WWW.DAGLIANO.UNIMI.IT

CENTRO STUDI LUCA D'AGLIANO
DEVELOPMENT STUDIES WORKING PAPERS

N. 291

April 2010

Liquidity Constraints and Firm's Export Activity

*Emanuele Forlani**

* Université catholique de Louvain - CORE

Liquidity Constraints and Firm's Export Activity*

Emanuele Forlani†
Université Catholique de Louvain - CORE

April, 2010

Abstract

This paper will assess the importance of internal firm resources in overcoming sunk entry costs associated with export. When firms are not able to raise additional external funds for investments, they are credit-constrained, and in such a case, new exporters have to rely on their internal liquidity to pay sunk costs. Using a data set of small and medium size Italian enterprises (SMEs), we find that entry probability in the export market is affected by the level of cash stock for constrained firms. We propose a methodology used to identify *a priori* constrained firms, employing index analysis as used in business economics. The estimation of the Euler equation for investments confirms the fitness of our classification. In addition we find that exporters show higher liquidity if they raise the number of destinations. Finally, we do not find evidence that entry in the export market improves firm's financial health, while *ex-ante* new entrants are found to be relatively more leveraged.

Keywords: Productivity, Credit constraints, Heterogenous firms, Trade
JEL Classifications: C14, D24, F10, F12, F13, F19, M40

*I am grateful to Hylke Vandenbussche, the IEG meetings in Louvain-la-Neuve, and ETSG Warsaw 2008 for comments received. I am also grateful to CORE and Centro Studi Luca d'Agliano for its financial support (FIRB Project 2003 D.D. 2186)

†Ph.D. Economics; Université Catholique de Louvain, Center of Operation Research and Econometrics (CORE); Voie du Roman Pays, 34; B-1348 Louvain-la-Neuve, Tel : (32) 010/47.43.61. Fax: (32) 010/47.43.01 E-Mail: emanuele.forlani@uclouvain.be

1 Introduction

Recently, the research in international trade has focused on the sunk cost associated with exporting activity and firms capacity to cover that cost. In this paper, we will analyse the empirical relationship between firm export behaviour (entry) and financial factors using a data set (survey) for a sample of small and medium-size Italian enterprises (SMEs). In particular, we try to define whether a firm's liquidity is a determinant of the internationalisation process; both entry choice and extensive margin of trade (number of markets served) figures are used.

The concern around export and credit is increasing, especially because of the policy implications of results involving the banking and production sectors simultaneously. The underlying theoretical models are the ones that deal with firms' heterogeneity and monopolistic competition (Melitz, 2003); in more recent extensions of this research, financial status was introduced to generate a second source of heterogeneity that affects firms' export choice. These models introduce the issue of financing the sunk entry cost associated with exporting. The main idea is that there exists a discrepancy between present cost and expected future profits; while costs are certain and immediately paid, revenues from export will be uncertain and collected later on. If the capital market is characterised by asymmetric information and friction, some firms will not export ceteris paribus the other conditions[1] because they are not able to pay the sunk cost of internationalisation. More precisely, these firms are defined as *credit constrained*: namely, these firms are not able to raise funds to finance their investments or projects (as exporters); credit-constrained firms rely largely on internal resources rather than external ones to finance their investments. However, this does not mean that "non-constrained" firms do not use internal funds in large part (see Kaplan and Zingales, 1997); it means that some firms are not reliable from financial institutions' point of view, so they are "constrained" to using their own liquidity despite its not being enough.

The present paper is situated in between the two streams of literature: the first about investment sensitivity to cash flows and the second on the relation between export and credit constraints. In the former stream, since Fazzari et al. (1988), there has existed a large body of literature that analyses the sensitivity of investments to internal

[1] If we consider capital demand, the demand will vary according to sector technology and firm resource availability; more precisely, the price of capital varies across firms because of internal (firm financial health) and external (sector technology) factors. Some sectors are capital-intensive, and hence, firms must invest such a significant amount of resources that the investment cannot be covered with internal resources (steel, machinery, chemicals, etc.); in contrast, other firms do not need credit due to high internal liquidity and low investment requirements. Thus, there exists heterogeneity not only in terms of productivity but also in terms of financial needs; firms pay a different unit capital price.

resources[2]. Based on the idea that financial constraints shrink investment possibilities, it is quite straightforward to assume the existence of a similar relationship between exporting activity and firms' financial constraints. In the second stream, there exist several papers that relate exports with firms financial status. This research may be classified into three groups of analysis. The first one analyses how credit availability affects export decisions (Campa Shaver, 2003, Chaney, 2005, Manova, 2006, Muuls, 2008); the second describes whether export activity eases credit constraints (Manole and Spatareanu, 2009); and the third observes financial health changes before and after entry into the export market (Greenaway et al., 2007; Bellone et al., 2010).

In this paper, we will empirically assess internal liquidity as a key factor in firms internationalisation process and in particular as important for or credit-constrained firms. The paper is fundamentally comprised of two parts. In the first one, we develop a methodology for constructing an index that describes firm financial status, defining a firm's credit constraints *a priori*. Then we empirically show that the amount of internal resources (cash stock) affects the probability of entering into the export market for those firms identified as highly credit constrained. The papers contributions are twofold. From a methodological point of view, we suggest a different strategy for testing the hypothesis of liquidity constraints and export; firms are clustered into different groups according to their relative level of leverage, and the classification is robust to several tests. The estimation of the Euler equation for investments will demonstrate that firms described as potentially constrained show investments' sensitivity to cash flows. Secondly, we demonstrate that when firms are identified as constrained, their export choices are based on the level of liquidity; however, the extensive margin of trade (number of markets served) is affected by the level of internal liquidity regardless. We will illustrate in Section 2 and Section 4.1 how the methodology developed differentiates the present analysis from previous research; rather than measure credit constraints and plug them into the regression, we rank firms according to their financial health and then test the effects of liquidity on entry choice for different groups. In addition, we provide evidence that entry into the export market does not increase financial health but that new exporters are *ex-ante* more leveraged than non-exporters. We conclude that financial resources are a source of heterogeneity across firms once we control for different factors. The rest of the paper is organised as follows. We next present the related literature on investments, financial constraints and firm export behaviour. In Section 3 we present the data, describing the relevant characteristics and descriptive statistics. In Section 4 we introduce the motivations for the methodology proposed and the strategy for identifying credit-constrained

[2]Hubbard (1998) and Bond Van Reenen (2005) for a literature review.

firms. In Section 5 we test the hypothesis that credit-constrained firms rely on internal financial resources to enter into the export market compared to the other firms, while in Section 6, we verify the effect of internal cash on the extensive margin of trade. In Section 7, we provide robustness check analysis, testing the effects of exporting both before and after entry. Finally, in Section 8 we conclude.

2 Related Literature: export and credit constraints

The underlying hypothesis throughout the entire paper is that export activity requires an initial sunk cost (developing new products, organising the distribution chain...). This initial cost may be interpreted as investments that cannot be covered/paid by firms; some enterprises are unable to gather enough funds to begin export activity. This implies that only a sub-sample of firms will be able to begin exporting, either because they own enough internal resources or because they are able to collect liquidity in the financial markets (from banks, financial institutions, or the stock market). In the new-new trade theory models, it is demonstrated that firm self-selection is driven by the presence of fixed costs that are unaffordable for less productive firms. Chaney (2005) introduces liquidity constraints into a model of international trade with heterogeneous firms (Melitz, 2003); then, liquidity becomes a second source of heterogeneity across firms[3]. In a recent paper, Das et al. (2007) show the importance of sunk costs for exports. They calculate an average fixed entry cost of around $400.000 for Mexican exporters, even if they claim that it can be lower in reality; in general, the paper demonstrates that entry costs are an important barrier.

A large part of the research on export and credit constraints focuses at the firmlevel, with particular attention to understanding the direction of the causal relation; do credit-constrained firms have more difficulty entering the export market, or does exporting activity improves firms' financial health?

There are two major findings; first, new exporters do not show greater financial resources than domestic firms before entry; and second, exporters own more liquidity than domestic firms, even if the relation is driven by long-term exporters. Greenaway et al. (2007) study the causal relationship between export and financial health using a panel of UK manufactures. The empirical analysis provides evidence that the causal

[3]There exist a number of theoretical works in the field of financial development that deal with liquidity constraints as a source of comparative advantage (Matsuyama, 2005; Becker Greenberg, 2005); in a Ricardian comparative advantage framework, the basic prediction is that either all or no firms export in a given sector. Beck (2002, 2003) finds evidence of links between trade, financial development and credit access.

relation moves from exports to financial health: exporters show higher liquidity indices, in particular among long-term exporters. Entrants do not show better financial status than non-exporters, either before and some year after entry into the export market. Similarly, Bellone et al.(2009) tackle the problem in both directions of causality and provide partially different results. Their findings demonstrate that new exporters have an *ex-ante* financial advantage over non-exporters; thus, financial constraints act as a barrier to firms' internationalisation, as demonstrated theoretically by Chaney (2005). However, they do not find evidence of improvements *ex-post* in the financial health of exporters, at least in the short term. They contribute also from a methodological point of view, introducing an index that measures firm's financial constraints.

Nonetheless, the causal relation between export and financial health continues to be ambiguous. Does exporting have a positive effect on firms' financial stability? Campa and Shaver (2003), using a panel of Spanish firms, find that cash flows[4] are more stable for exporters than for non-exporters, probably because export activity has a counter-cyclical effect, mitigating negative demand shocks. Similarly, Manole and Spatareanu (2009) find evidence that export alleviates credit constraints i.e., the sensitivity of investments to cash flows is reduced. Estimating the investment function, Manole and Spatareanu find that the relation is driven by new exporters rather than continuing ones. Then, in a second step, considering endogenous the export dummy, they discover that the evidence of a reduction disappears, suggesting that exporters still have *ex-ante* a financial advantage.

Regarding credit as a determinant of export, Manova (2006) empirically shows that credit constraints determine both the zeros in bilateral trade flows and the variation in the number of products exported as well as countries reached. Bermann and Hericourt (2010) find evidence that credit access is an important factor in determining entry into the export market for firms in developing countries; however, they also show that exporting does not improve firms financial health.

The present paper adds to the current literature regarding these issues. The main objective of this study is to understand if internal financial resources determine firm internationalisation processes and the extensive margin of trade (number of markets served). Then we try to provide some insight.

[4]Credit constraints are measured as a variation of investment in tangible fixed assets caused by financial variables.

3 Data description: Capitalia surveys

The data employed in the analysis are provided by Capitalia Bank (formerly MedioCredito Bank); these data are grouped into three surveys (the seventh, eighth, and ninth waves) that offer qualitative and quantitative information. In addition, two balance sheet data sets (1991-2000 and 2001-2003) exist. The data cover a sample of small and medium-size Italian enterprises (SMEs) in manufacturing sectors, and the firms can be followed partially across all the three surveys and matched with balance sheet data sets.

The first survey (from the seventh Capitalia survey wave) covers the period from 1995 to 1997, while the second (from the eighth wave) covers the period from 1998 to 2000 and the third that from 2001 to 2003. From the surveys, it is possible to obtain information about firm export status[5] or other features as destination markets, percentage of exports for each destination market, number of banks used by firms and the share of internal coverage for firm investments. The fundamental results are obtained by matching the eighth and ninth survey; the seventh is just used to describe the ex-post effect of entry into the export market because the use of the seventh survey drastically reduces the number of matched firms. The data from the surveys are not time-variant, so part of the empirical analysis uses cross-section techniques. Merging the last two surveys, we are able to follow 2554 firms and observe export status twice (Table B.5), whereas we match the two balance sheet we follow 4668 firms. In addition, we also have information about the destination market, more precisely about the export destination macro-region; we will use this information in section‘6. The survey asks if a firm exported to one of nine regions of the world during the period under consideration. The regions and the percentage of exporters for firm are reported in Table 3.1, as is the number of firms that replied to the survey questions in both waves. We can observe that in our sample, the most important relevant market is the European Union market, while Eastern Europe and Russia have increased their importance as destination markets.

Table 3.1: Destination regions: percentage in the 8^{th} and 9^{th} survey[‡].

