Export Survival and Foreign Financing

LAURA D'AMATO (BANCO CENTRAL DE LA REPÚBLICA ARGENTINA), MÁXIMO SANGIÁCOMO (BANCO CENTRAL DE LA REPÚBLICA ARGENTINA) AND MARTIN TOBAL (BANCO DE MÉXICO) *

Exporting is a finance intensive activity. However, exporters may be confronted with domestic credit constrains and/or high costs of funding in domestic financial markets. This paper investigates whether foreign financing gives exporters better financing conditions and, through this channel, increases their prospects for export survival. For this purpose, it assembles a unique dataset with micro-data on trade flows and financial characteristics of Argentine firms. The paper develops a simple theoretical model that allows identifying potential threats for identification and, using this theoretical model as a guide, undertakes a novel empirical strategy through the development of an original instrumental variable approach. Hence, in contrast with existing literature, the paper is able to establish causality between foreign financing and export survival rates. This result remains robust to the use of conventional survival techniques used in this literature, such as probit random effects and clog-log duration setups.

JEL codes: JEL Classification codes: F10, F13, G20, G28.

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1. Introduction

Exporting is a finance intensive activity. Exporters need large amounts of working capital to pay up-front costs associated with product customization to specific destination, marketing expenses and distribution networks (Amiti and Weinstein, 2011). Moreover, they need further financial insurance to cope with the additional transactional risks involved in international sales. While exporters could pay for these up-front costs and for the additionally required financial insurance with internal funds, there is a long time lag between production and receipt sales revenue and this, in turn, makes external finance particularly relevant for exporting activities (Amiti and Weinstein, 2011 and Chor and Manova, 2012). Along these lines, a now consolidated literature shows that external finance and better financing conditions exert increasing impacts on exports volumes (Manova, 2013; Molina and Roa, 2015; Paravisini, Rappoport, Schnabl and Wolfenson, 2015).[1]

Nonetheless, and beyond the great progress made by this literature, its focus remains on a specific set of activities. In particular, it investigates the effects of financing conditions on the intensive and extensive margins of trade, overlooking their potential incidence on export survival rates. Yet, this is surprising for at least three relevant reasons. First, export survival rates are particularly low in emerging countries, such as those from Latin America, when compared to the U.S., Europe and East Asia (Besdes and Blyde, 2010), suggesting that there is room to foster economic growth by consolidating the exporting sector. Second, regardless of whether increasing export survival is welfare-improving overall, the fact that it depended on credit conditions would indicate the existence of financial frictions, and, therefore, identify zones for policy-action (Hallak et al., 2016)).[2] Third, the literature mentioned above suggests that finance conditions increase export volumes by affecting recurrent costs of exporting, i.e., ultimately, export volume decisions depend on this type of costs. Thus, in this manner, the literature also implicitly suggests that finance exerts positive impacts on export survival rates (see Subsection 2.1).

The present paper fills this gap in the literature by investigating the impact of financing conditions on export survival rates for the case of an emerging market economy, Argentina. Moreover, it does it in a manner that presents two advantages with respect to the literature on exporters survival in general and also to Besedes and Blyde (2010) and Jaud et al. (2014), which are the only two papers that, without explicitly having the goal of exploring the impact of finance

[1]At the same time, a body of literature shows that financially developed countries have a comparative advantage in finance-intensive goods (see, for instance, Beck, 2002; Svaleryd and Vlachos, 2005; and Manova et al., 2011.

[2] Although these low rates can be rationalized as being part of a learning process experienced by firms to solve the uncertainty about foreign markets profitability, as in Hallak et al. (2016), increasing them, eventually for reentering firms, continues to be of first order of importance to boost export growth in developing countries

on export survival, link these two variables in an empirical study.[3] The first advantage is that we assembly and exploit a rich dataset containing unique information at the level of firms on their trade flows and financing sources. Access to detailed information on foreign and domestic levels of financing enables the paper to exploit heterogeneity across firms and different financing forms. The second advantage is that rather than limiting itself to the use of standard survival techniques, the present paper employs an instrumental variable technique that allows making a causal statement about the effect of financing on export survival prospects.

