the following export participation decision

$$u_{it} = \begin{cases} 1, & \text{if} \quad \pi_{it} + \delta[V_{i(t+1)}(1) - V_{i(t+1)}(0)] > \bar{\pi}_i + z_i(1 + h_{it} - u_{i(t-1)}) \\ 0, & \text{otherwise} \end{cases} , \tag{8}$$

where we denote $V_{i(t+1)}[1] = V_{i(t+1)}[u_{it} = 1]$ and $V_{i(t+1)}[0] = V_{i(t+1)}[u_{it} = 0]$.

This latter equation shows that four cases can arise.

Case 1 : if the firm i already exported in period $t-1$ ($u_{i(t-1)} = 1$) and is not financially constrained in period t ($h_{it} = 0$), then this firm will stay on the export market in the period t if $\pi_{it} + \delta[V_{i(t+1)}(1) - V_{i(t+1)}(0)] > \bar{\pi}_i$. This situation is similar to the case described by Roberts & Tybout (1997), where the firm i was already exporting in period $t-1$. In this case, the firm does not face sunk costs related to the export activity and is enough liquid to become exporter in the current period.

Case 2 : if the firm i already exported in period $t-1$ and is financially constrained in period t, then this firm will stay on the export market in the period t if $\pi_{it} + \delta[V_{i(t+1)}(1) - V_{i(t+1)}(0)] > \bar{\pi}_i + z_i$. Here, the firm i does not face sunk entry costs related to exports. However, the financial constraint represents an additional fixed cost z_i that the firm has to bear even if it is already on the export market.

Case 3 : if the firm i did not export in period $t-1$ and is not financially constrained in period t, then this firm becomes an exporter in period t if $\pi_{it} + \delta[V_{i(t+1)}(1) - V_{i(t+1)}(0)] > \bar{\pi}_i$. This situation is similar to Roberts & Tybout (1997), when the firm i was non-exporter in period $t-1$. Here, the firm faces entry sunk costs, but its financial health allows it to reduce its total fixed cost.

Case 4 : if the firm i did not export in period $t-1$ and is financially constrained in period t, then this firm becomes an exporter in period t if $\pi_{it} + \delta[V_{i(t+1)}(1) - V_{i(t+1)}(0)] > \bar{\pi}_i + 2z_i$. Here, the firm has to bear all the costs of serving the foreign market, since it not only faces the entry sunk costs, but also the fixed costs related to its financial stance. In this case, the level of productivity required to become an exporter is at its highest level.

In sum, firm i will decide to export whenever the difference in return from exporting, relatively to producing for the domestic market, is greater than the fixed cost of entry to the export market plus any fixed cost associated with its financial position. The stronger the financial constraint, the higher the productivity level required for the firm to export, for given sunk entry costs, in line with the conclusions of the inter-sectoral model of Manova (2006). Consequently, our model shows that firms that act in a better financial environment are likely to reduce the negative impact of export sunk costs. In the following, we aim at testing this intuition by looking at the way firms' financial stance influences their export activity.

3. The empirical strategy

3.1. The measure of financial constraints

Our previous theoretical framework showed that, in a context of credit market imperfections and credit rationing, financial constraints radically influence the export decision of potentially exporting firms. A financially constrained firm can be defined as a firm that does not have access to sufficient external liquidity and is not productive enough to generate sufficient internal liquidity. However, the measure of financial constraints has often been subject to controversy. Following the work of Fazzari *et al.* (1988), an abundant empirical literature attempts to measure financial constraints using the sensitivity of investment to the firm's cash flow, based on the assumption that external finance is more expensive than internal finance (due, for example, to the presence of information asymmetries and agency costs in the loanable funds market). However, this approach, assuming that higher sensitivity of investment to cash flow and financial constraint go hand in hand, was questioned by Kaplan & Zingales (1997), who show that less financially constrained firms exert a stronger sensitivity of investment to cash flow compared to firms that are financially more constrained. Alternative measures of the financial stance of the firm focus

on information asymmetries and agency costs (see for instance Chirinko & Schaller, 1995; Cleary, 1999). However, the use of such variables will lead to consider that only firms whose age or size is less than the sample mean may be financially constrained, which may not always be valid (see Cleary, 2006).

One way to deal with this shortcoming is to use self-assessment of financial constraints by the firm itself.[8] However, these indicators vary little over time and might therefore be problematic in a dynamic setup as the one used in the present study. Consequently, we draw upon a second measure of financial constraints, namely a composite indicator of financial health. This indicator, based on two financial variables, namely the ratio of net income to total assets and the share of new investment financed by equity, is computed following the method of Musso & Schiavo (2008) and presents sufficient time variability (subsection 3.4. details its construction).

3.2. The basic econometric model

Our benchmark model consists of regressing the export participation decision on the measure of financial constraints and a set of control variables expected to be determinants of the export decision. This procedure, based on the methodology developed by Bernard & Jensen (1995), compares the performance of exporting and non-exporting firms successively before and after their first year of export (see also Greenaway *et al.*, 2007; Bellone *et al.*, 2010). The basic econometric equation is

$$Export_{it} = \alpha + \beta_1 Finance_{i,t-1} + \beta_2 Control_{i,t-1} + u_i + v_t + \epsilon_{it}, \tag{9}$$

where *Export* stands for a dummy variable equal to 1 if in year t firm i is exporter and 0 otherwise,[9] *Finance* captures the financial constraints of the firm, u, v, and ϵ are respectively firm fixed effects (for example, the industry or ownership structure), time fixed effects and an idiosyncratic error term, and *Control* is a vector of determinants of the decision to export (to be discussed below).