	EU	Russia	E.Europe	Africa	N.America	S.America	Asia	China	Oceania
$Expo_{03}$	0.604	0.206	0.234	0.140	0.263	0.119	0.218	0.069	0.081
$Expo_{00}$	0.611	0.160	0.191	0.118	0.256	0.149	0.234	0.065	0.078
Obs	2048	2048	2048	2048	2048	2048	2048	2048	2048

[‡] $Expo_{03}$ and $Expo_{00}$ are dummies equal to one if the firm has exported in a given region. Averages are calculated in both surveys with the same firms.

[5]More precisely, the survey indicates if the firm was involved in export activity during the three years references.

The information about revenues and costs is recorded on the balance sheets: here, we find yearly budget items from 1991 to 2000 and from 2001 to 2003 in thousands of Euros. The balance sheet provides a detailed statement of assets and liabilities as well as data on input values, turnover, and number of employees. The key information about short- and long-term debts, credit, assets, equity, and so on will be used to rank firms according to their level of credit constraints. Finally, firms are classified according to a two-digit ATECO 2002 industrial classification; sector codes and the descriptive statistics on the sector level are shown in Table B.1 (Appendix B). On average, the firms included in the surveys are small or medium-size in term of their number of employees (less than 250). The variables are deflated using sector-specific indices (Source: EU-Klems).

It is important to note that we have no information about the representativeness of the data set in comparison with the Italian manufactures; for this reason, in Table 3.2, we compare the average growth rate of output per worker and labour productivity (value added per worker) between firms in the sample and those in the aggregated Italian data. The averages are calculated using balance sheet information[6], while the latter averages are derived from the EU-Klems data set. The averages are reported for the different sectors as well as for the aggregated manufactures; finally, the averages are calculated for 1996 to 2003. We can observe that the firms in the surveys grow three times more than those in the Italian manufacturing sector on the whole in all sectors: the results are straightforward in terms of both output and labour productivity. Thus, we can suppose that the firms in the surveys are "good" in terms of performance even if they are small in size and employment (Tab. B.1).

[6]The observations used consider firms present on both balance sheets (from 1991 to 2000 and from 2001 to 2003). The first and last centile of observations are eliminated from the calculation of the mean to avoid outliers.

Table 3.2: Average growth rates: comparative analysis from 1996 to 2003[‡].

	Labor Productivity		Output Per Worker	
Sector	Capitalia	EU-Klems	Capitalia	EU-Klems
DA	0.119	0.035	0.077	0.035
DB	0.103	0.020	0.069	0.038
DC	0.090	0.039	0.365	0.038
DD	0.094	0.030	0.065	0.034
DE	0.044	0.024	0.102	0.039
DG	0.086	0.020	0.120	0.037
DH	0.087	0.006	0.085	0.019
DI	0.102	0.033	0.094	0.049
DJ	0.088	-0.019	0.067	0.012
DK	0.081	0.020	0.055	0.021
DL	0.135	0.026	0.107	0.026
DM	0.110	0.033	0.091	0.061
DN	0.082	0.028	0.057	0.030
Total	0.098	0.024	0.087	0.032

[‡] Source: Our calculation from Capitalia and EU-Klems datasets. Average growth rates by sector and for all manufactures are reported. Labor Productivity is value added per worker. Weighting the growth rates does not change the averages.

4 Identification of constrained firms

To verify the hypothesis that financial resources act as a barrier to entry in the export market, we explain in this section the importance of *a priori* identification for credit-constrained firms. The present paper does not just provide empirical support for the idea that financial health matters for exports; more importantly, it develops a strategy for clustering firms according to their level of financial health. This type of classification is important in evaluating the impact of internal resources on a firm's investment decisions (Fazzari et al., 1988). The clustering produced will also be tested to verify that it is consistent with the idea that constrained firms show higher investment sensitivity to internal cash. Unlike in the previous research, where liquidity constraints are approximated with various indices and plugged directly into the export regressions, here we proceed differently; after the clustering, we test the effect of internal resources on the entry decisions for the different groups. First, we introduce the motivations, after which we explain the methodology; finally we justify the robustness of the clustering and estimate a Euler equation for investments.

4.1 Motivations

The theory behind the research on the causal relation between export and credit constraints departs from the analysis of investment sensitivity to cash flows[7] (Fazzari et al., 1988). In its original formulation, firms are credit constrained whether firms' investment level has a positive and statistically significant relation to cash flows; this means that the firms finance their projects mostly with internal resources rather than external ones (stock market resources, bank resources, etc.). In the presence of perfect capital markets, financial variables should have no impact on the investment decisions of firms: internal and external financing are supposed to be perfect substitutes with perfect capital markets if the investment is profitable. However, in this class of model, it is assumed that the cost of internal and external financing funds may differ for several reasons. The theory of investments and credit constraints is applied to a different research analysis. For example, Forbes (2007) uses a Euler equation framework to show that small Chilean firms were more credit-constrained than large firms during a period of Chilean capital market control. Poncet et al. (2009) analyse the case of Chinese firms and provide evidence that privately owned Chinese firms are more constrained than state-owned or foreign firms; the geographical and sectoral presence of the latter alleviates the constraints. Finally, Love (2003) highlights the importance of financial developments to reducing investment constraints, particularly in less developed countries. A similar approach, the standard accelerator model of investments, is used by Konings et al. (2002) and by Manole and Spatareanu (2009). In the former paper, the authors test whether firm investment in transition countries is sensitive to internal financing (cash flow); in the latter, how export activity alleviates the sensitivity of firm investments to cash flows is analysed.

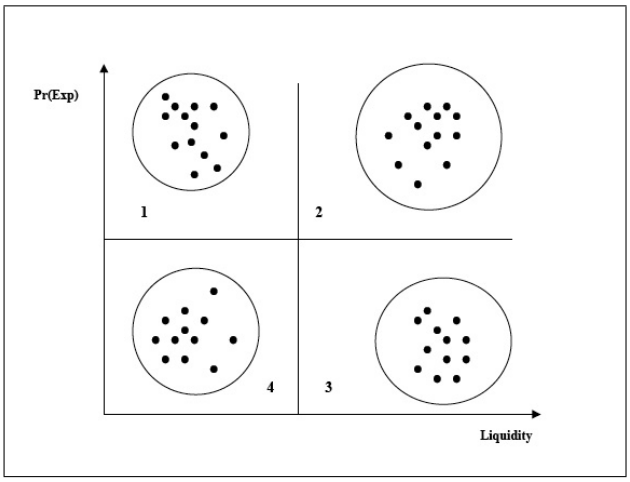
The logical connection between export and cash availability arises from the cited research. If internal cash affects investment decisions for constrained firms, entry choice may depend on liquid resources in the same manner, given that exporting requires an initial sunk investment. However, it can be misleading to directly test the effects of liquid resources on entry probability to properly estimate the causal relationship. It is not always true that higher cash flows cause more investments in the case of credit-constrained firms. Kaplan and Zingales (1997) show the existence of this positive relation for "healthy" firms as well; they rank firms *a priori* according to their level of credit constraints and find for a sample of large American enterprises that firms with a better financial situation invest more if they own more liquid resources[8]. In a different

[7]The theory of the Euler equation of investments is similar to the Q-Tobin model.

[8]The explanation for this is that the sample is composed on firms quoted in the stock market. They prefer to self-finance their investments to signal their good standing and maintain financial stability.

framework, however, Almeida et al.(2004) find that credit-constrained firms save cash compared to unconstrained ones as insurance for bad periods (*cash flow sensitivity on cash*). This introduces a serious problem in testing whether the choice to internationalise is affected by cash flows. It may not be sufficient to define an *a priori* level of financial status; rather, it may be necessary to test whether the clustering process identifies credit-constrained firms. The figure below (Fig. 4.1) represents the theoretical potential combinations of entry probability (Pr(Exp)) and internal cash level (Liquidity). It is clear that any interpolation may describe a statistically insignificant relationship.

Figure 4.1: Export-Credit Relation



In boxes 1 to 4 are represented four different situations. In the first one are the firms that are very likely to enter into the export market even if they own a low level of liquidity; they can use external financing to support their investments. In the second box are healthy firms, whereas in the third are firms with a high level of liquidity but a low probability of export; the former self-finance (Kaplan and Zingales (1997)), while the latter save cash (as Almeida et al.(2004)). Finally, in the fourth box are firms with a low probability of entry and low liquidity. The Figure 4.1 depicts the existence of different relations among entry and liquidity levels. Thus, the contribution of the methodology is the identification of different groups of firms, which is useful if the aim is to understand for which firms investments are sensitive to cash level. With these distinctions made between firms, we can test whether entry is affected by cash availability.

4.2 Identification Strategy

The identification strategy is based on two steps. The first one consists of defining credit-constrained firms using data contained in the balance sheet data set. With information on firm assets and liabilities, we calculate indices usually employed in the literature on business economics to evaluate the "goodness of investment". The reliability of the indices is tested using survey information on credit needs; we need verify that the indices capture firm liquidity needs. In the second step, we separate firms into four groups, aggregating the indices; then, using the Euler equation, we verify what type of relation exists between investments and cash flows for each group. In other words, we are testing if credit constraint rankings also capture a situation of investment sensitivity to cash flow.

As we introduced before, the indices used to approximate firm credit constraints come from the business economics literature and usually are employed to evaluate the financial stability of firms. More recently, these indices have been used by banks to assess credit risk, according to the fair-minded criteria imposed by the Bank for International Settlements (2006). There are three indices employed [9], and the choice of these three indices is justified by the fact that a threshold is defined for each of them; thus, it will be easier to classify firms. In addition, these three indices are used to evaluate firm financial stability from a different point of view. Incidentally, threshold satisfaction does not imply financial health or necessarily ensure firm profitability: the indices may depend on particular combinations of balance sheet items that may vary based on accounting conditions[10]. For these reasons, many indices are employed to evaluate firms, and other information is also taken into consideration. Because the indices roughly describe firm financial health, our approach consists of evaluating firms from the point of view of an external investor: is the firm a good investment, and is it reliable? An investor tries to evaluate a firm using balance sheet indices among other forms of information, and we will use a similar approach.

- The first indicator considered[11] is an indicator of firm financial independence named *Financial Independency Index* (FII onward); it evaluates to what degree a firm is financing its economic activity in a broad sense. It is defined as the ratio between the total amount of internal resources (equity plus cash flows) and the

[9] For more specific discussion of this subject, see Brealey-Myers (1999). The names given are not always the same across the literature; they sometimes change.

[10] If an index is much larger than the threshold proposed, this does not necessarily imply financial health but may instead suggest some problem with the financial stability of the firm.

[11] In Appendix A there is an extensive description of the data as well as index construction.

total amount of capital invested (total assets). The optimal ratio is fixed at greater than or equal to .33, meaning that at least one third of the firm's assets must be financed (covered) by internal resources (Brealey and Myers, 1997). However, an index much larger than .33 may suggest small firm size (low level of total assets).

- The second index is the *Solvency Ratio* (SR onward), the ratio of net assets plus long term debts to tangible assets plus leftover stock (intermediate input and final output). For this index in a stable situation, the tangible assets and leftover stock must be financially covered with long-term resources, so the optimal ratio must be larger than or equal to 1. The SR index states the principle that a firm's financial wealth must large enough to cover long-term production costs (tangible assets) and unsold production: ideally, if a firm destroys its production capacity and leftover stock, it has the resources to start up again. In other words, the production capacity of a firm has to be coherent with its internal financial resources. However, it is interesting to note that the SR index may be greater than one even if the debt load is very large; in this case, the criteria for financial stability are not met. Similarly, an index much larger than one can indicate a firms inability to repay equity and debts because its size is much smaller than the resources invested. These issues justify the combined use of several indices.

- The last index employed is a rough measure of cash availability and is given by the amount of instantaneous liquidity or cash assets (cash, bank and current account) over short-term debts (interests, furniture, wages...). It is termed the *Quick Ratio* (QR hereafter), and the optimal value should be larger than 1; in this case, a firm own sufficient resources to face the daily current cost of production processes. In light of this, the ratio indicates a firm's chances of paying off short-term debts without the need for additional external funds.