To approach the issue of financing conditions, we distinguish between foreign and domestic financing, being the first type obtained by Argentine firms from financial institutions located abroad, related companies, clients and suppliers and the second type obtained in domestic financial markets. Two characteristics of foreign financing, which are found in the data and have theoretical appeal, are used to identify the effect of financing on survival rates. First, the micro-data show that Argentine exporters tend to borrow in countries with smaller money market interest rates than Argentina, suggesting that monetary and liquidity conditions are easier and, thus, funds suppliers in these countries may be more willing to lend. The fact that firms only obtain foreign financing at smaller interest rates is not surprising given that, as suggested by Ahn (2011), this form of financing generally involves greater asymmetric information.[4] Second, there is also evidence in the data that, beyond differences in interest rates, Argentine exporters borrow abroad when domestic financial markets seemed more unwilling to lend. In this sense, foreign financing is also helpful in providing external finance when it is not available in the domestic market.

Having shown that foreign financing has distinctive characteristics, the paper proceeds by developing a simple theoretical model to illustrate one of the several channels though which finance can affect export survival rates. In the model, foreign financing allows firms to overcome liquidity constraints. Furthermore, the model serves at motivating our empirical approach by showing three results that are subsequently used for the construction of the instrument with foreign countries' money market interest rates and for improving the identification strategy. The theoretical model shows that: (i) a rise in a foreign country's interest rate increases financial costs and, through this channel, reduces export survival probabilities for firms that borrow in this country; (ii) this rise increases the shadow price of foreign financing and, thus, also affect firms

[3] Paravisini, Rappoport, Schnabl and Wolfenson (2015) could also be included in this list. However, they do not constrain their sample to new exporters, who mostly determine the consolidation of an exporting sector and for whom financing conditions may be more relevant, since they do not use standard survival techniques. Further, they focus on resources intermediated by the domestic bankst and analyze a one-time shock, i.e. the most recent financial crisis.

[4] Because asymmetric information costs are higher for parties from different countries, as suggested by Ahn (2011), exporters should make use of foreign financing mostly when this enables them to pay lower rates.

that would borrow in the referred country at smaller rates; (iii) exporters have a tendency to borrow in specific countries and the set of these countries is determined by idiosyncratic factors that are better defined at the firm-source country level, i.e., this is also suggested by evidence on borrowing that Argentine firms obtain from Brazil shown in Subsection 2.2.

The paper proceeds with the empirical approach that goes beyond the use of standard survival techniques that have been traditionally employed in the literature of survival using an instrumental variable linear probability model. First, two time discrete survival models are considered: a clog-log with frailty and a probit random effects. In contrast with the continuous time Cox model, the clog-log and the probit random effects can deal with potential bias stemming from the annual aggregation of trade data and from stochastic unobserved heterogeneity (Hess and Persson, 2012 and Perez-Estevez, 2014). Further, the probit random effects avoids the restrictive proportionality assumption, according to which the effect of regressors on the hazard is constant over duration time. The results of these continuous time duration models suggest that, controlling for such variables as the amount of domestic financing obtained by a firm and its number of employees, foreign financing is associated with better prospects for export survival.

In addition, the paper estimates an instrumental variable model. In this empirical setup, foreign financing is instrumented for with a financial index that uses information on the money market interest rates prevailing in countries from which the Argentine exporter obtains financing. This financial index captures time-variation stemming from changes in the credit supply conditions of the foreign countries. Since this variation is exogenous to the exporters, it enables us to account for potential bias arising unobservable characteristics of the firms that vary over time.

Furthermore, following the intuitions of the theoretical model, the empirical strategy incorporates fixed effects defined at the firm-country level, controlling for unobservable characteristics of the exporters that do not vary over time but may, nonetheless, determine their tendency to borrow in countries with systematically different rates, i.e., addressing point (iii) mentioned above. To our knowledge, this is the first attempt to develop a systematic identification strategy using instrumental variables in the context of finance and export survival. The outcomes indicate that foreign positively causes an increasing impact on export survival.