8. This index is provided by the World Bank's Enterprise Survey, and was used, among others, by Becchetti & Trovato (2002) to analyze the determinants of firms' growth for a sample of Italian small and medium firms, or by Chaffai *et al.* (2011) to assess the link between financial constraints and productivity for a sample of Moroccan firms.

9. For robustness issues we will consider, in addition to the export decision, the export intensity and account for the length of the period before starting to export.

3.3. The identification strategy

Several problems arise when estimating our benchmark model. First, the likely presence of unobserved characteristics that may affect firms' decision to export. We tackle this issue by considering, in addition to traditional firm and time fixed effects, variables indicating the industry sector of the firm and the structure of the shareholding of the firm. [10] Second, in accordance with our theoretical model and the empirical evidence (see for example Roberts & Tybout, 1997), we include the exporter status lagged by one period to control for hysteresis caused by exporting entry sunk costs. Finally, and more importantly, the likely endogeneity of financial constraints in explaining the export decision, which may have several origins such as a simultaneity bias (double causality), an omitted variables bias, or a measurement errors bias. To account for potential endogeneity in the absence of instrumental variables in microeconomic survey data, we follow Baldwin & Gu (2003) and Bellone *et al.* (2010) and introduce lagged, instead of current, values for all explanatory variables. In addition, to tackle the potential endogeneity of the measure of financial constraints, we include the so-called inverse Mills ratio (IMR) derived from a probit regression of the financial constraint dummy on instrumental variables (Table 11 in the Appendix presents the results of the estimation of the variable IMR).

Since the explained variable, namely the export participation decision, is dichotomous, we use a conditional probability *probit* model, assuming a normal distribution function, to estimate this discrete choice model. [11]

3.4. The data

We use an unbalanced panel of 1655 Egyptian manufacturing firms, including 22.78 percent exporting firms, over the 2003-2008 period, taken from the World Bank's *Enterprise Surveys* database. [12] This survey primarily addresses issues related to the production of the firm and its business environment i.e. access to finance, access to infrastructure,

10. Several subsequent variables that could have been used to control for heterogeneity, such as managerial ability, product features, technology or foreign experience, are unfortunately not available.

11. Estimations performed using a *logit* model have no qualitative impact on our results and are available upon request. In addition, we will implement a fixed effects *tobit* estimator to account for censoring when dealing with export intensity.

12. This period was obtained by exploiting the information provided for the year preceding each survey year (2004, 2006, and 2008). However, this information was not available for indicators of the financial constraint. Therefore, the self-assessment indicator is assumed to be constant between the year preceding the survey and the survey year. Table 12 in the Appendix reports the detailed structure of our panel.

competition, corruption, etc. We used two basic strategies for cleaning up our database. First, we eliminated firms for which export variables, financial variables, production accounts, capital and labor were not informed. Second, following Greenaway *et al.* (2007) and Stiebale (2011), we control for the potential influence of outliers and for coding errors by excluding the top and bottom 1 percent of firms.

Let us first discuss our main variables, namely the export decision and financial constraints. Regarding the former variable, we consider in the benchmark model the export participation decision, which is a dummy variable indicating whether the firm is an exporter or not. In addition, we allow in the robustness section for two alternative measures, namely the export intensity, defined as the ratio between the value of the production for export markets and the total output of the firm, and the time elapsed before firms start exporting, computed based on a duration model (see Tables 7 and 8 in the Appendix for the definition of variables and descriptive statistics).

Regarding the latter variable, we use an index of self-assessment of financial constraints, ranging between 1 (absence of constraints) and 4 (strong financial constraints). We redefine this variable to be equal to 0 in the absence of constraint (1 initially) and to 1 in the presence of a constraint (2 to 4 initially). In addition to self-assessment indexes, we also use a liquidity score built using the method of Musso & Schiavo (2008), as an alternative measure of financial constraints. Given the limited observations on financial variables, we retain only two variables for the construction of this score, namely the ratio of net income to total assets and the share of new investments financed with equity, which reflect at best the characteristics of the financing constraint. The construction procedure is as follows : (*i*) for each year, the value of each variable was first reported in its industry average ; (*ii*) for each year, these transformed values are ordered decreasingly according to their levels of financial health ; (*iii*) then, the values of each variable are grouped into quintiles so as to obtain a score ranging from 1 to 5 ; (*iv*) finally, we compute the sum of these individual scores to generate the composite score of the financial position of the firm as Bellone *et al.* (2010)'s Score A. [13]

13. The main limitation of this score is in the method of aggregation, which may seem arbitrary, and an alternative method would be to count the number of times for which the values of two individual scores are in the first two quintiles of the distribution. However, Bellone *et al.* (2010) show that the different composite scores obtained by different methods of aggregation are strongly correlated : indeed, the correlation coefficient between the financial constraint dummy and the liquidity score is 0.738 and is statistically significant at 1 percent, suggesting that firms facing a financial constraint are likely those that are less liquid.