In Table B.2 are reported the ratios' means and standard deviations, while Table B.4 indicates mean sector averages. First of all, we need to understand if the indices described above have links to firm credit constraints. Intuitively, we can state whether ratios increase this implies that financial health of a firm improves, and a firm is less credit constrained; a firm can more easily gather funding from external resources because it offers more collateral. To test the relationship between the indices and firm financial constraints, we regress firms perceptions of credit needs with respect to the ratios. The surveys in question (the eighth and ninth) provide two interesting binary variables. The first dummy, called Ask, is equal to one if a firm asked more credit from external sources

without getting it; otherwise, it takes a value of zero if a firm reports that it obtained credit; the second dummy *Des* takes a value of one if a firm desired more credit than it received[12] and a value of zero otherwise. The two dummies may be considered as proxies for a firm's credit constraints. A cross-sectional probit analysis is implemented separately for each survey. The regressors are dummy variables indicating if a ratio is above or below the threshold; the dummies take the value of one if they are above the advised threshold and otherwise take the value of zero. Then we estimate the probability of the firms desiring more credit or asking for it, on dummies based on the fulfilment of a certain threshold; a negative sign for index dummies ($DFII$, DSR, and $DQuick$) implies that when the ratio is high enough (i.e., FII is above 0.33), the probability of the firm perceiving itself as credit constrained decreases[13]. The results are reported below in Tables 4.1 and 4.2.

Table 4.1: Desire More Credit: Probit Analysis for 2000 and 2003‡.

	(1) Des_{i00}	(2) Des_{i00}	(3) Des_{i00}	(4) Des_{i03}	(5) Des_{i03}	(6) Des_{i03}
$DFII_i$	-0.641***			-0.479***		
	[0.059]			[0.083]		
$DSolv_i$		-0.545***			-0.577***	
		[0.053]			[0.079]	
$DQuick_i$			-0.553***			-0.585***
			[0.053]			[0.080]
TFP_i	-0.108***	-0.085***	-0.086***	-0.119***	-0.115**	-0.116**
	[0.033]	[0.032]	[0.032]	[0.046]	[0.046]	[0.046]
Const	-1.016***	-0.951***	-0.946***	-1.197***	-1.117***	-1.126***
	[0.122]	[0.122]	[0.122]	[0.179]	[0.182]	[0.182]
Obs	3928	3928	3928	1809	1809	1809
Pseudo R^2	0.040	0.036	0.037	0.036	0.05	0.05
χ^2	146.24	129.26	132.52	53.947	75.082	72.930

‡ Source: Capitalia. Robust standard errors in squared brackets. Des_{i00} and Des_{i00} are the dependent variables coming respectively from the 8^{th} and 9^{th} survey. The regressors are contemporaneous to the dependent variables, i.e., 2000 or 2003.

We can observe that the average probability of a firm perceiving itself as credit-constrained is lower when a firm's ratios are , or above the given threshold both for $DFII$, DSR, and $DQuick$. Thus, it seems that the ratios are able to indicate the level of firm constraints or at least demonstrate how firms perceive their financial situation.

[12]Table B.3 in Appendix B shows the descriptive statistics for the dummies. The first table reports the relation between the surveys in 2000 and 2003. The table below reports the transitional matrix for the dummies from 2000 to 2003. The variation in the number of observations depends on the fact that in the 9^{th} survey, few firms responded to the question concerning credit obtained *Ask*.

[13]The regression with the indices in levels provides the same qualitative results, which are available on request.

Table 4.2: Asked More Credit: Probit Analysis for 2000 and 2003‡.

	(1) Ask_{i00}	(2) Ask_{i00}	(3) Ask_{i00}	(4) Ask_{i03}	(5) Ask_{i03}	(6) Ask_{i03}
$DFII_i$	-0.609***			-0.451**		
	[0.088]			[0.218]		
$DSolv_i$		-0.441***			-0.478**	
		[0.075]			[0.200]	
$DQuick_i$			-0.448***			-0.537***
			[0.075]			[0.208]
TFP_i	-0.072	-0.052	-0.053	0.083	0.087	0.095
	[0.045]	[0.044]	[0.044]	[0.100]	[0.102]	[0.102]
Constant	-0.969**	-1.651***	-1.648***	-1.060	-1.056	-1.109
	[0.434]	[0.178]	[0.178]	[0.940]	[0.954]	[0.960]
Obs.	3835	3835	3835	288	288	288
Pseudo R^2	0.037	0.028	0.028	0.040	0.044	0.047
χ^2	67.077	56.315	57.462	14.879	17.053	17.911

‡ Source: Capitalia. Robust standard errors in squared brackets. Ask_{i00} and Ask_{i00} are the dependent variables coming respectively from the 8^{th} and 9^{th} survey.. The regressors are contemporaneous to the dependent variables, i.e 2000 or 2003.

In addition, it is interesting to note that as productivity [14](TFP) increases, then a firms probability to perceive itself insufficiently financed decreases; more efficient firms find it easier to finance their investments (with both internal and external resources).

Now, we will to employ the cited ratios for cluster firms in four different groups to identify *a priori* firm financial health. The index is constructed, making a weighted average for the dummy variables $DFII_i$, $DSolven_i$, and $DQuick_i$; the dummies are defined as equal to one if they are above the respective "security" threshold. Finally, the relative weights w_d are constructed with the coefficients reported in column(1)-(3) in Table 4.1i.e.,

$$Index = \sum_{d=1}^{3} x_d * w_d \quad \text{with} \quad w_d = \frac{\alpha_d}{\sum_{d=1}^{3} \alpha_d}, \tag{4.1}$$

where α_d is one of the three estimated coefficients i and x_d is the dummy[15]. Determining the weighted sum of the three dummies, we obtain four firm clusters; firms that belong to group zero or one are likely to be more credit-constrained[16] because *Index*

[14]TFP is the Total Factor Productivity estimated using the Levinsohn Petrin technique (2003).

[15]If we use as weights the coefficients from Table 4.2 Col(1)-(3), the final clustering does not change. We prefer to use information from the 8^{th} survey because a larger pool of firms replied to these questions than to the questions on the 9^{th} survey. Based on the lower portion of Table B.3 it is possible to observe that a few firms changed their answers from one survey to the other.

[16]For example, firms are members of group 0 if all dummies are equal to zero, or in other words, if all of the firms indices fall below the threshold .

assumes a lower value. It is important to note that we construct both time-variant and time-invariant rankings. In the former case, group membership may change every year if indices change. In the latter, as in Kaplan Zingales (1997), the index is time-invariant; dummies are defined using as benchmarks the ratio averages across the entire period (from 1997 to 2003). In Table B.4, it is possible to note that average indices do not cross thresholds every year, while in Table 4.3, the summary statistics (averages) are reported for each time-invariant group.

Table 4.3: Averages by time invariant index[‡].

Index	INV	Y	C.Stock	C.Flow	TFP	Bond	Banks03	Firms
0	820.36	24293.51	4525.64	2692.64	4.50	2197.34	5.51	1409
1	327.64	19863.47	4230.65	2293.33	4.56	2153.29	4.58	388
2	3867.91	57682.60	14858.16	10575.55	4.91	5943.60	5.24	181
3	972.12	22545.35	7737.21	4486.10	4.15	2011.09	4.07	575
Total	997.32	25576.24	5939.53	3595.45	4.46	2411.28	5.01	2553

Index	Inv/KB	Y/KB	C.Stock/KB	C.Flow/KB	Bond/KB	EquityR	Expo03	Dest03
0	0.20	44.53	1.68	0.86	0.59	0.44	0.70	1.53
1	0.18	15.03	2.31	1.02	0.29	0.25	0.62	1.55
2	0.17	3.54	0.78	0.43	0.13	0.10	0.64	1.36
3	0.16	7.28	2.29	1.03	0.13	0.06	0.68	1.66
Total	0.18	28.72	1.85	0.89	0.40	0.30	0.68	1.55

[‡] Source: Our calculations from Capitalia. Firms is the number of individual in a given time invariant category. TFP is the total factor productivity calculated with Levinsohn Petrin (2003). KB is the value of tangible fixed asset calculated at the beginning of period t.

It is evident[17] that half of the firms are in the potentially highly constrained group (group 0); however, firm clustering does not determine a rank for the variables[18] such as investment intensity (INV/KB), cash intensity ($C.Stock$ or $C.Flow$ over KB), productivity (TFP) or export participation ($Expo03$). Secondly, firms in groups 0 and 1 generate lower cash stock and are less leveraged (Bond); however, the relative debt load ($Bond/KB$ or $EquityR$) decreases if firms are classified as less credit-constrained; this is probably an effect of the methodology used to cluster firms. Finally, it is interesting to note that firms in groups 0 and 1 have a production level (Y) that is not very different from that of group 3 but that Y/KB suggests that these firms are undercapitalised on average; in other words, their annual production value is 44 times greater than the tangible asset value at the beginning of period t (the corresponding standard deviation is around 2305.2)

[17] The interpretation of the averages does not change if we provide averages using the time-variant index.

[18] A more detailed description of variables can be found in Appendix A.

A firm cluster tries to identity *a priori* if a firm is potentially constrained; it is likely that a firm in group 0 or 1 will find it difficult to finance its investments with external resources, so that it will be forced to use internal liquidity. This seems reasonable if we look at average debt intensity ($Bonb/KB$) in Table 4.3. Now, we will test whether the created clusters capture the idea of liquidity constraints: namely, if investments are sensitive to cash flows for some groups. For this reason, we estimate a Euler equation for investments (see Hubbard et al., 1998 or Bond Van Reenen, 2003 for a survey) where the coefficient of internal liquidity (cash) is our term of interest. We expect a positive and significant coefficient for those firms that are presumed to be creditconstrained; i.e., group 0 and 1. This will mean that firms increase their investments if they own sufficient internal resources[19].

The estimated empirical model derives from a Euler equation for investments, and following Love (2003), we define it as

$$\left(\frac{Inv}{KB}\right)_{it} = \alpha_0 \left(\frac{Inv}{KB}\right)_{it-1} + \alpha_1 \left(\frac{Y}{KB}\right)_{it} + \alpha_2 \left(\frac{CS}{KB}\right)_{it-1} + \alpha_3 TFP_{it-1} + \delta_t + c_i + u_{it}. \qquad (4.2)$$

where δ_t, c_i, and u_{it} are time dummies, fixed effects and the *i.i.d.* error term. The variables are scaled with the level of tangible assets, but the value of capital at the beginning of year t (KB) is used[20] rather than the contemporaneous value of capital (K); furthermore liquidity is approximated by cash stock rather than cash flows[21]. Unlike in the previous literature, we introduce an additional variable into the model, the TFP, because Tables 4.1 and 4.2 have suggested that more productive firms are more satisfied with their financial situation. As in the previous regression, the TFP is calculated using the Levinsohn Petrin method (2003) to avoid problems with the assumptions for the investment function (Olley and Pakes, 1996). A more detailed discussion is provided in Appendix C with the derivation of the Euler equation (Eq 4.2); in Appendix A, regression data are described, as is the depreciation method.

4.3 Euler Equation estimation

The objective of this section is to ascertain what kind of relationship exists between investments and internal liquidity in each cluster; we must test whether the clustering

[19]Kaplan and Zingales find a positive coefficient of CF or CS for the group of unconstrained firms. However, they are analysing a sample of biglarge and quoted American firms. Here, the argument thatof a good signal for stock market comes from self-financing does not work. Just three firms considered in the sample are quoted here.

[20]Love, 2003; Forbes, 2007.

[21]However, the results do not change.

generated is robust or whether we are able to classify firms according to their level of financial constraints. We expect that α_2 from Eq. 4.2 will be positive in group zero (0) and one (1) because it defines in that case *a priori* constrained firms. Given the characteristics of the firms, we do not expect to find results similar to those of Kaplan and Zingales (1997); here we deal with SMEs, not quoted firms, so the need does not exist to signal financial stability to the stock market.

