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Financial Constraints and Foreign Market Entries or Exits: Firm-Level Evidence from France*

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Résumé

Cet article étudie l'effet des contraintes de financement sur les changements dans le nombre de marchés sur lesquelles les firmes exportent. Un modèle est développé dans lequel un moindre accès aux financements externes, ou en manque de ressources internes, détériorent la capacité à financer les coûts d'exportation récurrents et réduisent la probabilité de maintien sur les marchés étrangers. De plus, les contraintes financières sont un obstacle à l'expansion des exportations parce qu'elles réduisent la capacité à payer les coûts d'accès à des nouveaux marchés ; de ce fait elles conduisent les firmes à éviter la perte de destinations d'exportation. Pour tester les prédictions de ce modèle, nous utilisons une base de données longitudinale combinant une information sur les destinations des exportations des firmes et des variables de contraintes financières au niveau individuel. Nous obtenons deux résultats. Premièrement, les contraintes de financement ont un impact négatif sur le nombre de nouvelles destinations d'exportations. Deuxièmement, les contraintes de financement sont associées à une probabilité plus élevée de sortie des marchés d'exportations ; ceci étant compatible avec des contraintes qui limiteraient principalement la capacité à payer les coûts d'exportation récurrents.

Mots-clés : Hétérogénéité des firmes, contraintes financières, exportation

Codes JEL : D24, F14, D92

Abstract

This paper studies the effect of credit constraints on the expansion and survival of firms in foreign markets. It develops a model in which, lower access to external finance, or reduced internal liquidity, hampers the firm ability to finance the recurrent costs to serve foreign markets and decreases firm survival in foreign markets. Additionally, financial constraints act as a barrier to firm export expansion by decreasing the firm ability to finance the entry costs into new export markets; thus, they push firm to avoid losing destinations. We use a unique longitudinal dataset on French firms that contains information on export destinations of individual firms and allows us to construct various firm-level measures of financial constraints to test these predictions. We obtain two main results. First, credit constraints have a negative effect on the number of newly served destinations. Second, higher probability of exit from the export market is also associated with credit constraints; that is consistent with constraints limiting the financing of recurrent export costs.

Keywords: Firm heterogeneity, financial constraints, trade

JEL classification: D24, F14, D92

1 Introduction

There is growing evidence that credit constraints are an important determinant of global trade patterns. An important finding of recent trade literature is that there are sizeable fixed costs associated with entry into export markets (Roberts and Tybout, 1997; Das, Roberts and Tybout, 2007). In the presence of imperfect capital markets some firms that could profitably export may not do so because investors will not be willing to finance their trade costs (Chaney, 2005; Manova, 2010). This suggests that financial constraints will have an effect on trade flows by determining the composition and number of firms that enter export markets and thus affect aggregate trade flows and the competitiveness of countries.

The goal of this paper is twofold: we focus on disentangling the effects of credit constraints for, on the one hand, firms' expansion and, on the other hand, survival in export markets; and to exploit a French firm dataset providing rich information on exports and financial constraints. First, we develop a simple theoretical model in which credit constraints influence firm expansion and survival through the firm ability to finance sunk entry costs and the recurrent fixed costs to serve an export market. The model suggests that financial constraints have a negative impact on firm expansion in foreign markets by limiting firm ability to finance entry costs and reducing the number of newly created export relations. Additionally, the effect of credit constraints on survival in export markets is ambiguous. In the presence of credit constraints the probability that a firm survives in the export market is reduced because liquidity strapped firms may not be able to finance the recurrent per-period costs to stay in the market. On the other hand, lower availability of credit increases the option value of staying in the export market. Since the firm knows that it would be difficult to finance the sunk cost of entry, should the firm exit and decide to re-enter in the future, the firm increases its efforts to avoid losing the destination.

For this purpose, we, first, develop a simple theoretical model in which credit constraints influence firm expansion and survival in export markets through the firm ability to finance sunk entry costs and the recurrent fixed costs to serve an export market. While financial constraints negatively impact firm expansion in foreign markets by limiting the firm ability to finance entry costs and reducing the number of newly created export relations, the effect of credit constraints on export markets survival is ambiguous. In the presence of credit constraints the probability that a firm survives in the export market is reduced as liquidity strapped firms cannot finance the recurrent per-period costs to stay in the market. On the other hand, lower availability of credit increases the option value of staying in the export market. Since the firm knows that it would be difficult to finance the sunk cost of entry, should the firm exit and decide to re-enter in the future, the firm increases its efforts to avoid losing the destination.

We test these predictions empirically using a firm-level dataset for France. The dataset we use merges the Banque de France's FIBEn survey and French customs data and is particularly well suited for this analysis. First, contrary to most datasets used in the literature, contains precise information on each firms' exports to any destination in a given year, thus allowing to

analyze the dynamics of entry and exit into the export market. In addition, its panel dimension allows to control for fixed firm characteristics and trends. Second, the dataset also has precise information on firms' financial ratios providing several measures of firms' credit constraints. In addition to standard measures of liquidity and trade credit, it also contains unique information on firms that default on trade creditors that allows to construct an indirect measure of credit constraints. A final advantage of the dataset is its representativity of the overall population of French exporters; it contains information on firms across different size classes including an important number of small and medium firms that are particularly likely to be affected by financial constraints.

Equipped with this firm level information on export destinations and credit access, we regress the number of entries and the number of exits on firm credit access, controlling for firm productivity, firm size and unobserved heterogeneity. The empirical results confirm the theoretical predictions. Our main results can be summarized as follows. First, credit constraints have a negative impact on the expansion of firm activities abroad through their negative impact on the number of newly served export destinations. Second, credit constraints not only deter firm entry into export markets, but also have a negative effect on firm survival in the export market by increasing the probability that a firm exits export markets and thus the number of exits from the export market. Therefore credit constraints, by preventing firms from entering new export destinations, and by prompting them to quit export markets, reduce the overall number of firms that export and decrease aggregate exports in the long run. These results are robust to using different indicators of firms' credit constraints and different definitions of entry and exit.