Table 1 presents several statistics regarding our main variables for the year 2008. Regarding the sectoral distribution of firms, most of them belong to the metal and textiles industries (roughly 1/3), while the least represented sectors are agro industries and machinery & equipment (see column 1). More than one fifth of firms are exporters, however with important heterogeneities among sectors (1 out of 15 and 1 out of 3 firms export in agro industries and chemicals respectively, see column 2). On the average, income from exports is around 8.5 percent of total output, but it can climb to roughly 1/5 of the total income for textiles industries (see column 3). On the whole, Table 1 emphasizes important heterogeneities among sectors, which may reflect differences in sectoral input costs on the export market, in productivity, in capital intensity, in the possibility of achieving economies of scale and in the transport costs (in addition, Table 9 in the Appendix provides simple comparative statistics for exporting versus non exporting firms). Regarding financial factors, on the average more than 2 out of 5 firms of our sample are financially constrained, suggesting that access to financial services is indeed a major constraint in Egypt. At the sectoral level, the relatively low (high) share of export income might be explained by the relatively high (low) share of financially constrained firms in the agro industries (garments), as illustrated by columns 3 and 4.

We augment these descriptive statistics with simple correlations between financial and export variables, presented in Table 2. The decision to export appears strongly and robustly inversely correlated with the variable measuring financial constraints, confirming our intuition. In addition, the degree of liquidity of the firm is positively correlated with the decision to export. Finally, the last line of Table 2, in which we consider the variable export intensity, confirms the intimate link between financial and export variables.

Regarding control variables, we focus on the most important determinants of the export activity outlined in the related literature. To ease comparison with previous studies, we follow Greenaway *et al.* (2007) and Bellone *et al.* (2010) and consider the employment (measured by the number of permanent workers of the firm), the total factor productivity (TFP) [14] and the average wage (computed as the firm's total wage spending divided by

14. TFP is defined as the difference between actual and predicted output, and we measure it using a semi-parametric approach following Levinsohn & Petrin (2003), which consists of using intermediate inputs to control for the correlation between input levels and unobserved productivity shocks. Table 10 in the Appendix presents the results of the Levinsohn & Petrin (2003) productivity estimator. Unlike Olley & Pakes (1996) who use investment to control for correlation between input levels and unobserved productivity shocks, Levinsohn & Petrin (2003) use intermediate inputs to tackle this simultaneity issue. This is done by setting intermediate input as a function of firm's state variable, the capital input and the productivity.

TABLE 1 – Exports and sectoral distribution of exporting firms in 2008

Description	Firms (%)	Exporters (%)	Export intensity (%)	Financially constrained firms (%)
Agro industries	1.31	6.67	6.66	62.50
Chemicals	7.57	32.18	6.65	34.48
Garments	11.31	25.78	18.85	39.43
Machinery & Equipment	3.31	31.58	7.31	34.78
Metal industries	16.45	20.74	5.69	45.21
Non metal industries	11.58	21.05	6.85	39.50
Textiles	16.80	22.40	10.54	46.77
Other industries	31.68	20.66	6.73	44.66
	100.00	22.50	8.53	42.94

TABLE 2 – Correlations between financial constraints and exports

	Financial constraint	Liquidity score
Decision to export	-0.701***	0.622***
Export intensity	-0.630***	0.682***

Note : *** represents statistical significance at 1%.

the number of permanent employees). [15]

4. Financial constraints and exports : the main results

In light of our theoretical intuition, we estimate in our benchmark model the influence of financial constraints on the firms' decision to export, when controlling for several key determinants of the decision to export. The results are presented in Table 3, with robust standard errors in parentheses. According to regression (1) performed using a standard *probit* model, lagged (log) TFP has no significant effect on the decision to export, a result consistent with Bellone *et al.* (2010) and Greenaway *et al.* (2007), contrary to the size of the firm (measured by employment) which fosters the probability to export. In addition, the negative and significant effect of the average wage on the export decision can be explained by the fact that high labor costs penalize firms' participation in international

15. Since, according to Table 9, there is no statistically significant difference in terms of age between exporting and non exporting firms, we discard this control variables in our analysis.

markets (see for instance Greenaway *et al.*, 2007; Stiebale, 2011). In this context, we show that financially constrained firms present a significantly lower probability of exporting, since the coefficient of the variable financial constraint is negative and significant at the 5 percent level (column 1). Remark that this result is obtained when controlling for the variables explained above and also in the presence of time, industry and ownership fixed effects.

Moreover, we analyze the sensitivity of this finding in several steps. First, we consider an alternative measure of financial constraints. According to regression (2), the lagged liquidity score has a positive and significant effect, confirming that firms with better financial health increase their chances of going into the export activity. Second, despite having the advantage of correcting for clustering, pooled probit estimations are less appropriate regarding unobserved heterogeneity. To overcome this shortcoming, we perform in regressions (3) and (4) static random effects probit estimations (RE Probit). Results confirm our previous findings, namely that a less financially constrained or a more liquid firm has a higher probability of exporting. Finally, we investigate the reliance of our results by performing in columns (5) and (6) dynamic random effects probit estimations (Dynamic RE Probit), which control for the hysteresis phenomenon in export markets. Indeed, being an exporter in the previous period significantly increases the probability of being an exporter in the current period, as emphasized by the positive and significant coefficient of the lagged export decision, confirming the presence of sunk entry costs into foreign markets for Egyptian firms. More importantly, regression (5) and (6) support yet again a significant role of the financial stance for the export activity, since the coefficients of the financial constraint dummy and of the liquidity ratio are remarkably stable in sign and magnitude.