The equation 4.2 presents several estimation issues (Love, 2003; Forbes, 2007). The first regards the presence of fixed effects c_i jointly with potential endogenous regressors: consequently, the within estimator may be biased. Second, the dependent variable is also defined as a regressor with a one-period lag; it introduces a problem of estimator consistency because of the correlation among the error terms. To solve these problems, the equation 4.2 is estimated using a "difference-GMM" estimator for the dynamic panel (Arellano and Bond, 1991). The equation 4.2 is taken in first difference, and all regressors of 4.2 are considered endogenous; lagged values in levels are used as instruments for first differences[22]. As an additional control, the "equity ratio" is introduced to control for the level of debt in relation to total assets ($EquityR_{it}$). Table 4.4 reports the estimation results: in the first column, the Euler equation is estimated considering all firms in the data set, while in the other four columns, Eq. 4.2 is estimated cluster by cluster.

[22]For a more detailed discussion of the estimation of the Euler equation for investments , see Love (2003) and Forbes (2007).

Table 4.4: Euler Equation: Difference GMM by cluster[‡].

	(1) All1	(2) CL0	(3) CL1	(4) CL2	(5) CL3
IKB_{it-1}	-0.398***	-0.642***	-0.222***	-0.416*	-0.134
	[0.073]	[0.173]	[0.070]	[0.215]	[0.112]
$CSKB_{it-1}$	0.011***	0.011***	0.119***	0.148	-0.002
	[0.001]	[0.002]	[0.030]	[0.187]	[0.014]
YKB_{it}	-0.000***	-0.000***	0.006	0.089*	0.022***
	[0.000]	[0.000]	[0.008]	[0.046]	[0.007]
TFP_{it-1}	0.012	-0.654	-0.163	-0.633	-0.057
	[0.374]	[0.675]	[0.543]	[0.879]	[0.160]
$EquityR_{it}$	0.015	0.074	-0.041	0.240	-0.102
	[0.075]	[0.096]	[0.261]	[0.645]	[0.733]
Obs.	7258	3992	1060	508	1698
Firms	2209	1215	332	153	509
Instr.	32	32	32	32	32
AR2 Test	0.942	0.235	0.483	0.155	0.134
Hansen Test	0.153	0.713	0.376	0.710	0.228

[‡] Difference GMM estimation. Variables in log. Robust standard errors in squared brackets. Time dummies included both as variables and instruments. One step estimator used. Significance level: * is the p-value>0.1, ** is the p-value>0.05, and *** is the p-value>0.01. Instr: total number of instruments. P-Value reported for AR2 Test and Hansen test. CL is cluster. Firms included in the estimation are the result of matching between balance sheet 1991-2000 and 2001-2003. All regressors are considered endogenous and are instrumented from the 3rd lag. Investments, sales and cash stock are scaled with the capital value at the beginning of period.

As conjectured, we find that the investments are sensitive to cash stock in the case of firms defined *a priori* as credit constrained, namely firms belonging groups 0 and 1. In other words, Euler equation analysis supports the robustness of the clustering method proposed: the firms in groups 0 and 1 are suspected to be credit-constrained, and the estimated coefficients (Tab 4.4) show that for these firms, investments depend on internally generated cash. Then, for each regression, we check the validity of our instruments with Hansens J-test of over-identifying restrictions; the p-value reported indicates the orthogonality of the instruments and the error terms and their validity. Similarly, the second-order correlation in the error term is not detected. At first glance, the specifications in columns 2 and 3 suggest that the investments' sensitivity is larger for firms in group one than in group zero; *ceteris paribus* other factors, a 10% increase in the CF/KB ratio increases investments by 0.1% and 1.2% for firms in groups 0 and 1, respectively. However, using a standardised impact approach, this gap almost disap-

pears. We can compute that an increase of one standard deviation[23] above the mean in the CF/KB ratio of groups 0 (13.49=22.66/1.68) and 1 (1.37=3.18/2.31) increases investment by 14.8% and 16.3%, respectively. Thus, the classification produced to identify *a priori* credit-constrained firms seems quite reliable. In addition, robustness checks are reported in Table C.1 using the "system GMM" estimator, and they provide the same qualitative results.

To in conclusion, our empirical evidence suggests that investments depend on the level of internal resources for firms belonging to group zero or one. As long as we assume the existence of sunk cost associated with exporting, we expect to find a positive effect of internal liquidity on entry probability for those firms that are credit-constrained. However, other firms do not encounter difficulties in gathering resources to begin export activity.

5 Entry and credit constraints

In this section, we verify the idea that internal liquidity determines the entry choice for the export market and in particular for credit-constrained firms (with the definition given by index 4.1). Theoretical and empirical research has demonstrated the existence of sunk investments associated with exporting at the firm level; financially constrained firms can rely only on internally generated cash to overcome this cost and begin exporting. For this reason, we estimate a discrete choice model (probit) considering non-exporters and new entrants from 8^{th} and 9^{th} surveys; by matching the two surveys, it is possible to examine 644 firms in twelve different manufacturing sectors. The estimated model (5.1) follows the non-structural approach of Roberts et al.(1997) or Bernard and Jensen (1999) and can be written as

$$Entry_{i03} = \begin{cases} 1 & \text{if} \quad G\left(\alpha_0 CS_{i00} + \sum_{c=0}^{3} \alpha_c X_c CS_{i00} + \beta_n \mathbf{Z(n)}_{i00} + \gamma + \epsilon_i\right) > 0 \\ 0 & \text{otherwise} \end{cases} \tag{5.1}$$

with $Entry_{i03}$ as the entry status of firm i in the 9^{th} survey[24], and ϵ_i is the *i.i.d.* error term. The coefficients of interest are α_c, which capture the effect of liquidity in year 2000 on entry probability: a positive sign will mean that the entry probability increases

[23]The standard deviation of $CSKB$ is 22.66 for group 0 and 3.18 for group 1. The means are reported in Table 4.3.

[24]The G function is a normal distribution. The variable $Entry_{i03}$ assumes a value of 1 if a firm enters the export market between the 8^{th} and the 9^{th} survey; otherwise, it assumes a value of 0.

as the level of internally generated cash increases. Unlike with the Euler equation (4.2), we do not scale the level of cash with tangible assets; the fixed costs of exporting are assumed to be equal across firms. Then we interact the cash stock level in the year 2000 (CS_{i00}) with the (X_c) dummy, which identifies the membership in a given cluster (Equation 4.1); because of the number of observations, we cannot run a regression for each group if we want to guarantee the efficiency of the estimated coefficients[25]. Finally, the use of time-invariant clustering is justified by the fact that we want to capture a clear-cut effect of cash stock; the inclusion of a time-variant indicator would make it difficult to disentangle the effect of cash from the variation in clustering due to expected entry (we will see this in Section 7). In Table 5.1, entrants and domestic firms are reported in time-invariant clusters, while summary statistics for exporters are presented in Table B.5.

Table 5.1: Entry and domestic by cluster[‡].

Export \ Cluster	0	1	2	3	Tot.
Domestic	259	108	38	129	554
Entrants	71	16	8	15	110
Tot.	330	124	46	144	644
Ent./Tot.	0.215	0.129	0.174	0.104	

[‡] Ent./Tot: entrants over the total number of firms in a given sector.

To make the analysis more robust, we introduce control variables $\mathbf{Z(n)}_i$: the controls are defined both in year 2000 if extrapolated from balance sheet data and coming from the 9^{th} survey. The former group is formed by productivity (TFP), capital intensity (KL) and the workforce(Lab) in year 2000 as well as cash stock taken in logarithmic terms; the latter group includes information about the number of banks ($Bank$), R&D or product innovation ($UpProd$ or $NewProd$). Finally, sector and regional dummies (γ) are included in the estimation. The marginal effects (average marginal effect) of Eq. 5.1 are directly reported in Table 5.2; then we can interpret the coefficients as elasticities (i.e., variation in the probability of entry due to variation in the variable of interest).

First of all, we note that cash stock (lagged) has no effect on entry probability, while its iteration with the dummy X_0 is positive and significant; in the case of credit-constrained firms (firms in cluster 0), we observe a statistically significant effect of internal cash. Internal liquidity increases the probability of entry. It implies that if the level of

[25]However, if we run the probit cluster by cluster, we find that CS_{00} positively affects the entry probability for the firms in cluster zero i.e., the more constrained firms. In this case, 330 observations are used. In addition, the use of time variant index does not affect the estimation results.

Table 5.2: Probit estimation: entrants versus domestic[‡].

	(1) Exp_{i03}	(2) Exp_{i03}	(3) Exp_{i03}	(4) Exp_{i03}	(5) Exp_{i03}	(6) Exp_{i03}	(7) Exp_{i03}
Ln(CS)_{i00}	0.005	0.021	0.020	0.026	0.023	0.028	0.025
	[0.021]	[0.023]	[0.022]	[0.024]	[0.039]	[0.039]	[0.042]
$\text{X}_0\text{Ln(CS)}_{i00}$		0.018***	0.020***	0.020***	0.019***	0.021***	0.019***
		[0.005]	[0.006]	[0.006]	[0.006]	[0.006]	[0.007]
$\text{X}_1\text{Ln(CS)}_{i00}$		0.008	0.008	0.008	0.008	0.012	0.008
		[0.007]	[0.007]	[0.007]	[0.010]	[0.011]	[0.012]
$\text{X}_2\text{Ln(CS)}_{i00}$		0.010	0.011	0.011	0.011	0.016	0.015
		[0.009]	[0.010]	[0.009]	[0.010]	[0.010]	[0.010]
TFP_{i00}	-0.013	0.003	0.014	0.011	0.025	0.022	-0.012
	[0.047]	[0.040]	[0.035]	[0.035]	[0.050]	[0.053]	[0.049]
Ln(KL)_{i00}	0.010	0.003	0.005	0.006	0.024	0.024	0.012
	[0.014]	[0.017]	[0.017]	[0.017]	[0.022]	[0.022]	[0.025]
Ln(Lab)_{i00}	0.016	0.001	0.009	0.006	0.004	0.003	0.005
	[0.034]	[0.032]	[0.035]	[0.035]	[0.042]	[0.043]	[0.047]
Bank_{i03}	0.016**	0.012*					
	[0.007]	[0.006]					
$\text{R\&D}_{i03}$			0.042				
			[0.032]				
Deloc_{i03}				0.036			
				[0.063]			
Autofin_{i03}					0.000		
					[0.000]		
UpProd(H)_{i03}						-0.077*	
						[0.045]	
UpProd(M)_{i03}						-0.032	
						[0.045]	
NewProd(H)_{i03}							0.073*
							[0.041]
NewProd(M)_{i03}							0.004
							[0.029]
Obs	555	555	558	554	455	455	457
Pseudo R^2	0.105	0.128	0.123	0.118	0.124	0.130	0.128

[‡] Marginal effect reported. Ln are variables in logs. Robust standard errors are clustered by sectors and they are in squared brackets. Sector and region dummies included. X_0, X_1, and X_2 are dummies that take value 1 if a firm is respectively in cluster 0, 1 and 2. Significance level: * is the p-value>0.1, ** is the p-value>0.05, and *** is the p-value>0.01.

cash stock increases by 10%, the entry probability increases by 0.2% for constrained firms alone[26]. More precisely, given that cluster 3 is omitted (for reasons of multicollinearity), the coefficient must be interpreted in comparison with the group of less constrained firms (cluster 3). Then, if the cash stock increases 10%, the entry probability grows by 0.2% more for constrained firms than unconstrained ones[27]. This suggests that firms

[26]The results do not change if we introduce the contemporaneous value of cash.

[27]If we omit cluster 0 instead of 3, the signs of the coefficients become negative.

need resources to cover fixed entry costs if they want to export; because the firms in cluster 0 experience difficulty securing financing from external investors, they rely on internal financing. To conclude, we note two results that seem interesting. First of all, the number of banks has a positive impact on entry probability: more banks can mean a larger pool of potential investors. Secondly, great efforts at product innovation increase ($NewProd$) the probability of entry, while product upgrading decreases exports; we can presume that entry into a new market entails the development of a new product, while the strengthening of a firms domestic position requires product upgrades.