The paper relates closely to an emerging literature on export survival. A strand of this research investigates the role played by country and industry level variables, such as the degree of a product's differentiation or differences in GDP, on export survival (see Hess and Persson 2011; Besedes and Prusa 2007; Besedes 2008; Fugazza and Molina 2009; Nitsch 2009; Brenton et al. 2009a; Brenton et al. 2009b; Araujo, Mion and Ornelas 2012 and Cadot et al. (2013). A different

strand of research examines the role played by firm-level characteristics, considering variables as size (Fu and Wu 2014), the initial value of a firm's exports (Fugazza and McLaren 2014) and foreign capital participation (Esteve Perez et al., 2007; see Volpe and Carballo 2008; Tovar and Martinez 2011; Stribat 2012 and Jaud et al. 2014 for other references). The paper also relates to the work by Albornoz et al. (2012). They use data on export values of manufacturing firms between 2002 and 2007 to show that the behavior of Argentine exporters follows a sequential pattern. In line with their results, we find that survival rates in Argentina are low.

Before proceeding, a final and critical remark deserves to be made. In the debate of export survival an economic development, it has been argued that the existence of low export survival rates can be just signaling a trial and error, or learning process (see Brenton, Saborowski and Von Uexkull, 2010). In fact, Fanelli and Hallak (2016) are able to account for the low survival rates found in the data by introducing experimentation and learning into a model of export dynamics. The goal of the present paper is not to argue against this statement. Instead, the present paper claims that external finance and better financial conditions improve export survival, beyond the trial and error process, and for firms with sufficient learning and good skills.

The paper is organized as follows. Section 2 revises the main reasons why access to external fund matters for the dynamics of exporters and builds a model that motivates our empirical exercise, illustrating the channels through which access to foreign financing can improve survival rates. Section 3 describes the methodological approach adopted to study the importance of foreign financing for export survival. In Section 4, the dataset is described and used to provide descriptive analysis. Section 5 presents the estimation results and finally, section 6 concludes.

2. Links between Foreign Financing and Export Survival

2.1 Finance Conditions and Exporting Costs

In traditional heterogeneous firm models of trade, entry costs are modelled as one-time costs and conceived as a critical determinant of entry into the export market (for instance, see Melitz 2003). However, there is also a different type of exporting costs that goes beyond market entry, that is paid on a recurrent basis and, most importantly, that affects other export-related decisions, among which export-volume decisions stand out. For instance, once an exporter enters the market, it continues to face costs that allow increasing the scale of production, paying for shipping, duties and insurance, complying continuously with regulatory requirements or maintaining distribution networks regularly. Unlike entry costs, these other costs that affect additional export-related decisions are faced on a recurrent basis and are paid more than once.

Moreover, these recurrent costs are frequently paid upfront and, thus, external finance is important for export dimensions that go beyond market entry. External finance enables exporters to obtain liquidity and, through this channel, afford recurrent costs that determine additional export-related decisions. External finance also allows them to reduce variable costs of exporting by enabling them to increase their scale. Finally, to the extent that the recurrent costs are financed externally, interest rates also affect additional export-related decisions: because interest payments are faced on a recurrent basis, and are thus themselves also recurrent costs, smaller interest rates should increase export volumes. Consistent with these ideas, the literature suggests that external finance and better financing conditions increase export volumes, indirectly suggesting that they also allow both affording and reducing recurrent costs (see review below).

Since external finance and better financial conditions allow affording and reducing recurrent costs, it is surprising that their link with export survival has been overlooked. After all, export survival decisions depend on recurrent cost just as export volumes do: lack of liquidity to afford these costs or to increase the scale of production may force exporters to exit the market, and large interest rates attached to their loans increase interest payments, potentially turning the export experience unprofitable. Thus, given that the literature on export volumes suggests that finance and recurrent costs are linked, it is natural to think that external finance and better financing conditions also increase export survival rates. This is the empirical question this paper addresses.