This paper contributes to a recent literature on trade and finance that investigates the linkages between firm-level financial constraints and international trade. On the theoretical side, two recent works develop novel theories that help to understand how financial constraints affect firm trade activities. First, Chaney (2005) extends Melitz's (2003) dynamic industry model with heterogeneous firms to consider the possibility that firms face liquidity constraints in the financing of the costs to enter export markets. A main prediction of his model is that credit constraints will lead to suboptimal entry into export markets and financial underdevelopment will decrease a country's aggregate exports by restricting the number of firms that export. The main underlying mechanism is that if firms must pay some entry costs to access foreign markets and if they face internal liquidity constraints to finance these costs, then only firms with enough liquidity will export. Second, Manova (2010b) develops a more sophisticated modeling of financial constraints that Chaney (2005) by introducing the possibility that firms can borrow externally to finance their trade costs and considering differences across sectors in external finance dependence and asset tangibility. Her model yields the interesting prediction that in the presence of credit constraints a country aggregate export will depend on the country level of financial development and its productive structure.

On the empirical side, a few studies provide micro-level evidence on the importance of

financial constraints for firm trade activities (e.g. Campa and Shaver 2002, Bellone et al 2010, Greenaway et al 2007, Muûls 2008, Berman and Héricourt 2010, Bricongne et al 2010, Minetti et Zhu 2011). These studies shed new light on the link between export status and firm financial health and on the ways in which financial frictions restrict firms export participation.¹ On the link between financial health and export status the existing studies give mixed results. Greenaway et al. (2007) using panel data for UK firms find that participation in export markets improves a firm’s financial health, but ex-ante financial health has no effect on the probability that a firm enters export markets. On other hand, Bellone et al. (2010) reach opposite conclusions using French firm-level data. They find that firms that enjoy better ex-ante financial health are more likely to start exporting and participation in export markets does not lead to better financial health.

Closer to our work, Berman and Héricourt (2010) find that credit constrained firms are less likely to become exporters using firm-level data for several developing and emerging economies. In addition their results show that financial constraints do not influence the probability of staying in export markets and neither firm’s export volumes, suggesting that sunk entry costs are the most important hurdle for credit constrained firms, while the financing of fixed and variable trade costs seems not to be influenced by credit constraints. Moreover, Muûls (2008) tests the empirical implications from Manova’s (2010b) model and confirms the findings that liquidity constrained firms are less likely to become exporters. She also finds that firms with easier access to finance earn greater export revenues and export more products in line with the idea that firms need external funds to overcome both fixed and variable costs of exporting. Matching together export data with firm-level credit constraints, Bricongne et al. (2010) show that during the 2008-2009 crisis credit constraints emerged as an aggravating factor for firms active in sectors of high financial dependence. Having experienced a payment incident over the past year has a negative impact on the firm’s export growth rate in normal time; during the crisis the negative impact is heightened but the authors argue that the overall contribution of credit constraints on the trade collapse was limited. Recently, using a survey on 4700 Italian firm including responses on financial statements, Minetti and Zhu (2011) find in cross-section that credit rationing reduces dramatically both the probability of exporting and foreign sales.

Our paper contributes to this literature on two aspects. First, it provides an analytical framework for disentangling how financial constraints interact with firm entry, on the hand, and firm exit from foreign markets, on the other hand; it shows that the impact on firm exit is ambiguous depending on the nature of the constraint. And second, it provides new empirical evidence showing that financial constraints have a negative effect on the expansion and survival of firms in export markets; also, in contrast with Minetti and Zhu (2011), the time dimension in

¹Other studies investigate whether financial constraints matter for entry into export markets using data for different countries. Manole and Spartareanu (2010) find that Czech exporters are less financially constrained than non-exporters and that less constrained firms self-select into exporting rather than exporting alleviating firms’ financial constraints. Arndt et al. (2009) find that less financially constrained firms are more likely to start exporting using German data.

our dataset allows the use of firm fixed effects. Our findings are consistent with the theoretical prediction of the impact of credit constraints on financing recurrent costs on foreign market. The joint consideration of financial constraints on entry and exit allows a better understanding of the drivers of firm trade dynamics and of the extensive margin of trade, i.e. the number of firms that export in an economy, which are important drivers of aggregate export flows.

The paper proceeds as follows. In the next section we develop a simple theoretical model describing the relationship between financial constraints and export market entry and exit. Section 3, describes the dataset and discusses the firm-level measures of financial constraints. Section 4 describes the empirical strategy and section 5 presents the baseline results. Section 6 provides some extensions and tests the robustness of our results with respect to alternative definitions of entry and exit. The last section concludes.

2 The Model

This section derives a simple theoretical model to study the relationship between credit constraints and firm entry and survival into export markets.

The main outcome of the model is that credit/liquidity constraints reduce the probability to enter a new destination because credit constraints limit the firm ability to finance the entry costs. But the impact of credit

constraints on the exit from the export market is ambiguous. If financial constraints affect the firm ability to finance the recurrent costs then the probability to exit a destination is higher. However, if credit constraints affect the firm ability to finance entry costs then the probability to exit the market is lower as the firm will increase its efforts to stay in the destination.

2.1 Without Credit Constraints

Consider a given country x , the firm can be currently an exporter or not. Assume first the case that the firm is already exporting to x . But the firm faces an exogenous probability h to lose this market. This probability is mitigated by the expenses of the firm to maintain this foreign market; typically, the firm supports its distribution network in x , actually ex ante gaining π_1 . To maintain its foreign market the firm incurs recurrent fixed costs that involve distribution and servicing costs. Formally, reducing by p_1 the probability of quitting the market is associated with a recurrent fixed cost $cp_1^2/2$. Let V_1^x the asset value of the destination x for the firm when it exports in x , and V_0^x the value when the firm does not export. We have the following relation

$$rV_1^x = \pi_1 + (h - p_1)(V_0^x - V_1^x) - cp_1^2/2, \quad (1)$$

where r is the interest rate.