Let us now discuss the quantitative implications of our results. According to Table 3, the coefficient of the financial constraint variable is remarkably stable, and corresponds to a marginal effect between -0.079 and -0.067. The same holds for the marginal effect of the liquidity ratio, located between 0.018 and 0.026. Consequently, on average, being financially constrained is associated with a 6.7 to 7.9 percent decrease in the probability of exporting. In addition, as regards the financial liquidity, a 10 percent increase in this ratio generates a 1.8 to 2.6 percent increase in the probability to export. Our results significantly outweigh the conclusions of recent studies performed on developed countries. For example, in Bellone *et al.* (2010) the coefficient on their Score A for RE Probit and

TABLE 3 – Financial constraints and the export market participation decision

	Pooled Probit		RE Probit		Dynamic RE Probit	
Export decision	(1)	(2)	(3)	(4)	(5)	(6)
Export Decision (-1)					0.431***	0.551***
					(0.126)	(0.148)
Financial constraint (-1)	-0.162**		-0.259***		-0.223***	
	(0.068)		(0.089)		(0.079)	
Liquidity ratio (-1)		0.096***		0.071***		0.091**
		(0.024)		(0.016)		(0.039)
Log Employment (-1)	-0.426***	0.329***	-0.362***	0.418***	0.339***	0.147***
	(0.069)	(0.080)	(0.081)	(0.090)	(0.062)	(0.032)
Log TFP (-1)	-0.036	-0.010	-0.038	-0.002	0.032	-0.005
	(0.039)	(0.021)	(0.037)	(0.035)	(0.043)	(0.027)
Log Average wage (-1)	-0.141***	-0.088***	0.097***	-0.089***	-0.094*	-0.065**
	(0.031)	(0.019)	(0.033)	(0.028)	(0.054)	(0.028)
IMR	1.035		1.289		1.374	
	(1.285)		(2.017)		(1.581)	
Constant	-16.052***	-2.782***	-15.364***	-3.146***	-2.263***	-1.871***
	(1.195)	(0.678)	(1.233)	(0.731)	(0.497)	(0.319)
Year dummies	NO	NO	YES	YES	YES	YES
Industry dummies	NO	NO	YES	YES	YES	YES
Ownership structure dummies	NO	NO	YES	YES	YES	YES
Observations	3944	5267	3944	5267	3944	5267
Number of firms	-	-	1218	1529	1218	1529
Log likelihood	-1056.595	-1285.27	-1093.264	-1012.01	-984.975	-976.334

Note : ***, **, and * denote significance at the 1-percent, 5-percent, and 10-percent levels, respectively. Standard errors are reported in parentheses. Ownership structure dummies indicate legal status of the firm that is either "Individual ownership", "Partnership", "Limited Partnership", "Stock Partnership", "Stock Company", "Limited Liability Company", "Affiliate of a Foreign Company", "Public Sector Company", or "Other".

Dynamic RE Probit estimators are respectively 0.042 and 0.045, which is about half of our estimated coefficients of the variable close to their Score A, namely the liquidity ratio (our coefficients are between 0.071 and 0.096). These differences emphasize the crucial role of financial factors for promoting exports in developing countries, in which firms are likely to be less productive, because more distant from their possibility frontier production, and therefore more sensitive to the burden of export entry sunk costs.

5. Financial constraints and exports : robustness

The previous section illustrated that financial constraints decrease the probability for a firm to export. These findings hold when considering different measures of financial constraints or different estimation methods. In addition, the magnitude of this effect is remarkably important for Egyptian firms compared to what is usually outlined in developed countries. The goal of the present section is to explore the robustness of the significance and magnitude of this effect with respect to alternative measures of the main dependent variable (i.e. exports, first subsection) and of the main independent variable (i.e. financial factors, second subsection).

5.1. Financial constraints and alternative measures of the export activity

Our benchmark model analyzes the effect of financial constraints on the decision to export. In this subsection we consider two alternative measures of the latter variable, namely export intensity and the length of the period before starting to export. Let us first focus on the former variable.

To explore the way financial constraints affect export intensity, defined as the firm's share of export income in total output, we estimate equation (9) above with export intensity as the dependent variable. As emphasized by the ordinary least square with fixed effects (OLS-FE) regression (1) in Table 4, financially constrained firms present a significantly lower share of export income compared to non financially constrained ones. As this was the case when using the decision to export as the dependent variable, this result is established when controlling for time, industry and ownership structure dummies, as well as for employment (which positively influences export intensity), the TFP (which has still no significant effect), and for the negative effect of the average wage. Moreover,

we equally control variables for the experience in exporting, defined as the number of years since the firm started exporting relative to each considered period. As expected, a higher experience in exporting, denoting the importance of export activities for the firm, significantly increases the share of export income in the total output of the firm.