Regarding the literature on export volumes, the influential work of Paravisini, Rappoport, Schnabl and Wolfenson (2015) matches firm-level data with bank-level information and studies whether bank credit fosters export volumes in Peru, interpreting the capital flow reversal of 2008 as an exogenous shock to credit supply. They find that export elasticities to credit are positive and argue that external finance enables exporters to afford exporting costs that cannot be attributed to market entry. Just as this paper does, the study isolates exogenous variation in credit supply. Yet, it does not aim at contributing to the export survival or the development literatures and, thus, does not use standard survival techniques or constraints its sample to new exporters.[5] Moreover, unlike the present paper, the study focuses on financial resources intermediated by domestic banks.

In a different paper, Molina and Roa (2015) also match firm-level data with bank-level information for the case of Colombian manufacturing firms. Using the ensuing unique dataset, they estimate the effect of bank credit on different export dimensions. Their results show that bank credit increases export volumes and export reach, measured by the number of destinations

[5] In a different exercise, they find that credit does not affect entry or exit. In this regard, note that they focus on a different question and, thus, consider a different type of sample.

attained by a firm. Similar to Paravisini, Rappoport, Schnabl and Wolfenson (2015), they argue that external finance allows affording exporting costs that cannot be attributed to market entry.

An additional influential work is Manova (2013). She investigates how financial markets imperfections distort international trade by exploiting heterogeneity in financial development across 107 countries and in financial vulnerability across 27 sectors. The results show that most distortions are due to trade specific effects and that, in turn, most of these effects are due to reductions in export volumes, rather than by limited entry into the export market. This result indirectly suggests that external finance is important in affording variable exporting costs. Thus, in this sense and given that recurrent costs affect export survival decisions, our outcome that external finance improves export survival is supportive of Manova's results (2013).

Besedeš, Kim and Lugovskyy (2014) also investigate the link between market imperfections and export growth by developing a dynamic model in partial equilibrium in which, as a firm establishes, it reduces credit constraints by diminishing the perceived risk of its project. They test the model and confirm that credit constraints affect export growth but the effect is not persistent over time. Just as we do, they link finance to an export dimension. However, we focus on survival rather than on export growth and on credit, particularly on foreign credit, rather than on credit constraints. Moreover, while their main contribution is theoretical, we focus on empirics.

As noted above, financing conditions may not only allow exporters to afford recurrent costs, but also diminish their costs by financing larger scales of production. Along these lines, Khon et al. (2016) calibrate a model with plant-level data for Chile and find that firms that are more dependent on external funds relative to their productivity level distort their scale of production by a greater amount. Similarly, Gross and Verani (2013) develop a model in which firms need working capital to afford both variable and fixed costs of exporting that are faced recurrently and are paid upfront. In this setup, new exporters begin operating below their desired level but then the constraints relax enabling them to increase their scale (see also Feenstra et al. 2013).[6]

In summary, the literature suggests that external finance and better financing conditions allow affording and reducing recurrent costs of exporting. This, in turn, is consistent with the evidence of the next subsection, according to which Argentine firms borrow abroad when domestic

[6]Feenstra et al. (2013) incorporates "time to ship" into a heterogeneous firm model, in which the longer time lag in exports between production and sales makes working capital needs higher for exporters, forcing them to borrow from banks. However, banks do not observe productivity or whether the capital is used to supply domestic or foreign markets; thus, they offer different contracts for domestic firms and exporters in which the scale distortions are greater for exporters due to higher working capital needs. An application of their model shows that credit conditions become tighter as a Chinese firm export share grows, the time to ship lengthens and information incompleteness is more acute.

financing is scarce and in countries with smaller interest rates. Furthermore, more generally, given that the literature shows that financing conditions affect export volumes through its relationship with recurrent costs, it is natural to think that external finance and better financing conditions increase export survival rates. Finally, as a complement to the present section, Subsection 2.3 develops a model in which foreign financing at sufficiently low interest rates diminishes interest payments that are faced recurrently and, though this channel, increases export survival rates.