Assume now that the firm does not export to x . The firm incurs foreign market entry costs cp_0^2 for a probability p_0 to enter in the market x . These entry costs may include the costs of packaging, upgrading product quality, establishing marketing channels, building up information on demand. We have thus:

$$rV_0^x = p_0(V_1^x - V_0^x) - cp_0^2/2. \quad (2)$$

The first order conditions give

$$cp_1^* = (V_1^x - V_0^x) \quad (3)$$

and also

$$cp_0^* = (V_1^x - V_0^x). \quad (4)$$

Replacing values (3) and (4) in the asset equations (1) and (2) gives the second order equation followed by the unconstrained optimal choices p_1^* and p_0^* :

$$(r + h)p_1^* = \frac{\pi_1}{c} = (r + h)p_0^* \quad (5)$$

Consequently, the probability to quit the destination market, $h - p_1^*$, is a decreasing function of π_1 . Conversely, the probability to enter the market, p_0^* , is increasing with potential profits. Intuitively, the more the revenues in the foreign market x are high, the more the firm will try to enter or to stay in this market.

2.2 With Credit Constraints

Now, assume that the firm faces binding credit constraints. As suggested by Chaney (2005), there are reasons to believe that firms may face credit constraints when financing their export activities. Export investments are intrinsically riskier than domestic ones, due to information asymmetries and contract incompleteness that are more pervasive in international transactions relative to domestic ones. We consider two subcases. First, that credit constraints play on the propensity of the firm to finance the recurrent fixed costs to maintain its market. Second, or alternatively, it plays on the capacity to mobilize liquidity to gain a new destination. Sunk and fixed trade costs may include learning about the profitability of potential export markets, making investments in capacity, product customization and regulatory compliance, or setting up and maintaining foreign distribution networks (Manova, 2010).

1. Case 1: Recurrent costs are binding

Assuming that the per period fixed costs to serve a destination market are binding, say $cp_1^2/2 \leq (V_1^x - V_0^x)^2/(2c\beta_1^2)$ with $\beta_1 > 1$. The larger is β_1 , the tighter the constraint is. By

convexity, the optimum follows $cp_1 = (V_1^x - V_0^x)/\beta_1$ and still $cp_0 = (V_1^x - V_0^x)$. Replacing these new values in the asset equations (1) and (2) gives:

$$(r + h)p_0 = \frac{\pi_1}{c} + (2/\beta_1 + 1/\beta_1^2 - 1)p_0^2/2 = \frac{\pi_1}{c} + (1 - 1/\beta_1)^2 p_0^2/2 \quad (6)$$

Alternatively,

$$(r + h)(p_0 - p_0^*) = (1 - 1/\beta_1)^2 p_0^2/2 > 0. \quad (7)$$

Then $p_0 < p_0^*$ and thus $p_1 < p_1^*$. Finally the propensity to quit the destination x is naturally higher than in the unconstrained case, but the effort to gain a market is also reduced. Intuitively, the opportunity cost of a new destination is magnified by the higher risk of losing this market.

2. Case 2: Foreign market entry costs are binding

Assuming that the entry costs to gain a destination are binding, say $cp_0^2/2 \leq (V_1^x - V_0^x)^2/(2c\beta_0^2)$ with $\beta_0 > 1$. By convexity, the optimum follows $cp_0 = (V_1^x - V_0^x)/\beta_0$ and $cp_1 = (V_1^x - V_0^x)$. Then

$$(r + h)(p_1 - p_1^*) = -(1 - 1/\beta_0)^2 p_1^2/2 < 0. \quad (8)$$

Then, contrary to the case 1, $p_1 > p_1^*$. Intuitively, because of the liquidity constraint, it is more difficult to regain a lost market; so, the firm increases its efforts to avoid to lose the destination. On the contrary, as in the case 1, $p_0 < p_0^*$. This intuitive property can be formally proved with a simple absurd reasoning: assume that both $p_1 > p_1^*$ and $p_0 > p_0^*$; Then, p_0^* and p_1^* are reachable because they are less costly for the constrained firm; Since this last choice is optimal without financial constraints, it is better for the constrained firm than the optimal constrained choice (p_0, p_1) ; Impossible.

In both cases, the credit/liquidity constraints reduce the probability to gain the destination. But, their impact on the probability to quit the foreign market is ambiguous depending on the nature of the constraint. If the credit constraints hurt the capacity to finance recurrent costs both entry and exit are reduced. However, when the credit constraints mainly bind the financing of entry costs, the model predicts that entry is reduced but firms tend to increase their effort to preserve their positions on foreign markets. Therefore the effect of credit constraints is an empirical matter that we will test in the next sections.

Theoretical impacts of financial constraints

	Constraint on entry costs	Constraint on recurrent costs
Entry	-	-
Exit	-	+

Figure 1:

3 Data Description

We construct our dataset from custom data gathered by the French custom services and from profit and loss and balance sheet data gathered by the Banque de France. The dataset has several advantages that make it particularly well suited for analyzing the effect of financial constraints on firms export entries and exits. First, the dataset contains information on financial variables that allow to construct firm-level measures of financial constraints. Second, for each firm it allows us to precisely observe its exports to any destination in a given year. A final advantage of the dataset is that it includes an important number of small and medium firms that are particularly likely to be affected by financial constraints. The dataset contains information on an average of 42,000 firms operating in the manufacturing sector during² the period 1995-2007.

The main data source is the French Customs database. This database is a very comprehensive source of information on national exports. It reports the amount of exports and the country of destination, for each firm located on the French metropolitan territory covering close to the totality of the value of national trade (97%). For each firm it allows to precisely observe its exports to any destination. In our database there are about 170 countries of destination.