We question the relevance of our results in three ways. First, we consider in regression (2) the liquidity ratio as a proxy for financial constraints. Not only control variables conserve their sign and significance, but the liquidity ratio exerts a positive and significant effect on the export intensity, suggesting that financial liquidity promotes exports, in accordance with the effect of financial constraints (see regression (1)). Second, to take into account the left-side censoring of the dependent variable, we present in regressions (3) and (4) the *tobit* with fixed effects (Tobit-FE) estimator. Despite the magnitude loss for the liquidity ratio, the effect of financial constraints remains remarkably robust in sign and magnitude, confirming that less financially constrained and, to some extent, more liquid firms, are associated with stronger shares of export income in their total output. Finally, regressions (5) and (6) display system GMM estimators that allow controlling for individual heterogeneity and correcting for the endogeneity bias. [16] Interest variables reveal a damaging effect of financial constraints on the share of the export income of the considered Egyptian firms.

As for the decision to export (see Table 3 above), our analysis shows that being financially constrained or presenting low liquidity ratios significantly declines export intensity. On the average, export intensity is lower by 7.72 (Tobit-FE marginal effect) to 49.2 (System GMM) percent for financially constrained firms. In addition, the effect of the liquidity ratio is also statistically significant ; a firm that could increase its liquidity score from the mean of the least liquid quartile of firms to the mean of most liquid quartile of firms would increase its export intensity by 0.26 (Tobit-FE marginal effect) to 5.5 (OLS-FE) percent. This latter result, overturning the negative effect of financial health of firms on export intensity found by Bellone *et al.* (2010), can be explained by the role played by learning-by-exporting and economies of scale in the export process, particularly in developing countries (see for instance Bigsten *et al.*, 2004; Blalock & Gertler, 2004).

Let us now focus on the second alternative measure for exports, namely the length

16. To perform GMM estimations we assume a linear probability model (see for instance Greenaway *et al.*, 2007; Bellone *et al.*, 2010) and consider as instruments all right-hand side variables lagged twice or more and time dummies.

TABLE 4 – Financial constraints and the export intensity

	OLS-FE		Tobit-FE		System GMM	
Export intensity	(1)	(2)	(3)	(4)	(5)	(6)
Export intensity (-1)					0.344***	0.289***
					(0.067)	(0.061)
Financial constraint (-1)	-0.179**		-0.149**		-0.492***	
	(0.087)		(0.073)		(0.149)	
Liquidity ratio (-1)		0.055***		0.006*		0.009***
		(0.015)		(0.003)		(0.002)
Log Employment (-1)	0.132***	0.144***	0.216***	0.206***	0.290***	0.240***
	(0.039)	(0.041)	(0.064)	(0.059)	(0.090)	(0.074)
Log TFP (-1)	0.155	0.104	0.280	0.032	0.038	0.054
	(0.148)	(0.171)	(0.357)	(0.270)	(0.065)	(0.102)
Log Average wage (-1)	-0.094**	-0.051*	-0.061***	-0.105***	0.339*	0.257
	(0.040)	(0.028)	(0.016)	(0.035)	(0.188)	(0.086)
Experience in exporting	0.833***	0.654**	1.102***	1.081**	0.822***	0.898***
	(0.225)	(0.280)	(0.268)	(0.465)	(0.200)	(0.249)
IMR	0.788		0.543			
	(0.865)		(0.644)			
Constant	-1.196***	-1.176***	-4.375***	-4.159***	-2.484***	-1.936***
	(0.286)	(0.263)	(1.102)	(0.967)	(0.524)	(0.381)
Year dummy	YES	YES	YES	YES	YES	YES
Industry dummy	YES	YES	YES	YES	NO	NO
Ownership structure dummy	YES	YES	YES	YES	NO	NO
Observations	3944	5267	3944	5267	3432	4604
Number of firms	1218	1529	1218	1529	1066	1338
Adjusted R-squared	0.513	0.544	-	-	-	-
Wald (p-value)	-	-	0.000	0.000	-	-
Hansen (p-value)	-	-	-	-	0.254	0.147
AR(2) (p-value)	-	-	-	-	0.178	0.233

Note : ***, **, and * denote significance at the 1-percent, 5-percent, and 10-percent levels, respectively. Standard errors are reported in parentheses. (-1) denotes the lagged value of the corresponding variable. Hansen (p-value) is the p-value of the Hansen test of overidentifying restrictions. AR(2) is the Arellano and Bond test of second order autocorrelation. The Tobit-FE estimator is run with the export intensity as a left-censoring variable.

of the period before starting to export (or the hazard rate of starting to export), which measures the probability for a firm to start exporting for the first time. This probability negatively depends on the time between the birth of the firm and the starting year of becoming an exporter, which we assume to be influenced by financial factors. Following Prentice & Gloeckler (1978) and Jenkins (1995), we estimate a duration model that allows controlling for unobserved heterogeneity among firms. A common and important problem in duration models concerns the censorship, i.e. the presence of firms of different ages can cause a left censoring for the period during which the firm does not export. We control for this censorship through the inclusion of age and year fixed effects into all our estimated duration models, reported in Table 5.[17] In particular, remark that our strategy is supported, for both Gamma RE and Normal RE estimators, by the values of the log-likelihood ratio test indicating that unobserved frailty is statistically significant (see columns (3) to (6)).

Regression (1) tests the effect of financial constraints on the time firms take before starting to export. To ease up comparison with our previous results, we control for time, industry and ownership structure, and we also include employment (positive effect), TFP (not significant) and average wage (negative effect) as control variables. In addition, observe that the coefficient of the log of time is negative and significant, supporting that the longer the absence from foreign markets, the lower the probability for a firm to enter export markets.[18] Finally, and more importantly, we show that being financially constrained significantly decreases the probability to start exporting, a result in accordance with the effect of financial constraints on the decision to export and on export intensity.