2.2 Foreign Financing: Liquidity and Better Financial Conditions

This subsection focuses on foreign financing. In particular, it provides evidence suggesting that exporters use it to obtain external finance and better financing conditions. There are at least two reasons motivating these facts. First, when domestic financing is scarce, foreign financing becomes the sole option to obtain external finance and afford exporting costs. Second, foreign financing involves greater asymmetric information than domestic financing (Ahn, 2011); thus, in general, foreign financing would be undesirable unless it offered lower interest rates. We look for these two motivations of foreign financing in the data and present the results in Figures 1 and 2.

Figure 1 shows the distribution of Argentine firms according to the value of the index used to construct the instrument, which as noted below reflects the cost of foreign financing. For each exporter, the index is a weighted average of the money market interest rates in countries from which it has borrowed (hereafter referred to as "source countries"), and relative weights depend on the importance of each country in the total amount of foreign financing obtained by the firm (see Section 4 for more details). In each panel, the vertical line indicates the money market interest rate prevailing in Argentina for the relevant year.

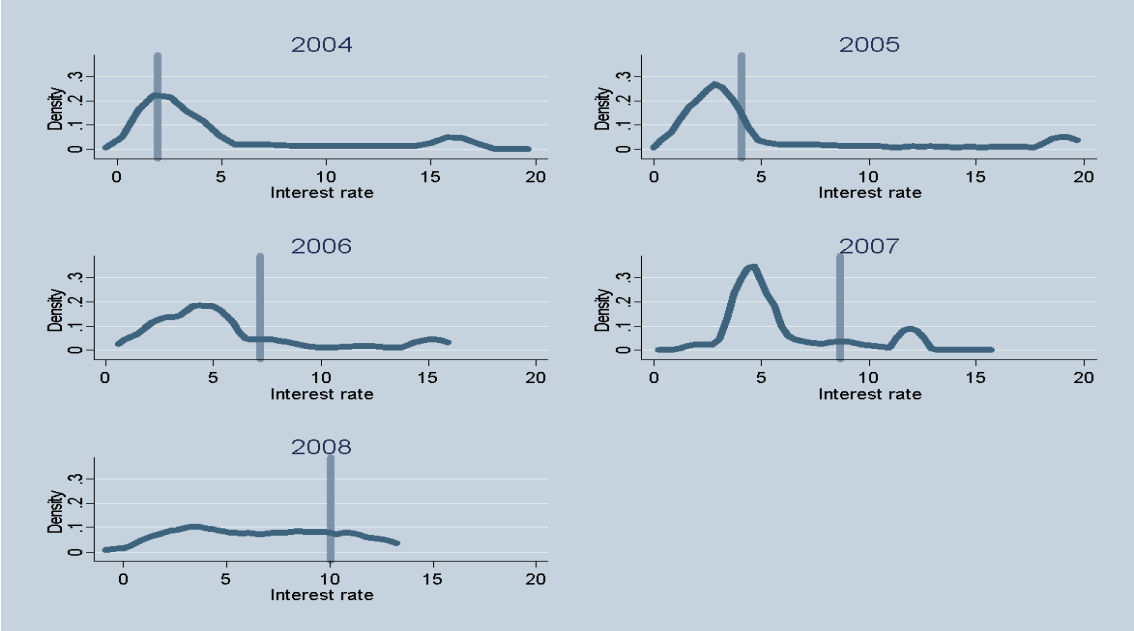
Two patterns emerge from Figure 1. In all panels, with the exception of the one referred to 2004, the greater mass of the distribution is located to the left of the vertical line. This indicates that Argentine firms tend to borrow in countries in which the money market interest rate is smaller, possibly suggesting that in these countries borrowers are more willing to lend and/or that they have easier liquidity conditions. In turn, this is consistent with the fact that foreign financing is generally associated with lower interest rates and smaller interest payments.