For our empirical analysis, we refine the definition of exporting status and thus of entry in and exit from a market. Let v_{ict} , the value exported by the firm i in country c at date t . We define a export entry (or a newly created export relation) whenever we observe that a firm exports to a destination the current year but did not export to that destination the previous two years: $v_{ict-2} = 0$ and $v_{ict-1} = 0$ and $v_{ict} > 0$. In opposite terms, we define an export exit (or a terminated relation) whenever we observe that a firm exported to a destination during the previous years, but it does not currently export to that destination in the current year nor in

²Although the sources of data also contain information on firms in service sectors, we restrict our attention to the manufacturing sector for the shake of homogeneity. Exports in the services sector are quite different from manufacturing since not all the services are traded.

the next year: $v_{ict-1} > 0$ and $v_{ict} = 0$ and $v_{ict+1} = 0$. By considering two lags when constructing the entry and exit variables, we assume that firms completely lose their sunk startup costs if they are absent from a market for two years. This is in line with previous empirical evidence suggesting that sunk start-up costs depreciate very quickly and that firms that most recently exported two years ago have to pay nearly as much to re-renter foreign markets as first time exporters (Roberts and Tybout, 1997; Das et al., 2007).

We complement the exports data with information on firm’s balance sheet from the FIBEn database, a large French firm-level dataset constructed by the Banque de France. The FIBEn database is based on firms’ fiscal documents, including balance sheet and profit and loss statements, and thus includes information on both stock and flow account variables. Using this information we construct a number of financial ratios that we use to measure credit constraints. In addition, we obtain firm-level information on trade credit defaults from an internal longitudinal database of the Banque de France to construct a proxy for credit constraints: payment incidents, which we describe in detail below together with the description of the complete set of financial ratios.

The merge of the different datasets and the lack of data for some observations leave a maximal sample of about 30.000 firms. The resulting dataset is fairly representative of the population of French firms. Table 1 reports mean and standard deviations for the main variables used in the empirical analysis, including the financial measures for credit constraints, which we describe in the next subsection. The sample is unbalanced. It includes about 16% of all exporting firms, covering about two-third of the top 1% exporters and accounting for about 40% of total French exports. Compared to most empirical studies, the sample includes firms of various sizes, especially numerous small firms that account for the great majority of the observations: the median employment is rather low 30 workers. On average, these firms serve 8.5 destinations, and enter or exit from slightly more than one foreign market each year, according to the above definitions of entry and exit. There are therefore a sizeable number of entries and exits from the export market each year.

3.1 Measuring Credit Constraints

We use four different variables to measure firm-level credit constraints (see table 2). Existing studies on the effects of financial constraints on firms’ investment typically compute the correlation between firm investment and measures of firm internal liquidity or external debt to identify credit constraints (e.g. Fazzari and Petersen, 1993). Significant correlations are typically interpreted as financial markets having an effect on firm investment and denoting financing constraints. We build on this literature to construct standard variables that are typically used to measure firm financial constraints. Table 3 gives the list and description of the variables used to measure credit constraints.

Table 1. Summary statistics key variables 1996-2005

Variable	Mean	Median	Sd	Obs
Number of entries (t+1)	1,205	0	2.029	227 060
Number of exits (t+1)	1,040	0,00	1.0820	227 060
Number of destinations (t+1)	8,478	3	14.448	227 060
Employment	86,417	28	361,688	227 060
Ln(TFP)	-1.676	-1.635	0.582	227 060
liquidity ratio	0.607	0.577	0.412	227 060
Inverse trade credit ratio	8.991	6.848	16,635	227 038
Equity to assets ratio	0.033	0.026	1.444	226 992
Payment incidents	0.061	0	0.239	203 158

Notes: 1. Samples vary from one estimation to another due to construction of the variables and dropped observations (e.g. due to the constancy of the explained variable etc.). However, summary statistics are similar for the various used samples. We report here statistics for observations as a. firms report positive export sales at least one year during the sample period, b. liquidity ratio and TFP are known at date t, c. smooth entry is known at date t+1. For the definition of the financial variables see Table 3.

2. Payment incidents are not available for 2005

Figure 2:

Table 2: Description of financial variables used in the paper

Financial variables	Description
liquidity ratio	Short term debts over current assets
Inverse trade credit ratio	Turnover over accounts payable to suppliers
Equity to asset ratio	Total shareholders equity over total assets
Payment incidents	Dummy equal 1 if the firm has defaulted to its trade creditors, 0 otherwise

Figure 3:

We start by using a measure of credit constraints that has been used extensively in the literature: firm liquidity, measured by the ratio of short term debt to current assets. This is an indicator of the general indebtedness of the firm, which shows whether short-term liabilities are backed with relatively liquid assets. A high liquidity ratio indicates lower firm ability to meet its current obligations and less liquidity. If current liabilities exceed current assets then the firm may have problems meeting its short-term obligations and financing its investment. In addition such firms may face bigger hurdles in accessing external sources of capital, so they may also be more credit constrained (Jensen and Meckling, 1976; Myers, 1977).

Second, we use a commonly used measure of trade credit: the amount of trade payables as a share of turnover. This is a standard measure in the trade credit literature that measures the amount of credit that is extended to the firm by its suppliers (See e.g. Levchenko et al., 2010; Love et al., 2007). The higher the trade credit, the more the credit suppliers allow firms delaying paying their bills, and thus the more working capital the firm has to finance other investments (Cuñat, 2007). We take the inverse of the trade credit ratio, so that an increase in ratio represents an increase in financial constraints.

The third measure of financial constraints that we use is the ratio of equity to total assets, that is the share of the total assets that are owned by the firm's shareholders. This is a standard ratio to evaluate the overall financial stability of a company, or the firm ability to repay its debts if all assets were to be sold. To the extent that owner's equity is often not considered as eligible for collateral when firms try to secure a business loan, a high assets to equity ratio indicates easier access to external financing or lower credit constraints. In the analysis we use the inverse of this ratio, equity to total assets, so in line with the other proxies an increase in the ratio represents an increase in financial constraints.