To corroborate our results, we perform an exercise, changing the discrete measure of credit constraints (the four clusters from Eq 4.1) for a continuous measure of firms' credit constraints. We construct a standardised index ($Stindex$) that is calculated similarly to 4.1; here, we substitute the dummies with the corresponding time-invariant ratios (FII, SR, and Quick) and determine the sectors' standardised averages. The index can be written as

$$StIndex(C)_{isx} = \sum_{x} \left(\frac{Ind_{isx}}{\overline{Ind}_{sx}} \right), \tag{5.2}$$

where Ind_{isx} is one of the three indices (x) for firm (i) in sector (s) and $\overline{Ind}_{sx}$ is the corresponding mean in sector (s); as $StIndex$ increases, the firm's financial stability increases[28]. Table B.2 provides descriptive statistics for 5.2. Finally, we interact $StIndex$ with the cash stock variable and plug it into Eq. 5.2. Now the interaction term is expected to be negative; as the indicator $StIndex$ increases, firms are less constrained and internal resources are less relevant to entry into the export market.

[28]This is not necessarily true for a very high value of $StIndex$ given that the optimal financing mix is "ideally" a balanced combination between equity and debt.

Table 5.3: Probit estimation: entrants versus domestic (continuos index)[‡].

	(1) Exp_{i03}	(2) Exp_{i03}	(3) Exp_{i03}	(4) Exp_{i03}	(5) Exp_{i03}	(6) Exp_{i03}
Ln(CS)$_{i00}$	0.042*	0.039*	0.041**	0.047**	0.046	0.039
	[0.022]	[0.021]	[0.021]	[0.023]	[0.032]	[0.030]
StIndex*Ln(CS)$_{i00}$	-0.011***	-0.010***	-0.011***	-0.011***	-0.010**	-0.009**
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
TFP$_{i00}$	0.009	-0.002	0.009	0.006	0.018	-0.013
	[0.038]	[0.043]	[0.037]	[0.037]	[0.053]	[0.048]
Ln(KL)$_{i00}$	0.013	0.009	0.012	0.013	0.031	0.021
	[0.015]	[0.015]	[0.016]	[0.015]	[0.019]	[0.019]
Ln(Lab)$_{i00}$	0.011	0.004	0.011	0.008	0.011	0.014
	[0.034]	[0.031]	[0.034]	[0.034]	[0.043]	[0.045]
Bank$_{i03}$		0.012**				
		[0.006]				
R&D$_{i03}$			0.048			
			[0.033]			
Deloc$_{i03}$				0.044		
				[0.065]		
UpProd(H)$_{i03}$					-0.071	
					[0.044]	
UpProd(M)$_{i03}$					-0.030	
					[0.048]	
NewProd(H)$_{i03}$						0.071*
						[0.040]
NewProd(M)$_{i03}$						0.009
						[0.029]
Obs	561	555	558	554	455	457
Pseudo R^2	0.108	0.121	0.115	0.110	0.116	0.116

[‡] Marginal effect reported. Ln are variables in logs. Robust standard errors are clustered by sector and they are in squared brackets. Sector and region dummies included. Significance level: * is the p-value>0.1, ** is the p-value>0.05, and *** is the p-value>0.01.

Table 5.3 shows the results for the continuous proxy ($StIndex$). The sign of the interaction term is negative as expected and remains constant across different specifications. In addition, the effect of the cash stock (CS) is positive and significant. The interpretation is quite straightforward: as internal liquidity increases, the entry probability decreases, but the positive effect tends to disappear as long as the firm's financial stability increases i.e., when $StIndex$ (5.2) increases. As CS increases by 10%, the entry probability increases by 0.4%, but this positive effect disappears as long as the firm is less constrained (StIndex increases); via a simple calculation based on column 1, an increase of CS reduces entry if $StIndex$ is above 3.81; however, this is never the case in our sample.

Finally, to make our analysis more robust, we test how the entry probability is affected by other sources of financing the investments. The 9^{th} survey helps us in providing

information about financing sources and contributions to investments in the period 2001-2003. The results are shown in Table 5.4.

The results show that entry probability increases if the share of investments financed by public funds or fiscal benefits increases: the increase is small but significant. The results may suggest that firms in the sample are quite small and find an advantage in using public subsidies to finance their investments, among which are export costs.

Table 5.4: Probit estimation: entrants versus domestic (fiscal variables)[‡].

	(1) Exp_{i03}	(2) Exp_{i03}	(3) Exp_{i03}	(4) Exp_{i03}	(5) Exp_{i03}	(6) Exp_{i03}
Autofin_{i03}	-0.000					
	[0.000]					
CrShort_{i03}		-0.001				
		[0.001]				
CrNorm_{i03}			0.000			
			[0.001]			
CrLong_{i03}				0.000		
				[0.001]		
Pubbl_{i03}					0.002***	
					[0.001]	
FiscAdv_{i03}						0.002**
						[0.001]
TFP_{i00}	0.006	0.003	0.000	0.004	0.003	0.007
	[0.039]	[0.039]	[0.040]	[0.038]	[0.038]	[0.039]
Ln(KL)_{i00}	0.039***	0.038***	0.036**	0.038***	0.034***	0.040***
	[0.013]	[0.013]	[0.014]	[0.013]	[0.011]	[0.011]
Ln(Lab)_{i00}	0.033	0.033	0.036	0.032	0.035	0.032
	[0.030]	[0.029]	[0.030]	[0.030]	[0.029]	[0.030]
Obs	457	457	464	457	457	457
Pseudo R^2	0.093	0.095	0.091	0.093	0.104	0.101

[‡] Marginal effect reported. Ln are variables in logs. Robust standard errors are clustered by sector and they are in squared brackets. Sector and region dummies included. Significance level: * is the p-value>0.1, ** is the p-value>0.05, and *** is the p-value>0.01.

6 Destination Markets

In this section, we perform a second type of analysis to control whether exporting in additional markets (variation in the extensive margin of trade) is affected by the level of internally generated liquidity. The analysis performed is similar to that in Eq. 5.1, but the dependent variable and firms taken into consideration change. The dependent variable is defined as the variation in the number of markets served from the 8^{th} to 9^{th} survey ($\Delta Dest_{i03}$); in Section 3, the characteristics of the destinations are described, while in Table 3.1 and B.6, the descriptive statistics are reported. Unlike with Eq. 5.1,

in these regressions, we consider only firms that indicated exports on both surveys, avoiding any concerns regarding the effect of market variation on pure entry. Quitters, entrants and continuous domestic firms are excluded from the regression, as are firms that reduce market coverage [29] The main challenge is to understand if the choice to serve an additional market involves an additional sunk cost that cannot easily be paid by all exporters; the inclusion of new entrants, quitters, or domestic firms would have introduced several firms decisions into the regression in addition to our main focus i.e., exports in a new market. Thus, the estimated coefficients would have been misleading. The empirical model used to test whether an increase in the markets depends on firms internal liquidity and financial health is a linear probability model (OLS). The results[30] are reported in Table 6.1.

For each specification, the estimated coefficient of (CS) points out that internal resources increase the extensive margin of trade in every case i.e., they increase market coverage. We find that among exporters, cash stock positively affects the growth of extensive margins. However, unlike in Table 5.2 and 5.3 an extra gain from internal liquidity exists for those firms that are not highly credit constrained[31]. To be precise, we are evaluating the importance of CS in the groups 0, 1, and 2 with respect of group 3 which is excluded for multicollinearity; the coefficients must be interpreted in comparison with those of group 3, (the less constrained firms). Then the results in Table 6.1 must be interpreted as follows: an increase in the cash stock for firms in groups 1 and 2 increases their extensive margin with respect to the firms in group 3, the less constrained firms. Again, internal resources matter, but for mild constrained firms.

To better interpret the results, it is important to emphasise that we are running regressions among continuous exporters that are expanding their number of markets served; more precisely, we are considering firms that are already internationalised and are currently expanding their activities abroad. The sunk costs are partially paid the first time they start to export; in the current case, firms are just facing an additional fixed cost of exporting, and they already have experience with international markets. Then the positive effect of CS is independent of cluster membership. We know from the data (Tab. B.7) that exporters are relatively more leveraged (BK) than other firms. Given that exporters are more leveraged than non-exporters, internal cash should be invested in new markets because firms do not want to increase their exposure to external debt but would instead prefer to maintain a stable mix of financing sources. The

[29] The dependent variable is a discrete variable and ranges from 0 (no extra market) to 9 in one case.

[30] An ordered logit model provides the same qualitative results, but the algorithm shows convergence problems.

[31] According to the definition given in section 4.2.

Table 6.1: Entry in new markets‡

	(1) $\Delta Dest_{i03}$	(2) $\Delta Dest_{i03}$	(3) $\Delta Dest_{i03}$	(4) $\Delta Dest_{i03}$	(5) $\Delta Dest_{i03}$	(6) $\Delta Dest_{i03}$	(7) $\Delta Dest_{i03}$
Ln(CS)_{i00}	0.182*	0.185**	0.166**	0.195**	0.243**	0.209**	0.218**
	[0.086]	[0.073]	[0.069]	[0.069]	[0.084]	[0.090]	[0.083]
$\text{X}_0\text{Ln(CS)}_{i00}$		0.017	0.015	0.020	0.016	0.023	0.027
		[0.013]	[0.013]	[0.013]	[0.015]	[0.016]	[0.016]
$\text{X}_1\text{Ln(CS)}_{i00}$		0.048*	0.045*	0.044*	0.039*	0.044	0.054**
		[0.024]	[0.024]	[0.023]	[0.021]	[0.025]	[0.023]
$\text{X}_2\text{Ln(CS)}_{i00}$		0.055*	0.063**	0.064**	0.057*	0.058*	0.056*
		[0.026]	[0.026]	[0.026]	[0.027]	[0.028]	[0.027]
TFP_{i00}	-0.118	-0.094	-0.106	-0.101	-0.264	-0.200	-0.182
	[0.288]	[0.279]	[0.244]	[0.269]	[0.306]	[0.296]	[0.263]
Ln(KL)_{i00}	-0.097	-0.106	-0.106	-0.113	-0.107	-0.103	-0.126
	[0.101]	[0.090]	[0.085]	[0.095]	[0.107]	[0.110]	[0.100]
Ln(Lab)_{i00}	0.094	0.066	0.072	0.066	0.017	0.042	-0.006
	[0.094]	[0.084]	[0.084]	[0.085]	[0.097]	[0.097]	[0.097]
Banks_{i03}	0.005	0.004					
	[0.017]	[0.017]					
$\text{R\&D}_{i03}$			0.377***				
			[0.101]				
Deloc_{i03}				0.167			
				[0.202]			
Autofin_{i03}					-0.001		
					[0.002]		
UpProd(H)_{i03}						0.257***	
						[0.074]	
UpProd(M)_{i03}						0.285*	
						[0.132]	
NewProd(H)_{i03}							0.419**
							[0.142]
NewProd(M)_{i03}							0.197*
							[0.097]
Cons.	0.043	-0.129	-0.177	-0.329	0.739	0.437	0.284
	[0.943]	[0.877]	[0.791]	[0.872]	[1.067]	[1.017]	[0.926]
Obs	787	787	789	787	654	647	666
R^2	0.091	0.099	0.119	0.103	0.099	0.101	0.105

‡ OLS regression. Robust standard errors are clustered by sector and they are in squared brackets. Sector and region dummies included. Significance level: * is the p-value>0.1, ** is the p-value>0.05, and *** is the p-value>0.01.

"well-established" exporters prefer to use internal resources to expand their exporting activities[32]. Finally, to increase their extensive margin, firms need resources that can be used to cover past debts if their financial situation is potentially critical (as for firms in cluster zero); this may explain the coefficient for CS interacted with the X_0 dummy.

Some other interesting results are reported in Table 6.1). The significant and pos-

[32] Alternative estimation using the log growth rate of markets provides the same results.

itive coefficients of the product upgrade ($UpProd$) dummy and new product dummy ($NewProd$) highlight the importance of innovation in the internationalisation process. The dummy variables capture the firm's effort to make investments aiming to upgrade or develop new products. It seems that product quality matters to competition in more than one market. Similarly, the R&D dummy is significant and positive.