We test the robustness of the latter result in two ways. On the one hand, we consider an alternative measure for financial constraints. Regression (2) supports the results from (1), since a higher liquidity ratio significantly increases the probability of start exporting. On the other hand, to account for unobserved individual heterogeneity, we consider two random effects (RE) duration models, namely with Gamma (regressions (3) and (4)) and Normal (regressions (5) and (6)) distributed error terms. While the positive effect of the liquidity ratio is significant only for pooled estimations, a decrease in financial constraints

17. Compared to the analysis performed for the decision to export which takes into account all firm types together (see Section 4), the duration analysis focuses on never-exporters and export starters only, which reduces the number of firms to 991 (965 when we use the liquidity score as the measure of financial conditions).

18. Our finding is in line with the conclusions of Bellone *et al.* (2010), outlining that firms intending to internationalize seek to do so as soon as possible after their birth.

TABLE 5 – Estimating the hazard rate of entering the export market

	Pooled data		Gamma RE		Normal RE	
Hazard rate	(1)	(2)	(3)	(4)	(5)	(6)
Log Time	-0.019***	-0.018***	-0.004***	-0.004***	-0.003**	-0.004***
	(0.005)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)
Financial constraint	-0.024***		-0.017**		-0.013*	
	(0.006)		(0.007)		(0.007)	
Liquidity ratio		0.009**		0.002		0.001
		(0.003)		(0.013)		(0.013)
Log Employment	0.108***	0.103***	0.051***	0.054***	0.048**	0.050**
	(0.026)	(0.027)	(0.015)	(0.016)	(0.020)	(0.021)
Log TFP	0.003	0.004	0.001	0.001	0.002	0.002
	(0.010)	(0.008)	(0.003)	(0.001)	(0.006)	(0.011)
Log Average wage	-0.033***	-0.041***	-0.022**	-0.019*	-0.021*	0.028***
	(0.009)	(0.011)	(0.009)	(0.010)	(0.012)	(0.009)
Constant	2.106***	2.481***	7.604***	5.300***	7.381***	6.119***
	(0.448)	(0.576)	(1.949)	(1.472)	(2.108)	(1.456)
Year dummy	NO	NO	YES	YES	YES	YES
Industry dummy	NO	NO	YES	YES	YES	YES
Ownership structure dummy	NO	NO	YES	YES	YES	YES
Observations	3944	5267	3944	5267	3944	5267
Number of firms	-	-	1218	1529	1218	1529
LR test	-	-	18.49***	18.47***	24.17***	24.17***

Note : ***, **, and * denote significance at the 1-percent, 5-percent, and 10-percent levels, respectively. Standard errors are reported in parentheses. LR test represents the statistic of likelihood ratio test for unobserved frailty.

enhances the likelihood of start exporting, confirming our previous findings regarding the decision to export and export intensity. Consequently, access to finance (and reducing the cost of financing) negatively impacts the time between the birth of the firm and its internationalization, confirming the presence of sunk entry costs in exports market for the Egyptian firms in our sample.

To summarize, our results strongly support that the absence of financial constraints and, to some extent, better liquidity significantly increase export intensity and the time duration before exporting of Egyptian firms, adding to their effect on Egyptian firms' export decision established in the previous section. In the following subsection, we extend our robustness analysis by exploring the effect of subsequent measures of financial factors on all export measures considered above.

5.2. Alternative measures of financial constraints and exports

Compared to the benchmark model developed in the previous section, we consider now alternative measures of the financial stance, namely a credit access dummy, the value of the last credit, the value of bank guarantees needed as collateral for loans, and a dummy for bank overdraft access (see Table 7 in Appendix for their definition). For simplicity, Table 6 reports exclusively the coefficient of the variable of interest, i.e. the measure of the financial stance. The top panel presents the results of estimations based on the same sample as previously, namely with influential firms excluded, [19] while results for the full sample are reported in the bottom panel of Table 6. For each measure of exports, we employ an appropriate method of estimation, namely RE Probit for the decision to export, Tobit-FE for the export intensity, while for estimating the hazard rate of entering the export market we assume that the error term is normally distributed. [20]

The first column illustrates the impact of the four measures of the financial stance on the decision to export. According to our estimations, the access to credit and to bank overdraft significantly increases the probability for a firm to being an exporter. In addition, the decision to export is equally related to having recently had access to a consistent credit. [21] On the whole, these results confirm and extend our findings in the benchmark model based on financial constraints dummy and the liquidity ratio as measures of the

19. As previously, influential firms are excluded by dropping the top and bottom 1 percent of firms.

20. The number of observations varies depending on data availability for the alternative measures of financial factors.

21. The effect of the value of collateral needed for loans presents the expected sign but is not significant.

financial stance of the firm.