Finally, a unique feature of our dataset is that it contains information on firms that are

credit strapped because they cannot access external banking finance. Since 1992 all French banks have a legal obligation to report any previous default on trade creditors to the "Système Interbancaire de Télécompensation" within four business days. These defaults on trade credit are called payment incidents. The Banque de France aggregates this information on payment incidents and makes it available to commercial banks on a weekly basis; so banks can evaluate the current trustworthiness of potential clients and adjust their lending accordingly. In addition, firms that have no more payment incident are removed from this "black list" after one year. Aghion et al (2011) are the first to exploit these longitudinal data on payment incidents and show that being notified on that list under the heading "incident de paiement" is indeed negatively and significantly correlated with a firm's access to loans during the next year. Thus suggesting that firms that had a payment incident in the past year are credit constrained. Based on this information we follow Aghion et al (2011) and build a proxy for credit constraints as a binary variable equal to 1 whenever the firm has experienced at least one payment incident during the previous year, and zero otherwise. Actually, as in Aghion et al. (2011), we observe that the number of payment incidents nor the level of these incidents for a given year are more correlated with the interest variables than the binary variable. This observation is consistent with the interpretation that more than their precise financial situation, being black listed is the main channel capturing by the payment incident variable.

Table 3 reports the correlation between our four measures. While the liquidity ratio and payment incident are positively correlated, the correlation between equity to asset ratio and the three other measures are virtually null. The inverse trade credit ratio is even negatively correlated with the liquidity. This confirms that these various variables may provide complementary indirect measures of credit constraints.

4 Empirical Model

The theoretical model in Section 2 implies that credit constraints influence the number of newly served destinations and the number of destinations that ceased to be served by a firm through the effects of financial constraints on the financing on trade costs. To test these theoretical predictions we run a set of specifications and model the count of the number of newly served destinations by a firm and the number of destinations stopped to be served as a function of a firm's credit constraints.

Consider $N_{i,entry}$ the total number of export destinations to which a firm i begins to export in a given year t , and $N_{i,exit}$ the total number of export destinations to which firm i ceases to export in year t . Since the number of entries and exits can take only discrete and positive values, we assume each of these variables is governed by a Poisson process. In order to account for overdispersion, we use a negative binomial specification which generalizes the

Table 3: Correlations between financial variables

	liquidity ratio	Inverse trade credit ratio	Equity to asset ratio	Payment incidents
liquidity ratio	1.00			
Inverse trade credit ratio	-0.08	1.00		
Equity to asset ratio	0.00	-0,00	1.00	
Payment incidents	0,10	-0,02	-0,00	1.00

Note: see table 2 for a description of the sample

Figure 4:

Poisson distribution by introducing an individual, unobserved effect into the conditional mean.³ The conditional expectation of the number of entries or exits (denoted both as Y_{it} for simplicity in notation) as a function of financial constraints can be then expressed as:

$$\begin{aligned}
 E(Y_{it}|X_{it-1}) &= \exp(\beta FC_{it-1} + Z_{it-1}\Phi + \eta_i + \tau_t + \varepsilon_{it}) \\
 &= \exp(\beta FC_{it-1} + Z_{it-1}\Phi + \eta_i + \tau_t) \partial_i
 \end{aligned} \tag{9}$$

where Y_{it} denotes the number of entries or exits and FC_{it-1} measures financial constraints. Y_{it} follows a negative binomial $Y_{it} \sim NB(\lambda, \lambda + \vartheta\lambda^2)$ where the parameter ϑ is a measure of overdispersion. The coefficient of main interest β measures the effect of financial constraints on the number of entries or exits. Following the intuition from the theoretical model, credit constraints reduce the probability to serve a new foreign destination. This would be reflected in a negative and significant β coefficient on the number of entries. On the other hand, credit constraints may have a positive effect on the number of exits, $\beta > 0$, if financial constraints diminish the firm ability to finance the recurrent fixed costs to stay in an export destination. Alternatively financial constraints may have a negative effect on the number of exits, $\beta < 0$, if financial constraints force firms to increase their efforts to avoid losing the export destination, as suggested by Eq. (8) in the theoretical model.

The rest of the explanatory variables included in the vector Z_{it-1} control for a set of firm

³We also considered the Poisson distribution, but given that dependent variables display a significant amount of overdispersion (the variance is larger than the mean) we preferred to estimate a Negative Binomial model that accounts for overdispersion.

characteristics that influence the probability to enter or quit the export market . As suggested by equation (5) in the theoretical model the probability to quit the destination market is a decreasing function of firm profits in this market π_1 . Following *a la* Melitz (2003) models, we assume that profits π_1 on this market are an increasing function of the size of the firm Y and the technological advance of the firm γ . More precisely, in such models, the size and the productivity level are joint. In our reduced form, in order to take into account the maximal heterogeneity (Redding, 2010), we control both for the size of the firm measured by the total number of employees, and for the technological level measured by the firm total factor productivity. Total factor productivity is estimated based on the Solow residual method.⁴ Additionally, we control for the total number of export destinations served by the firm. All the explanatory variables are lagged one year to avoid potential simultaneity bias. Finally, η_i is a firm specific idiosyncratic effect and τ_t is a full set of year dummies that control for macro effects, such as exchange rate changes or other macroeconomic shifts.⁵ Note that the firm fixed effects also control for time specific trends since the explained variables reflect changes in the number of export destinations.