7 *Ex-ante* and *ex post* effects

In this final section, we develop a robustness check analysis. We will evaluate how a firm's financial health changes before (*ex-ante*) and after (*ex-post*) the beginning of exporting activity. The aim of this final section is to explore whether export activity changes financial status before or after the entry into foreign markets; the approach is similar to that of Bernard and Jensen (1999) in the analysis of self-selection or learning via exporting mechanisms in relation with a firm's productivity. The fundamental idea is that once a firm decides to begin exports, this choice can improve (or worsen) its financial situation. Descriptive statistics provide mixed evidence. We know from Table B.7 that on average, new exporters show a lower debt/equity ratio (EquityR) but have a higher burden of debt relative to fixed assets (BK). If we consider the cluster average, the gap between new exporters and domestic firms widens because the new exporters are more likely ranked as credit-constrained. However, descriptive statistics are not sufficient. For this reason, we look at the variations in different financial indicators before and after entry in comparison with those for domestic firms. As with previous estimations (Table 5.2), we consider only entrants and domestic firms; to test whether credit constraint measures (Eq. 4.1 and Eq. 5.2) and other indicators change before entry, we follow the same approach as Bernard Jensen (1999) and Bellone et al.(2010). We run a simple OLS model using as dependent variables financial indicators in the year 2000 and, among regressors, the entry status in year 2003 namely,

$$Y_{i00} = \alpha Entry_{i03} + \sum_f \beta_f X(f)_{i00} + \epsilon_i. \tag{7.1}$$

Y_{i00} is a generic financial indicator[33] in 2000, while X_{00} are the control variables that are contemporaneous to the dependent variable. The results are reported in Table 7.1.

Table 7.1 reports the estimation results for equation 7.1. In columns 1 and 2, we

[33]In Table 7.1, the cluster index (Eq. 4.1) and the continuous index (Eq. 5.2) are defined using time-variant ratios instead of averages from 1996 to 2003. $Cluster_{i00}$ is constructed with the values for the three ratios (FII, SR, and Quick) in 2000. The same is true for $StIndex_{i00}$.

Table 7.1: Financial Status: Ex-Ante[‡].

	(1) $Cluster_{i00}$	(2) $StIndex_{i00}$	(3) $Ln(CS)_{i00}$	(4) $Ln(CF)_{i00}$	(5) $EquityR_{i00}$
$Entry_{i03}$	-0.356**	-0.162*	0.032	0.049	-0.195
	[0.161]	[0.085]	[0.080]	[0.067]	[0.150]
TFP_{i00}	0.133**	0.049	0.316***	0.403***	0.205
	[0.060]	[0.042]	[0.091]	[0.114]	[0.129]
$Ln(KL)_{i00}$	0.044	0.064**	0.283***	0.461***	-0.107*
	[0.038]	[0.028]	[0.053]	[0.039]	[0.056]
$Ln(Lab)_{i00}$	0.332***	0.227***	0.835***	0.748***	0.156
	[0.094]	[0.063]	[0.063]	[0.089]	[0.121]
$Bank_{i00}$	-0.123***	-0.072***	-0.023	0.004	0.057*
	[0.014]	[0.008]	[0.013]	[0.015]	[0.026]
Cons	0.114	0.474	1.200***	-0.414	-1.664*
	[0.509]	[0.286]	[0.329]	[0.394]	[0.886]
Obs.	562	562	559	551	562
R^2	0.133	0.134	0.648	0.646	0.0610

[‡] OLS estimator. Ln are variables in logs. *Cluster* assumes value 0, 1, 2, and . standard errors are clustered by sector and they are in squared brackets. Sector and region dummies included. Significance level: * is the p-value>0.1, ** is the p-value>0.05, and *** is the p-value>0.01.

note that firm financial health, measured by $Cluster$ and $StIndex$, is lower for future exporters; entry into the export market undermines a firm's financial stability, and based on index construction (4.1 and 5.2) we hypothesise that the debt burden increases relative to internal resources (equity, cash, etc.). In addition, even if it is not significant, in the case of the ratio between debt and equity (column 5), the *ex-ante* effect of exports is negative, meaning a lower level of debt relative to equity. However, there exists stronger evidence that exporting increases *ex-ante* financial instability.

The results are similar to those of Greenaway et al.(2007), which show that new entrants usually have high leverage; the existence of sunk cost associated with exports forces firms to use external funds for part of their financing. Similarly, we find that new exporters deplete their financial stability, increasing debts to overcome fixed costs. In some sense, the results displayed in Table 7.1 support the robustness of the methodology proposed (Section 4.2) for measuring a firm's credit constraint level. Finally, it seems that there are no differences in liquidity between entrants and domestic firms *ex-ante*; again, this corroborates the idea that cash matters for entry only for more constrained firms. Concerning relationships with borrowers, we note that the number of banks ($Bank$) is negatively correlated with the indices, suggesting that when more banks are available, it increases the relative burden of external debt. However, efficiency (TFP) and capital intensity (KL) are positively correlated with the indices at least for the sub-

sample of firms considered: more efficient capital-intensive firms are in better a financial position and generate higher liquidity.

The second part of this section focuses on the *ex-post* relationship. We control for the effects of entry on firm financial status after entry. For this purpose, we also use an additional survey that covers the period 1995-1997 (the 7th Capitalia Survey); in matching the three surveys, it becomes possible to follow 197 firms that are non-exporters or entrants in 2000 (and that continue exporting in 2003). Unlike above, we estimate the effect of entry in the year 2000 on the indices reported in the year 2003; the analysis compares entrants in 2000 with continuous non-exporters. The reported coefficients (Table 7.2) suggest that exporting does not affect firms' "health" (*Cluster* or *StIndex*), cash stock/flows or equity. The results are, again, very close to the findings of Bellone et al. (2010) and Greenaway et al. (2007), wherein export activity has no *ex-post* effect on the firm's financial variables. However, future financial health is associated with a higher level of past efficiency (TFP), capital intensity (KL) and workforce dimension (Lab); again, $Bank$ has a negative and significant sign, which suggests firms with high leverage need greater diversity in their sources of external financing (i.e. banks) than do firms with low leverage

Table 7.2: Financial Status: Ex-Post[‡].

	(1) Cluster$_{i03}$	(2) StIndex$_{i03}$	(3) CS$_{i03}$	(4) CF$_{i03}$	(5) EquityR$_{i03}$
Entry$_{i00}$	0.374	0.060	0.182	0.287	0.025
	[0.399]	[0.173]	[0.151]	[0.199]	[0.060]
TFP$_{i00}$	1.170***	0.586***	0.728***	1.148***	0.117
	[0.373]	[0.189]	[0.166]	[0.188]	[0.100]
Ln(KL)$_{i00}$	0.104	0.156**	0.329***	0.498***	0.053
	[0.161]	[0.057]	[0.074]	[0.053]	[0.032]
Ln(Lab)$_{i00}$	0.522**	0.305*	0.918***	0.792***	0.192**
	[0.227]	[0.163]	[0.089]	[0.102]	[0.063]
Bank$_{i00}$	-0.158**	-0.096**	-0.003	0.041	0.005
	[0.067]	[0.038]	[0.027]	[0.025]	[0.015]
Cons	-3.901*	-1.541	-0.241	-2.154**	-1.046*
	[1.815]	[1.009]	[0.983]	[0.889]	[0.514]
Obs	196	196	193	190	196
R^2	0.267	0.329	0.653	0.694	0.287

[‡] OLS estimator. Robust standard errors are clustered by sector and they are in squared brackets. Sector and region dummies included. Significance level: * is the p-value>0.1, ** is the p-value>0.05, and *** is the p-value>0.01.

8 Conclusions

Exporting is an activity that entails several costs, the most important of which are sunk entry costs. Throughout this paper, we discuss the impact of financial resources on the probability of entry into the export market and assess the importance of firms' credit constraints. We introduce a methodology for identifying firm constraints *a priori* and test whether internal liquidity determines the choice of entry and variations in the extensive margin of trade. We assume in this paper that the new exporter incurs well defined entry costs against uncertain future profits. If we introduce the existence of asymmetric information and imperfect capital markets, not all potential exporters can begin export activity. A vast body of literature tells us that the limited access to credit sources causes investment constraints (Love, 2003; Poncet et al. 2009). Considering export's entry costs as an investment, it appears that internal liquidity may affect entry choice.

Thus, the contribution of this paper is twofold. On the one hand, we develop a methodology for identifying a priori the level of a firm's financial health using both the insights from the literature on investment sensitivity on cash flows and the indices from business economics. On the other hand, we test a sample of Italian firms (small and medium-size, not quoted) to determine whether the level of internal resources involves both firm participation in international markets and variation in the extensive margin.

We find that internal resources are an important factor for the internationalisation of firms and in particular that entry decisions are determined by the level of cash stock for those firms identified as credit-constrained. Similarly, the growth of extensive margin of trade i.e., expansion into new markets is affected by internal resources.

In addition, this paper also controls for the variation in firm financial health before and after entry. In line with part of the literature, we find that new exporters show a lower index and lower financial stability (Greenaway et al., 2007) and that new exporters do not gain financial stability after entry (Bellone et al., 2010; Greenaway et al., 2007).

Further research should focus more attention on the extensive margin of trade and particularly on the geographical distance between the exporter and the destination market. If we assume fixed costs independent from the distance, there is no room for research; however if we assume that this distance factors into the difficulty of developing a product specifically for a market or the cost of creating a distribution network, then credit constraints and specific export destinations are potentially related.

References

[1] Ackerberg D., Benkard C.L., Berry S., Pakes A. (2005): Econometrics tools for analyzing market outcomes, *Handbook of econometrics vol.6* ed. Heckman J.J., Leamer E.E.

[2] Almeida H., Campello M., Weisbach M.S. (20004): The Cash Flow Sensitivity of Cash, *Journal of Finance*, Vol.59(4), pp. 1777-1804

[3] Arellano M. Bond S.R. (1991): Some specification test for panel data: Monte Carlo evidence and an application to employment equations, *Review of Economic Studies*, 58 277-298

[4] Bank for International Settlements (2006): International Convergence of Capital Measurement and Capital Standards: A Revised Framework - Comprehensive Version

[5] Beck T. (2002): Financial Development and International Trade. Is there a Link?, *Journal of International Economics*, Vol. 57(1), pp. 107-131

[6] Beck T. (2003): Financial Dependence and International Trade, *The Review of International Economics*, Vol.11(2), pp. 296-316

[7] Bellone F., Musso P., Nesta L., Schiavo S.,(2010): Financial Constraints and Firm Export Behavior, *forthcoming The World Economy*

[8] Becker B., Greenberg D. (2005): Financial Development and International Trade, *University of Illinois at Urbana-Champaign mimeo*

[9] Bernard A.B., Jensen B.J. (1999): Exceptional Exporter Performance: Cause, Effect or Both?, *Journal of International Economics*, Vol. 47(1), pp.1-25.

[10] Berman N., Hricourt J. (2010): Financial Factors and the Margins of Trade: Evidence from Cross-Country Firm-Level Data, *forthcoming Journal of Development Economics*

[11] Blundell R., Bond B. (1998): Initial conditions and moment restrictions in dynamic panel model, *Journal of Econometrics* vol.87, pp. 115-143

[12] Bond S., Van Reenen J. (2005): Microeconometric models of investment and employments, *Handbook of Econometrics* Vol.6 ed. Heckman J.J., Leamer E.E

[13] Brealey R., Myers S. (1999): Principles of Corporate Finance, ed. McGraw-Hill

[14] Campa J.M., Shaver J.M. (2002): Exporting and capital investment: On the strategic behavior of exporters, IESE Research Papers D/469, IESE Business School

[15] Chaney (2005): Liquidity Constrained Exporters, *University of Chicago mimeo*

[16] Das S., Robert M.J., Tybout R. (2007):Market Entry Costs, Producer Heterogeneity, and Export Dynamics, *Econometrica*, Vol.75(3), pp 837-873

[17] DeLoecker J. (2007): Does exports generate higher productivity? Evidence from Slovenia, Journal of International Economics, Vol 73(1), pp. 69-98

[18] Fazzari S.M., Hubbard M.G., Petersen B.C.(1988): Financing Constraints and Corporate Investment, *Brookings Papers on Economic Activity*, Vol.19(1), pp141-206

[19] Forbes K.(2007): One cost of the Chilean capital controls: Increased financial constraints for smaller traded firms, *Journal of International Economics*, Vol. 71(2), pp. 294-323

[20] Gilchrist S., Himmelberg C. (1998): Investment, Fundamentals and Finance, *NBER Working Papers n.6652*

[21] Greenaway D., Guariglia A., Kneller R. (2007): Financial factors and exporting decisions, *Journal of International Economics*, Vol.73(2),pp-377-395

[22] Hubbard G. (1998): Capital Market Imperfections and Investments, *Journal of Economic Literature*, Vol.35, pp.193-225

[23] Kaplan S.N., Zingales L.(1997): Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints, *The Quarterly Journal of Economics*, Vol.112(1), pp 169-215

[24] Konings J., Rizov M., Vandenbussche H.(2003): Investment Constraints in Transition Countries, *Economics Letters*, Vol.78, pp. 253-258

[25] Konigs J., Vandenbussche H. (2008): Heterogenous responses of firms to trade protection. *Journal of International Economics*, Vol. 76(2), pp 371-383

[26] Levinshon J., and Petrin A. (2003): Estimating Production Functions Using Inputs to Control for Unobservable, *Review of Economic Studies*, Vol. 70, pp. 317-342.