TABLE 6 – Alternative measures of financial factors and exports

Dependent variable	Export decision	Exports intensity	Hazard rate
	(1)	(2)	(3)
Influential firms excluded			
Credit access	0.078***	0.051**	0.044**
	(0.023)	(0.022)	(0.020)
Value of the last credit	0.066*	0.059**	0.198***
	(0.038)	(0.027)	(0.053)
Value of Collateral	-0.027	-0.199	-0.085
	(0.113)	(0.206)	(0.136)
Bank overdraft access	0.198***	0.075	0.083*
	(0.062)	(0.087)	(0.047)
All firms included			
Credit access	0.057	0.045**	0.023**
	(0.122)	(0.019)	(0.010)
Value of the last credit	0.030	0.103**	0.099*
	(0.104)	(0.044)	(0.056)
Value of Collateral	-0.077***	0.015	-0.026
	(0.022)	(0.144)	(0.045)
Bank overdraft access	0.053***	0.048**	0.096
	(0.016)	(0.020)	(0.103)

Note : ***, **, and * denote significance at the 1-percent, 5-percent, and 10-percent levels, respectively. Standard errors are reported in parentheses. All regressors retain their lag structure from previous regressions.

We extend these results in two ways. On the one hand, we replace the decision to export alternatively by the export intensity and the time duration, as measures of the export activity. First, we find that credit access and the value of the last credit exert a positive and strongly significant effect on the share of export income in total output (i.e. exports intensity, see column (2)). Second, having access to credit, to bank overdraft and to a higher credit recently increases on the time firms spend before starting to export of Egyptian firms (see column (3)). On the other hand, we check for the stability of our results with respect to the sample, by presenting in the bottom panel of Table 6 results obtained when influential firms are not excluded. According to the results in the bottom panel of Table 6, at least two out of the four measures of the financial stance are significant and present the expected sign, for each of the three considered measures of the export activity ; the access to bank overdraft fosters export participation and export intensity, while having access to credit and to a high credit recently increases exports intensity and the hazard rate of entry into exporting. Consequently, these results confirm that the favorable effect of better financial conditions on the export activity still holds when considering the entire

sample.

6. Concluding Remarks

We developed in this paper a simple theoretical model that captures the influence of the financial stance on the firms' export activity. We tested the possible existence of a positive effect running from better financial conditions to stronger export activity using a large sample of Egyptian firms. According to the results in our benchmark model, the presence of financial constraints is detrimental to the export activity, measured by the decision to export. Starting from this benchmark model, we explore the robustness of our finding in several ways. First, we show that a higher liquidity ratio increases the probability of being an exporter, confirming the negative effect of financial constraints on the probability of being an exporter. Second, using alternative estimation methods does not alter the effects of financial constraints and of the liquidity ratio on the decision to export. Third, the positive effect of better financial stance on the export activity still holds when replacing the decision to export alternatively by exports intensity and the probability of becoming an exporter. Finally, this positive effect remains robust when considering several additional measures of the financial stance and whether or not we control for outliers.

Consequently, to the best of our knowledge, this is one of the first papers providing firm-level robust empirical support for a favorable impact of financial factors on firms' participation in international trade in a developing country, while the existing literature focused on developed economies (see for instance Greenaway *et al.*, 2007; Bellone *et al.*, 2010; Stiebale, 2011). The presence of such a strong and positive relation is mainly due to the imperfection of the loanable funds market and the persistence of sunk costs of entry into exporting. One implication of our results is that financial constraints act as a trade barrier that is likely to slow growth and private sector development particularly in developing countries, which present poor financial institutions. Moreover, these financial constraints could lead to a reduction of international trade, which is a key engine for the progress of developing countries particularly in the context of the current crisis.

Future research could focus on the use of more detailed and more relevant measures of financial constraints. For example, the analysis of export intensity could be deepened and completed on an extensive way, by accounting for the number of foreign markets served or the number of products exported. In addition, subsequent research should could review

and break down the concept of sunk entry costs in order to estimate the extent to which these costs may have the characteristics of public goods, which call for an appropriate type of management.

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A. Appendix. To be published as supplementary material on the Journal's webpage, if possible

TABLE 7 – List and definition of variables used

Variable	Definition
Decision to export	Dummy variable equal to 1 if the firm is exporter, and 0 otherwise
Export intensity	The firm's share of export income in total output
Experience in exporting	The number of years since the firm started exporting relative to each considered period
Financial constraint	Dummy variable equal to 1 if the firm is financially constrained, and 0 otherwise
Liquidity score	Index in the range from 1 to 10, 10 being the situation of the most liquid firm
Credit access	Dummy variable equal to 1 if the firm currently have a loan from a financial institution, and 0 otherwise
Value of the last credit	The value of the last loan obtained by the firm from a financial institution, in Egyptian currency
Value of collateral	The value of the collateral required as a percentage of the loan value
Bank overdraft access	Dummy variable equal to 1 if the firm currently have an overdraft facility or line of credit, and 0 otherwise
Employment	Firm size measured by the number of permanent workers
TFP	Total factor productivity calculated based on the Levinsohn & Petrin (2003)'s method
Average wage	Wage per permanent worker

TABLE 8 – Descriptive statistics of variables

Variable	Mean	Std. Dev.	Minimum	Maximum
Decision to export	0.227	0.419	0	1
Export intensity	8.560	22.121	0	100
Financial constraint	0.420	0.493	0	1
Liquidity score	5.362	14.056	0	10
Log TFP	4.441	1.578	-2.591	12.603
Log Employment	3.938	1.582	1.098	10.351
Log Average wage	1.639	1.273	0.278	10.008
Credit access	0.262	0.503	0	1
Value of the last credit	2.64e+07	1.45e+03	7000	2.00e+09
Value of collateral	109	87.113	0	500
Bank overdraft access	0.346	0.298	0	1

TABLE 9 – Comparison of exporters and non-exporters in 2008

Mean	Exporters=259	Non-exporters=892	T-test (p-value)*
Financial constraint	0.329	0.462	0.002
Liquidity ratio	7.104	3.621	0.000
Firm age	23.984	23.314	0.110
Log TFP	5.557	4.613	0.000
Log Employment	5.513	3.717	0.000
Log Average wage	1.903	2.129	0.039

Note : (*) Mean comparison t-test for H0 : difference of means=0. These simple tests show that exporting firms are less financially constrained, more liquid, have greater access to overdraft facilities and credit, are slightly younger, have higher TFP, employ more, but pay lower wages on average compared to non-exporting firms.