5 Baseline Results

5.1 Effects on Credit Constraints on Export Entries

We look first at the effect of credit constraints on the number of newly served destinations. Table 4 presents the baseline results of estimating equation (9) with the number of entries as a dependent variable using a fixed-effect negative binomial. Each of the columns of Table 4 refers individually to a different measure of credit constraints. The results confirm the theoretical hypothesis that credit constraints restrict firm access to new export markets. The coefficients on credit constraints are negative and strongly significant for all specifications, regardless of the proxy used to measure credit constraints.

The variables of main interest are the variable measuring firms' credit constraints. A negative and significant coefficient on the credit constraints variables suggests that credit constraints are associated with lower export entries. The first column of Table 4 reports the results using as a proxy for credit constraints the liquidity ratio. The coefficient on the liquidity ratio is negative and highly significant at the 1 percent level. This result indicates that firms with a higher level of debt have difficulties to finance entry costs into new export destinations. Given that the liquidity ratio can be interpreted as a measure of the firm's lack of collateral, this result suggests that highly indebted firms may have problems to raise external financing to cover entry

⁴For a detailed description of the estimation of total factor productivity based on the Solow residual, together with the approach used to construct the stock of capital see Irac (2007). Data are similar to ones used in Askenazy et al. (2011). If we remove TFP or employment, the magnitudes of the estimated key coefficients are slightly larger

⁵Alternatively, we clustered observations according to firm Ids. In that case, the estimated coefficients (not reported) for the various measures of credit constraints are larger and more significant.

Table 4: Baseline regression results -Effects of financial constraints on entries into the export market

Negative binomial fixed effects model of count of number of entries				
Dependent variable: Number of newly served export destinations by firm i in t				
Financial variables	liquidity ratio	Inverse trade credit	Equity to asset ratio	Payment incidents
	(1)	(2)	(3)	(4)
Financial variable _{it-1}	-0.062 (3.00)***	-0.006 (7.05)***	-0.246 (2.24)**	-0.025 (1.94)*
lnEmp _{it-1}	0.189 (20.47)***	0.190 (20.63)***	0.194 (20.47)***	0.204 (19.99)***
lnTFP _{it-1}	0.110 (9.74)***	0.121 (10.76)***	0.108 (9.32)***	0.118 (9.65)***
Total no. destinations _{it-1}	-0.003 (5.16)***	-0.003 (5.44)***	-0.003 (5.51)***	-0.005 (8.50)***
Intercept	0.966 (24.26)***	0.992 (24.86)***	0.944 (23.56)***	1.108 (26.12)***
Observations	194 304	193 964	187 537	171 121
Number of firms	28 050	28 030	27 409	26 998

Notes: The regressions include year and firm fixed effects. Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 5:

costs into a new destination. This finding is confirmed by the negative and highly significant estimated relation between the equity to total assets ratio and the number of export entries in the second column. This result indicates that less solvent firms enter a smaller number of export markets.

In column 3, the inverse of the trade credit ratio has a negative and highly significant effect at the 1 percent level on the number of export entries. As discussed above, there is evidence that firms often rely on trade credit rather than on bank credit to finance their production and export costs (Levchenko et al., 2010). The negative effect of the inverse trade credit ratio on the number of newly served export destinations indicates that the higher the volume of trade credit the larger the number of newly served export destinations possibly because firms can finance entry costs. The results in column 4 also suggest that firms having had a payment incident serve a smaller number of new destinations. To the extent that as shown by Aghion et al (2011) a payment incident decreases the firm ability to borrow from external sources, this result suggests that limited access to external finance reduces firms' ability to finance new export investments.

The results from the control variables are in line with expectations. Firm size, as measured by the log of total employment, always has a positive and significant effect on the number of export entries suggesting that larger firms establish export relations with a larger number of export destinations. Second, the positive and highly significant effect on productivity suggests that more productive firms enter a larger number of export markets. This result suggests that

Table 5: Baseline regression results -Effects of financial constraints on exits from the export market

Negative binomial fixed effects model of count of number of exits				
Dependent variable: Number of destinations stopped to be served by firm i in t				
Financial variables	liquidity ratio	Inverse trade credit	Equity to asset ratio	Payment incidents
	(1)	(2)	(3)	(4)
Financial variable $_{it-1}$	0.042 (2.06)**	0.004 (4.54)***	0.629 (6.19)***	0.027 (2.37)**
$\ln \text{Emp}_{it-1}$	-0.251 (21.22)***	-0.248 (20.98)***	-0.239 (19.44)***	-0.253 (19.24)***
$\ln \text{TFP}_{it-1}$	-0.117 (10.33)***	-0.126 (11.12)***	-0.108 (9.20)***	-0.119 (9.72)***
Total no. destinations $_{it-1}$	0.072 (113.25)***	0.072 (113.18)***	0.072 (111.42)***	0.078 (109.98)***
Intercept	2.417 (38.92)***	2.355 (38.29)***	2.424 (38.09)***	2.426 (33.76)***
Observations	151 806	151 594	146 890	134 980
Number of firms	24 717	24 704	24 126	23 706

Notes: The regressions include year and firm fixed effects. Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 6:

because more productive firms earn bigger revenues, they can finance the entry costs into a larger number of export destinations. Finally, the negative and significant effect of the total number of export destinations on new entries indicates that the higher the number of export destinations served by the firm, the less likely the firm is to add a new export destination to its portfolio.

5.2 Effects of Credit Constraints on Export Exits

We now investigate the effect of credit constraints on the number of exits from the export market. The theoretical model predicts an ambiguous effect of credit constraints on the probability to survive in the export market. The model suggests that credit constraints will affect negatively firm survival if credit constraints prevent firms from financing recurrent fixed export costs. However, credit constraints will have a positive effect on survival if firms intensify their efforts to keep an export destination because they know that financing re-entry into the export market would be difficult precisely because of credit constraints.

In Table 5 we present our baseline results of estimating Eq. (9) with the number of exits as the dependent variable using a fixed-effect negative binomial specification. Similarly to above each of the columns of Table 5 refers individually to a different measure of financial constraints. The coefficients on the credit constraints variables are positive and significant, regardless of the

credit constraint proxy, indicating that credit constraints are associated with a larger number of export exits.