[27] Love I. (2003): Financial Development and Financing Constraints: International Evidence from the Structural Investment Model, *Review of Financial Studies*, Vol.16(3), pp 765-791

[28] Manole V. Spatareanu M. (2009): Exporting, Capital Investment and Financial Constraints, *LICOS Discussion Papers n.252/09*

[29] Manova K. (2006): Credit Constraints, Heterogenous Firms and International Trade, *NBER Working Paper n.14531*

[30] Matsuyama K. (2005): Credit Market Imperfections and Patterns of International Trade and Capital Flows, *Journal of European Economic Association*, Vol.3, pp. 714-723

[31] Melitz M. (2003): The impact of trade on intra-industry reallocations and aggregate industry productivity, Econometrica 71(6) 1695-1725

[32] Muls M.(2008): Exporters and credit constraints. A firm-level approach, *National Bank of Belgium* Research Series 200809-22

[33] Olley S., and Pakes A. (1996): The Dynamics of Productivity in the Telecommunications Equipment Industry, *Econometrica*, Vol 64(6), 1263-98

[34] Poncet S., Steingress W., Vandenbussche H. (2010): Financial constraints in China: firm-level evidence, *China Economic Review, forthcoming*

[35] Roberts M.J., Tybout J.R. (1997): The decision to export to Colombia: an empirical model of entry with sunk costs, American Economic Review 87(4) pp.545-564

A Data Description

- **Financial Independency Index** (FII): This index measures how much of a firms financing it provides itself. It is the ratio of internal resources or net assets (equity, reserves, profits) to the total assets employed by the firm.
- **SR:** This is the ratio of net assets plus long-term debts to total assets plus leftover stock (intermediate inputs and final output). It measures the ability of a firm to pay its long-term fixed expenses and to accomplish long-term expansion and growth.
- **Quick Ratio**: This is the amount of instantaneous liquidity plus postponed liquidity over short-term debts.
- **EquityR**: This is the ratio of long-term debt to firm equity.
- **Bond** is the value of long-term debt.
- **Cash Flow** (CF) is a measure of liquidity. Cash flows are profits plus depreciation and amortisation found plus worker leave indemnity (TFR).
- **Cash Stock** (CS) is a broader measure of liquidity as compared to CF. It includes liquid assets plus normal cash flows.
- **Lab**: Labour force, number of workers
- **K** is the deflated value of total fixed assets (tangible and intangible assets).
- **DA** is the value of depreciation and amortisation.
- **Inv** are the investments in tangible (m) and intangible (s) assets. They are defined as

$$Inv_{ijt} = K_{ijt} - (1 - \delta_j)K_{ijt-1} \quad \text{with} \quad \delta_m = .10 \ \text{ and } \ \delta_s = .20 \tag{A.1}$$

  with j defining an asset's typology (tangible or intangible).
- **KB**: Total fixed assets at the beginning of the year t. This is

$$KB_{it} = K_{it} - Inv_{it} + DA_{it} \tag{A.2}$$

- **Dest** is the number of markets served in a given survey.
- **Expo** is the export dummy for a given survey.

- **Bank** is the number of banks used by a firm in a given survey.
- **UpProd**: The firm invested in upgrading existing products during the survey period. The level of resources invested is high (H), medium (M), or low (L). Dummy variable.
- **NewProd**: The firm invested in the creation of new products during the survey period. The level of resources invested is high (H), medium (M), and low (L). Dummy variable.
- **R&D**: The firm invested in R&D during the survey period. Dummy variable.
- **Autofin**: The percentage of investments financed by internal resources during the survey period.
- **Deloc**: The firm delocalised production during the survey period. Dummy variable
- **CrShort, CrNorm, CrLong** are, respectively, the credit obtained with short-, medium- and long-term lending contracts. The burden of the investment contribution is reported.
- **Pubbl** is defined by the share of investments financed by public subsidies
- **FiscAdv** is defined by the share of investments financed through fiscal advantage.

B Descriptive Statistics

Table B.1: Descriptive Statistics[‡].

ATECO CODE	Description	Firms	Percent	Turnover	Workers	TFK	AV	KL	Wage
DA	Food, Beverages & Tobacco	454	9.73	22970.74	86.12	4966.44	4892.55	103.59	28.19
DB	Textile and wearing apparel	564	12.08	17818.26	85.88	3374.05	4609.20	50.05	36.46
DC	Leather	223	4.78	8973.61	41.53	942.59	1925.01	28.46	29.33
DD	Wood products	140	3.00	8868.28	46.08	3059.82	2702.73	53.45	25.55
DE	Publishing	276	5.91	12708.91	72.44	2150.32	3918.48	51.04	28.78
DG	Chemical products and synthetic fibers	206	4.41	62896.12	163.06	11745.81	12720.06	72.95	42.63
DH	Plastic and rubber products	236	5.06	12530.05	70.69	3453.69	4049.86	109.73	69.09
DI	Other non metallic and mineral products	255	5.46	17962.35	96.72	5995.14	6825.88	76.17	29.08
DJ	Manufacture of basic metallic products	787	16.86	14307.62	61.69	3079.01	3320.55	50.93	30.80
DK	Machinery and equipment	642	13.75	20310.87	114.36	3152.49	6673.33	247.23	63.01
DL	Manufacture of electrical machinery	438	9.38	28917.2	150.92	7259.47	10511.99	45.82	41.12
DM	Manufacture of motor vehicles	130	2.78	74913.75	259.46	18978.35	18166.85	72.45	32.42
DN	Other manufacture: house furniture	312	6.79	9349.53	48.49	1486.34	2483.10	39.19	28.53
	Total	4,668	100	20751.41	93.26	4416.99	5697.85	87.49	38.69

[‡] Source: Capitalia. TFK: Tangible fixed assets. AV: added Value in Th of Euros. KL: Capital intensity, fixed assets per worker. Wage: Average wage, total wage bill over total number of workers. The values variables are deflated with sector specific year deflators (Eu-Klems).

Table B.2: Financial Indicators[‡].

Sector	FII		Solven		Quick		EquityR		StIndex		Index	
	μ	σ	μ	σ	μ	σ	μ	σ	μ	σ	μ	σ
DA	0.245	0.179	0.848	0.642	0.957	1.159	0.458	1.197	1.022	0.779	0.797	1.134
DB	0.257	0.358	1.078	1.558	1.106	0.966	0.242	0.830	1.028	0.964	0.945	1.222
DC	0.231	0.168	1.093	3.207	1.089	3.043	0.218	0.630	1.014	0.881	0.695	1.085
DD	0.273	0.159	0.974	0.893	0.980	0.591	0.293	0.677	1.044	0.567	0.835	1.169
DE	0.232	0.177	1.164	0.989	1.158	0.899	0.353	1.547	1.011	0.683	0.958	1.165
DG	0.294	0.190	1.167	0.911	1.132	0.850	0.294	0.911	1.021	0.961	1.162	1.314
DH	0.281	0.193	1.112	0.864	1.110	0.641	0.244	0.835	1.026	0.588	1.186	1.277
DI	0.317	0.189	1.027	0.653	1.126	1.486	0.279	1.122	1.023	0.608	1.253	1.303
DJ	0.257	0.195	1.139	2.557	1.044	0.731	0.434	1.966	0.991	0.656	0.972	1.231
DK	0.271	0.194	1.145	1.719	1.084	0.746	0.242	1.134	1.009	0.635	0.991	1.244
DL	0.264	0.204	1.214	1.221	1.141	0.729	0.183	2.276	0.998	0.695	1.044	1.281
DM	0.233	0.172	0.846	0.495	0.862	0.437	0.904	3.229	0.991	0.626	0.874	1.193
DN	0.257	0.188	1.014	0.930	1.025	0.724	0.469	1.976	1.021	0.664	0.874	1.217

[‡] Source: Capitalia. Averages and standard deviation are calculated from 1997 to 2003. StIndex is the continuos standardized index from Eq 5.2. Index is the ranking index derived with Eq. 4.1. μ: average. σ: standard deviation. Equity Ratio is an additional index with numerator long term debt and as denominator equity. As it reduces the share of external financing shrinks compared to equity.

Table B.3: Firms' survey in 2000 and 2003.[‡].

Des \ Ask	2000			2003		
	No	Yes	Total	No	Yes	Total
No	3,454	67	3,521	0	0	0
Yes	660	240	900	212	125	337
Total	4,114	307	4,421	212	125	337

Transitional Matrix

2000 \ 2003	Ask			Desire		
	No	Yes	Total	No	Yes	Total
No	211	0	211	1,415	181	1,596
Yes	0	122	122	214	137	351
Total	211	122	333	1,629	318	1,947

[‡] Source: Capitalia. Ask: firm asks for more credit without getting it. Desire: firms would have desired more credit from the banks. In the cells are reported the number of firms.

Table B.4: Ratios Averages by Year Sector

Quick								
Sector \ Year	1997	1998	1999	2000	2001	2002	2003	Total
DA	0.960	1.012	0.943	0.954	0.921	0.956	0.996	0.964
DB	0.950	0.968	1.007	0.964	1.063	1.150	1.105	1.014
DC	1.595	0.927	0.980	0.950	1.419	0.909	0.923	1.073
DD	0.844	0.847	0.905	0.908	0.980	1.031	0.928	0.912
DE	1.174	1.092	1.089	1.064	1.116	1.236	1.115	1.114
DG	1.242	1.077	1.066	2.333	1.090	1.112	1.201	1.334
DH	1.055	1.044	1.054	1.070	1.127	1.063	1.140	1.074
DI	1.073	1.038	1.037	1.016	1.009	1.048	1.334	1.067
DJ	1.018	1.058	1.069	1.059	1.027	1.045	1.059	1.051
DK	0.974	1.011	1.043	1.012	1.050	1.109	1.093	1.038
DL	1.117	1.112	1.155	1.107	1.077	1.119	1.242	1.129
DM	0.954	0.995	0.937	0.929	0.836	0.853	0.908	0.926
DN	0.836	0.885	0.908	0.943	0.975	1.059	1.043	0.941
Total	1.039	1.015	1.028	1.064	1.047	1.069	1.094	1.047

FII								
Sector \ Year	1997	1998	1999	2000	2001	2002	2003	Total
DA	0.249	0.244	0.242	0.236	0.238	0.250	0.246	0.243
DB	0.237	0.240	0.240	0.244	0.266	0.238	0.269	0.246
DC	0.216	0.203	0.203	0.200	0.221	0.234	0.227	0.211
DD	0.226	0.230	0.230	0.237	0.271	0.278	0.271	0.245
DE	0.219	0.215	0.214	0.210	0.222	0.238	0.237	0.219
DG	0.270	0.277	0.278	0.284	0.288	0.298	0.296	0.284
DH	0.257	0.253	0.255	0.265	0.282	0.274	0.286	0.265
DI	0.292	0.293	0.294	0.293	0.304	0.319	0.328	0.301
DJ	0.246	0.245	0.251	0.257	0.258	0.254	0.259	0.252
DK	0.227	0.227	0.238	0.247	0.265	0.270	0.277	0.247
DL	0.244	0.240	0.246	0.250	0.261	0.264	0.267	0.251
DM	0.217	0.237	0.239	0.244	0.222	0.229	0.250	0.235
DN	0.219	0.218	0.215	0.231	0.250	0.259	0.263	0.233
Total	0.240	0.239	0.242	0.246	0.260	0.261	0.268	0.249

SR								
Sector \ Year	1997	1998	1999	2000	2001	2002	2003	Total
DA	0.853	0.852	0.851	0.850	0.809	0.847	0.889	0.850
DB	0.912	0.923	0.998	0.996	1.087	1.004	1.150	0.996
DC	0.870	0.838	0.872	0.863	0.936	0.942	0.979	0.887
DD	0.761	0.796	0.844	0.834	0.917	0.970	1.043	0.866
DE	1.287	1.190	1.204	1.185	1.124	1.157	1.214	1.196
DG	1.060	1.070	1.085	1.071	1.126	1.093	1.291	1.107
DH	1.064	1.071	1.097	1.104	1.165	1.083	1.085	1.095
DI	1.042	1.008	0.987	0.983	0.948	0.993	1.148	1.010
DJ	1.052	1.197	1.215	1.059	1.079	1.117	1.223	1.139
DK	1.011	1.027	1.106	1.026	1.035	1.103	1.311	1.080
DL	1.129	1.151	1.175	1.162	1.136	1.168	1.359	1.175
DM	0.919	0.931	0.942	0.892	0.784	0.844	0.928	0.899
DN	0.809	0.895	0.913	0.976	0.975	1.041	1.026	0.943
Total	0.990	1.023	1.054	1.016	1.027	1.048	1.160	1.041

Table B.5: Transitional Matrix: Export Status‡.