TABLE 10 – Levinsohn & Petrin (2003) productivity estimator

Dependent variable	Value added
Log Employment	0.552***
	(0.075)
Log Capital	0.148***
	(0.033)
Year dummies	YES
Industry dummies	YES
Ownership structure dummies	YES
Observations	5618
Number of firms	1655

Note : ***, **, and * denote significance at the 1-percent, 5-percent, and 10-percent levels, respectively. Standard errors are reported in parentheses. The Log of Employment is taken as the free input, whereas the Log of Capital, which is the endogenous input, is instrumented by the Log of Raw material and intermediate goods.

TABLE 11 – Result of probit regressions to generate the Inverse Mills Ratio

Estimator	RE Probit
Dependent variable	Financial constraint
Log Export intensity	-0.001
	(0.002)
Log Employment	-0.057
	(0.036)
Log TFP	-0.016***
	(0.004)
Constant	-0.031***
	(0.009)
Observations	3944
Number of firms	1218

TABLE 12 – The panel structure

Number of firms	Pattern	Percent
554	XXXXXX	33.47
377	XX	22.78
280	XX....	16.92
223	..XXXX	13.47
141	XXXX..	8.52
78	..XX..	4.71
2	XX..XX	0.12
1655	XXXXXX	100.00

FIGURE 1 – Percentage of Firms Identifying Access to Finance as a Major Constraint by Continent, 2006-2010

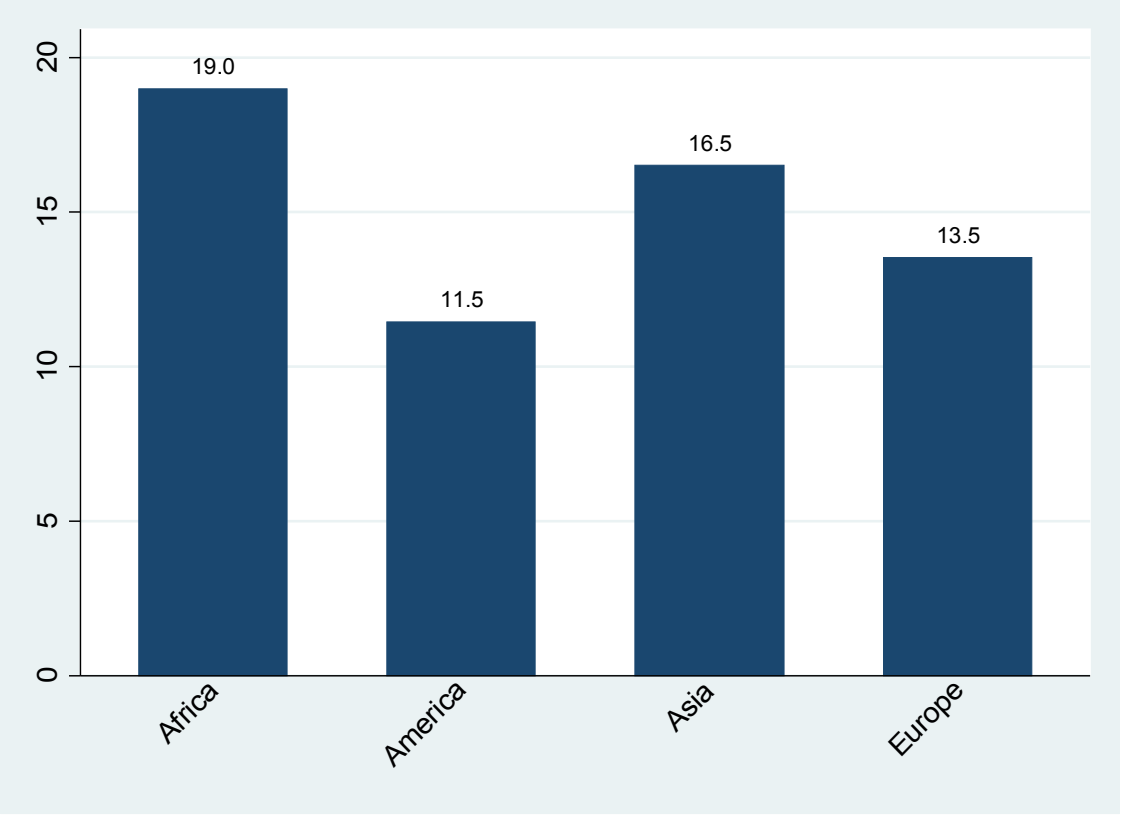

FIGURE 2 – Percentage of Firms that Export Directly, 2006-2010