The first column of Table 5 reports the results on the standard measure of firm liquidity -the ratio of short term debt to total assets. The results indicate that a higher liquidity ratio is associated with a higher number of exits from the export market suggesting that indebted firms have difficulties to finance the recurrent fixed period costs to keep an export destination. As discussed in the theoretical section, we may expect that recurrent costs are binding if credit constraints are driven by lack of collateral, but may be alleviated by sufficient trade credit. The results in the second column of Table 5 confirm this intuition. The positive coefficient on the inverted trade credit variable indicates that firms with a lower share of trade credit over turnover (a higher ratio) stop serving a larger number of export destinations suggesting that less trade credit is associated with lower probability of export market survival.

The other two credit constraints proxies, the equity to total assets ratio and the payment incidents variable, further have a positive effect on the number of exits at the 1 and 5 percent significance level respectively. The positive effect of the equity to total assets ratio suggests that lower firm solvency makes it difficult to finance the recurrent fixed trade costs. While the positive effect of the payment of incident variable indicates that firms that fail to repay their creditors in the past exit a larger number of export destinations than those firms that duly pay their creditors. This result suggests that payment incidents by reducing external finance to firms limit the firm ability to keep financing their activity in export markets. As before the results from the control variables are in line with priors. Larger and more productive firms stop serving a smaller number of export destinations. The positive coefficient on the number of export destinations further suggests that the higher the total number of export destinations served, the higher the number of exits.

Comparing the economic significance of the effect of credit constraints on the number of exits versus the number of entries the different credit constraints proxies deliver different intuitions. First, internal liquidity seems to matter more for the financing of the recurrent fixed export costs than for the financing of the sunk entry costs. Meanwhile, the effect of debt seems to matter more for the financing of new export destinations. These results may suggest that while internal liquidity is more important for financing the recurrent export costs, external financing may be needed to finance the sunk entry costs. The size of the effect of the two other proxies on the number of entries and exits is very similar, suggesting that access to trade credit and lack of access to external financing because of a payment incident influence similarly the financing of the fixed and entry costs of export.

To sum up, all the results presented in this section provide support to the predictions of the theoretical model. The results using alternative measures of financial constraints suggests, first, that credit constraints have a negative impact on the expansion of firms activities abroad through their negative impact on the number of newly

Table 6: Extensions -Effect of financial constraints on different types of exporters

Negative binomial fixed effects model of count of number of entries				
Dependent variable: Number of newly served export destinations by firm i in t				
Financial variables	liquidity ratio	Inverse trade credit	Equity to asset ratio	Payment incidents
	(1)	(2)	(3)	(4)
<i>Effect of financial constraints on entries into the export market--Continuous exporters</i>				
Financial variable _{it-1}	-0.051 (2.39)**	-0.005 (6.00)***	-0.240 (2.10)**	-0.024 (1.85)*
Observations	145224	144983	140753	129244
Number of firms	22571	22550	22104	21773
<i>Effects of financial constraints on exits from the export market--Firms that remain exporters</i>				
Financial variable _{it-1}	0.046 (2.19)**	0.003 (4.06)***	0.668 (6.38)***	0.026 (2.19)**
Observations	140 198	140 010	135 870	124 754
Number of firms	21 838	21 825	21 380	21 024

Notes: The regressions include the same controls as in Table 4 and 5. The regressions include year and firm fixed effects. Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 7:

served export destinations. Second, that credit constraints not only seems to deter firm entry into export markets, but also seems to have a negative effect on firm survival in the export market by increasing the probability that a firm exits export markets and thus the number of exits.

In addition, the magnitudes of the estimated impacts are quite similar to ones for entry flows. Actually, credit constraints are associated with both a reduction of entry and an increase of exit. Thus, the net estimated impact of flows may become large. For example, a firm facing a one standard-deviation rise of the inverse trade credit ratio may experience a net loss of about 0.5 destinations; if this rise maintains 5 years, the cumulative impact reaches 2.5 destinations, while exporting firms in our sample serve on average 8.5 destinations. So, the magnitude of our results is comparable to the findings of papers which examine the cross-section exporting status of firms. In the next section we investigate the robustness of the results along several dimensions.

6 Extensions and Sensitivity Analysis

6.1 Effect of Credit Constraints on Different Types of Exporters

The previous results investigate the effects of credit constraints on all exporting firms. However, we may expect different effects of credit constraints on firm export entries depending on whether a firm is a new exporter or it already exported in the past. Financial constraints may deter firm entry more willingly if firms are first time exporters because these firms may have more trouble raising external financing for their export expenditures because they don't have a previous export record. Alternatively, although our model abstracts from this possibility for simplicity, firms that were already serving the export market may use export revenues generated in other markets to ease their financial constraints and finance entry into other export markets. Campa and Shaver (2002) suggest that exporting firms are less tied to the domestic cycle, and less subject to financial constraints because they enjoy diversification benefits if economic activity in the markets in which they sell is not perfectly correlated.

To test whether the effect of credit constraints on the number of newly served destinations differs for continuous exporters, as compared to all firms, we estimate equation (9) with the number of entries as dependent variables only on the sample of continuous exporters. These are defined as those firms that export in t , and also exported in $t - 1$ and $t - 2$. The results reported in first panel of Table 6 suggest that the effect of financial constraints on entry is negative and of very similar size as that on the sample of all firms that also contains new exporters, suggesting that financial constraints affect similarly continuous and first time exporters.

Next, we investigate whether financial constraints matter differently for firms that quit the export markets altogether as opposed to firms that exit some export destinations, but still keep some presence abroad. We may expect the effect of financial constraints to have a larger effect on firms that exit completely the export market. To test this hypothesis, we estimate equation (9) over the sample of firms that stay in the export market. The results reported in second panel of Table 6 suggest that the effects of credit constraints on the number of exits are positive and of very similar magnitude as for the complete sample of firms, including also firms that quit the export market altogether.