2000 \ 2003	Domestic	Exporter	Total
Domestic	656	122	778
Exporters	530	1246	1776
Total	1186	1368	2554

1997 \ 2000	Domestic	Exporter	Total
Domestic	167	38	205
Exporters	41	565	606
Total	208	603	811

‡ Source: Capitalia.

Table B.6: Transitional matrix: Export destination‡.

2000 \ 2003	0	1	2	3	4	5	6	7	8	9	Total
0	557	79	26	9	0	3	0	0	3	1	678
1	77	190	79	35	6	3	3	0	0	1	394
2	33	85	123	77	36	21	6	4	2	4	391
3	7	23	62	65	37	22	11	4	5	4	240
4	7	7	12	34	22	17	11	6	6	2	124
5	3	1	9	9	12	24	6	4	7	3	78
6	6	1	2	8	11	5	6	3	2	4	48
7	1	2	0	2	12	7	4	6	2	3	39
8	2	0	1	2	6	0	7	4	6	5	33
9	3	1	1	6	3	2	2	1	1	3	23
Total	696	389	315	247	145	104	56	32	34	30	2,048

‡ Source: Capitalia. In the cell are reported number of firms. In first row and fir column are reported the number of regions served respectively in 2003 and 2000. Firms do not change.

Table B.7: Averages by export status[‡].

	All Firms	Continuos	Domestic	Entr03
Index	0.960	0.946	1.086	0.683
TFP	4.411	3.939	5.250	4.698
Ln(CS)	7.075	7.358	6.540	6.714
Labor	98.28	123.89	39.070	92.71
BK	0.300	0.357	0.189	0.208
EquityR	0.248	0.245	0.239	0.175
Obs	2554	1186	656	122

[‡] Simple averages across firms with export status information both in the 8^{th} and 9^{th} survey. Index: time variant cluster index. TFP: Levinsohn Petrin productivity. Labor: Workforce. BK: Long term debts over total assets. EquityR: equity ratio. Obs: Observations. Continuos: continuos exporters in both surveys. Domestic: non exporters in both surveys. Entr03: entrants in export market in 9^{th} survey.

C Euler equation for investments

The main advantage of Euler equation model respect to Tobin's q approach (Hubbard et al.,1998 or Bond Van Reenen, 2003 for a survey) is that it is less demanding in term of assumptions and data. In particular it can be difficult to find a proxy for the unobservable marginal q, since in most of the case firms are not quoted in the stock markets.[34] The Euler equation models of investment is derived from an optimization problem; the model captures the influences of future profits' expectations on current investment decisions. The Euler model assumes that credit constrained firms find more costly the investment tomorrow than today. In the derivation of dynamic equation we follow Gilchrist and Himmelberg (1998) Love (2003), and Forbes (2007).

Assume that each firm maximizes its present value which

$$V_t\left(K_t,\omega_t\right)=\max_{\{I_{t+s}\}_{s=0}^{\infty}} D_t+E_t\left[\sum_{s=1}^{\infty}\beta_{t+s}D_{t+s}\right], \tag{C.1}$$

subject to

$$D_t=\Pi\left(K_t,\omega_t\right)-C\left(I_t,K_t\right)-I_{t,} \tag{C.2}$$

$$K_{t+1}=(1-\delta)K_t+I_t, \tag{C.3}$$

[34]The stringent assumption is that market's valuation of capital has to be equal to manager's valuation. The problem is augmented by market imperfections.

$$D_t \geq 0. \tag{C.4}$$

Here $V_t(K_t, \omega_t)$ is the value of the firm at time t which depends on capital at begin of period K_t, and ont the productivity shock ω_t. The variable D_t is the dividend in t, $E_t[.]$ is the expected actual value of future dividends, while β_{t+s} is the discount factor; the dividends in (C.2) are equal to profits $\Pi(K_t, \omega_t)$ at net of labor cost, minus adjustment cost of new investments $C(I_t, K_t)$, and minus investments expenditure.I_t. The adjusting cost $C(I_t, K_t)$ can include disruption cost, learning, delivery lags or installations lags. Finally (C.3) and (C.4) are respectively capital law motion[35] and the nonnegative dividend condition. The last condition defines credit constraints, with its Lagrange multiplier λ_t. Using first order condition and envelope theorem, it yields the Euler equation

$$1+\frac{\partial C(I_t, K_t)}{I_t} = \beta_t E_t\left[\frac{1+\lambda_{t+1}}{1+\lambda_t}\left\{\frac{\partial \Pi(K_{t+1}, \omega_{t+1})}{K_{t+1}} + (1-\delta)\left(1+\frac{\partial C(I_{t+1}, K_{t+1})}{I_{t+1}}\right)\right\}\right]. \tag{C.5}$$

The ratio $\frac{1+\lambda_{t+1}}{1+\lambda_t}$ measures the relative shadow cost of external financing between period t and period $t+1$, namely the financing constraints. If capital market are perfect $\lambda_t = \lambda_{t+1}$, meaning that the cost of one unit of capital today is equal to one unit tomorrow and the true discount rate is given by β_t; while if $\lambda_t > \lambda_{t+1}$ then firm will find more convenient invests today than tomorrow. In this last case firm is defined as credit constrained.

To estimate Eq (C.5) it is necessary to introduce some assumptions to parametrize it. Particular attention is given to investment's shadow cost ratio: it is usually parametrized in the literature as a function of internal generated funds (cash flows or cash stocks in Fazzari et al. 1998 or Gilchrist Himmelberg, 1995). In this specific case it can be written as a function of firm specific credit constraints a_i, and internal generated resources[36],

$$\left(\frac{1+\lambda_{t+1}}{1+\lambda_t}\right)_i = a_0 + \alpha_i\left(\frac{Cash}{KB}\right)_{it} - \omega_{it} \tag{C.6}$$

The idea is that when firm generates more resources then it reduces the spread between the cost of capital tomorrow versus today. The fixed effects are captured by a_i while the productivity shock ω_{it} is introduced in the parameterization of shadow cost; if

[35]Investment is the state variable of the problem while capital the control variable. Investment's decisions are taken in period t, and are effective in $t+1$.

[36]Usually in the literature Cash Flow or Cash Stock are used as measure of internal generated resources, and they are scaled by the total amount of tangible fixed asset at the beginning of the period. Cash Stock should be preferred to Cash Flows (Love, 2003).

firm is more efficient the shadow cost reduces.

Next step is to define the marginal profit of capital (MPK): if production function is a Cobb-Douglas, the MPK deriving from profit maximization is a function of sales to capital ratio, i.e. $\theta\,(S/K)$ where θ is the ratio between the capital share's in production and firm markup (Gilchrist and Himmelberg, 1998). The firm's markup is captured by fixed effect but and the MPK is approximated as follow

$$MPK_{it} \approx c_i + c_1 \frac{S}{K_{it}}, \tag{C.7}$$

where c_i is fixed effects. Finally, to obtain an equation to estimate it is necessary to define also the investment adjustment cost function. We make a standard assumption of quadratic adjustment cost for investments, with fixed effects (b_i) and time effects (b_t) then

$$\frac{\partial C}{\partial I_{it}} = \frac{1}{b_0}\left[\frac{I}{K_{it}} - b_1 \frac{I}{K_{it-1}} - b_i - b_t\right]. \tag{C.8}$$

Since $E\left(\frac{1+\lambda_{t+1}}{1+\lambda_t}\right)_i \cong 1$ it is possible to approximate Eq (C.5) with a first-order Taylor approximation around the mean: in such way the various fixed effects can be captured in a single term. Then the empirical equation is obtained substituting Eq (C.6) to (C.8) in (C.5) and assuming rational expectations it yields

$$\left(\frac{I}{K}\right)_{it} = \alpha_0 \left(\frac{I}{K}\right)_{it-1} + \alpha_1 \left(\frac{Y}{K}\right)_{it} + \alpha_2 \left(\frac{CS}{K}\right)_{it-1} + \alpha_3 \omega_{it-1} + \delta_t + c_i + u_{it}. \tag{C.9}$$

In the above equation I is the investment level in fixed assets, K is the stock of fixed asset at the beginning of time t, Y are the sales, ω is firm's productivity, and $Cash$ are the internal resources (Cash flows or cash stock). The subscripts i and t denote respectively individual and time while c_i,δ_t, and e_{it} are fixed effects, time dummies and i.i.d. error term. The credit constraint effect is captured by α_s: whether the coefficient is positive and significant, it suggests us that investments are sensitive to internally generated cash, because the shadow cost of investments increases in function of cash (C.6). The Levinsohn-Petrin productivity is preferred because it does not assume any functional form for investments. It will help us to avoid problems of kinks in the investment function which is assumed smooth and continuos in Olley and Pakes (1996). For further discussion look at Ackerberg et al.(2004), and Levinsohn and Petrin (2003).

Table C.1: Euler Equation: System GMM by cluster[‡].

	(1) All	(2) CL0	(3) CL1	(4) CL2	(5) CL3
IKB_{it-1}	-0.019	0.019	-0.228**	0.010	-0.013
	[0.037]	[0.036]	[0.094]	[0.226]	[0.096]
CSK_{it-1}	0.016***	0.013***	0.088**	-0.059	-0.018*
	[0.001]	[0.001]	[0.035]	[0.081]	[0.010]
YK_{it}	-0.000***	-0.000***	-0.007	0.004	0.012***
	[0.000]	[0.000]	[0.005]	[0.011]	[0.004]
TFP_{it-1}	0.010*	-0.005	0.010	-0.013	0.006
	[0.005]	[0.012]	[0.014]	[0.013]	[0.009]
$EquityR_{it-1}$t	-0.065	0.065	0.104	0.146	0.205
	[0.060]	[0.090]	[0.169]	[0.450]	[0.463]
Const	0.107***	0.130***	-0.015	0.251***	0.020
	[0.032]	[0.049]	[0.130]	[0.087]	[0.061]
Obs.	9759	5370	1441	682	2266
Firms	2459	1358	373	172	556
Instr.	49	49	49	49	49
AR2 Test	0.3684	0.3341	0.8856	0.3124	0.2913
Hansen Test	0.3246	0.8686	0.6534	0.2308	0.4311

[‡] System GMM estimation. Robust standard errors in squared brackets. Time dummies included both as variables and instruments. One step estimator used. Significance level: * is the p-value>0.1, ** is the p-value>0.05, and *** is the p-value>0.01. Instr: total number of instruments. P-Value reported for AR2 Test and Hansen test. Firms included in the estimation are the result of matching between balance sheet 1991-2000 and 2001-2003. All regressors are considered endogenous and are instrumented from the 3rd lag. Investments, sales and cash stock are scaled with the capital value at the begin of period.