6.2 Alternative Definitions of Entry and Exit

By considering two lags when constructing the entry and exit variables, we assume that firms completely lose their sunk startup costs if they are absent from a market for two years. An additional advantage of our preferred measure is that it abstracts from possible statistical noise in the recorded entries and exits. However, evidence based on French firm-level data by Buono et al. (2008) suggests that entries and exits into the export market are very frequent and firms enter and exit many markets from one year to the other. To verify that our results are not driven by the definition of entry and exit we re-estimate the baseline model considering an alternative

more standard definition. For any two subsequent years we alternatively define a export entry (or a newly created export relation) whenever we observe that a firm does not export to a destination the previous year but it exports there the year after ($x_{ict-1} = 0$ and $x_{ict} > 0$). In opposite terms we define a export exit (or a terminated relation) whenever we observe that a firm exported to a destination the previous year, but it does not export there the year after ($x_{ict-1} > 0$ and $x_{ict} = 0$).

Table 7 reports the results using these alternative definitions of entry and exit. The results are in line with the previous findings using the baseline definitions. Overall credit constraints have a negative effect on the number of newly created export destinations. The coefficients on the credit constraints variables are negative, significant and of similar or a bit smaller size, except for the payment of incident proxy, which is no longer significant. The second panel of Table 7 further confirms that credit constraints have a positive effect on the number of export exits. However, the coefficient on the liquidity and the payment incident variable is no longer significant.

6.3 Remarks on endogeneity

Although in the previously discussed results we include fixed effects and lag the explanatory variables, this may not completely correct for endogeneity and omitted variable bias. A more satisfying approach would be to use instruments to control for endogeneity bias. Some instruments are natural for payment incidents. For instance, one possibility would be to use information on the supply of credit available to the firm. Following Amiti and Weinstein (2009), a good candidate would be the health of banks providing credit to firms. However one would have to match firms with banks which, given data available, would be extremely difficult for large firms and impossible for SMEs. A less demanding approach would be to use information on the overall characteristics of the credit supply available to the firms, such as the number of bank establishments in the region the firm is located in. Used in a cross section analysis such indexes of local banking supply (e.g. by Minetti and Zhu (2011)) would have little or no time variability, therefore it would not be possible to use them in our firm fixed effects specification. A promising possibility would be to use existing information on the payment incidents by creditors of the firms: we may consider as exogenous the negative shock for a firm due to non payment by its creditors. However, these data are not still available for research and should require investigation on their quality.

7 Conclusion

This paper develops a simple theoretical model to study the role of financial imperfections on the expansion and survival of firms in export markets. The main predictions of the model are that

Table 7: Sensitivity with respect to alternative definitions of entry and exit

Negative binomial fixed effects model of count of number of entries				
Dependent variable: Number of newly served export destinations by firm i in t				
Financial variables	liquidity ratio	Inverse trade credit	Equity to asset ratio	Payment incidents
	(1)	(2)	(3)	(4)
<i>Alternative definition of entry</i>				
Financial variable $_{it-1}$	-0.050 (3.62)***	-0.006 (10.80)***	-0.179 (2.49)**	-0.010 (1.11)
Observations	271115	270671	261283	225158
Number of firms	32462	32448	31733	30501
<i>Alternative definition of exit</i>				
Financial variable $_{it-1}$	0.006 (0.49)	0.004 (6.69)***	0.300 (4.61)***	0.012 (1.48)
Observations	200 595	200 282	193 975	168 797
Number of firms	28 467	28 451	27 771	26 591

Notes: The regressions include the same controls as in Tables 4 and 5, and year and firm fixed effects. Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 8:

financial constraints hinder the expansion of firms into new export markets. But their impact on export survival is ambiguous depending on the nature of the constraint. We test these predictions using data on French firms containing information on firms individual export destinations and on several proxies for firms' credit constraints. Our large dataset allows controlling for firm heterogeneity.

We find that credit constraints are associated with fewer newly served export destinations. Furthermore, we also find that credit constraints seem to have a positive effect on the number of exits from the export market suggesting that credit constraints decrease firm export survival. We perform a number of sensitivity checks and show that these findings are not sensitive to the measure of financial constraints, nor to the particular definition of firm entry or exit.

These results have implications for the understanding of firm trade dynamics and show a potential role for credit market imperfections on a country's aggregate exports. Credit market imperfections decrease firms ability to gain new markets and decrease firms export survival. This in turn has an effect on the number of firms exporting in an economy and on aggregate exports. The results are also consistent with the prediction of the model that credit constraints besides acting on the capacity to finance entry costs, influence firms' capacity to finance recurrent costs on a foreign market. This distinction may be useful for directing the public support to exporters.

The magnitude of the estimated connection between our measures of credit constraints entry and exit from foreign market is apparently small. However, cumulatively, year after year, credit

constraints may significantly affect the extensive margin of trade. So, credit constraints may be a partial candidate for the bad exporting performances and the relative decline of French exports observed during the 2000 decade

There are future extensions we plan to undertake. First, along with using additional data to correct for endogeneity, the paper may be extended through an exploitation of other dimensions of the customs database. Our empirical strategy collapses the information on destination of exports into (the change in) the number of destinations. An alternative strategy, would be to estimate logit models modeling the dependent variable as the existence of a positive flow to a given destination. However a possible drawback of this approach is that the number of observations would be huge and we would only be able to introduce the country dimension in the left-hand-side of the equation whereas the payment incidents variable would remain firms-time specific. Second, future work will also estimate logit models for French exports to specific markets (US, Germany, China, etc.). These would have the advantage of providing us with country specific coefficients on the effects of credit constraints on exports. Indeed it would be interesting to know for instance if credit constraints are more binding for exports to remote or less financially developed countries.

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