Furthermore, all panels exhibit bimodal shaped distributions, being one of the modes located to the right of the vertical line. This is because a small but non-negligible proportion of Argentine firms borrowed in Brazil, i.e., the exception is 2008 when rates in both countries were close to each other.[7] That is, some characteristics of the firms can make them more prone to borrow in

[7]In Brazil, rates were equal to 16.24; 19.12; 15.28; 11.98 and 12.36 in 2004, 2005, 2006, 2007 and 2008, respectively.

specific nations and, particularly, in countries with consistently higher interest rates, i.e., Brazil and Argentine share borders, trade flows and strong cultural links and, thus, some of the Argentine firms may be particularly good at overcoming asymmetric information in this country. The implication is that the unobservable characteristics of the firms may be correlated with the interest rates used in the construction of their financial index. Since this threatens the validity of our instrument, we explicitly account for this fact by introducing different fixed effects in Section 5.

Figure 1. Distribution of average money market interest rates across countries of origin of financial funds received by Argentinian exporters between 2004 and 2008

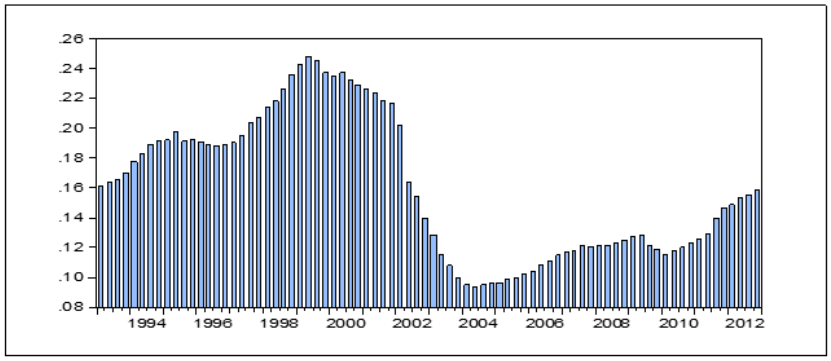


Notes: The figures depict the distribution of firms according to the average money market interest rate in the countries they got funds from. The average rate by firm in each year is constructed using constant weights by country of origin of the funds, with weights calculated across all the years in the sample 2004 -2008. For each of the years the lighter blue line depicts the correspondent money market interest rate in Argentina.
Source: International Financial Statistics of the IMF; Central Bank or Argentine and own Author's calculations

Finally, the fact that in 2004 most firms borrowed in countries with higher interest rates may be interpreted as evidence against their importance in explaining foreign financing. However, Figure 2 argues against this hypothesis. This figure shows that the ratio of private credit to GDP took its lowest value between 1993 and 2012 precisely in 2004. It is exactly in this year in which the financial crisis of 2001 exerted the greatest impact and, thus, financing in the domestic market for Argentine firms may have been particularly scarce. In this context, it is not surprising that many of these firms borrowed in countries in which the money market interest rate was higher than it was in Argentina. In summary, the evidence presented in this section is consistent with the facts that Argentine firms use foreign financing to obtain external finance at smaller interest rates and use it more intensively when domestic financing is scarce, as also speculated above. That is,

the evidence is consistent with the facts that foreign financing is associated with smaller interest rates, thus reducing interest rate payments, and provides liquidity to afford exporting costs.

Figure 2. Ratio of Bank Credit to Nominal GDP in Argentina



Sources: BCRA for bank credit to the private sector figures in Argentine pesos; INDEC and private consultants for nominal GDP figures.

2.3 Motivating Model

This subsection borrows from the static, partial equilibrium setup of Manova (2013) to build a simple model. The goal is not to develop a fully-fledged theory of foreign financing and survival; instead, the main goal is to derive a simple framework that motivates and guides the empirical analysis. As an additional goal, the model attempts to complement the mechanisms described in Subsection 2.1 by illustrating a particular link between foreign financing and export survival. In the model, foreign financing enables exporters to obtain liquidity at sufficiently low interest rates, thereby reducing recurrent costs, increasing export profitability and therefore export survival.

The model derives three results that will impose discipline on the IV strategy undertaken in Section 5: (i) in the model, firms obtain foreign financing in countries in which their idiosyncratic characteristics make it easier to borrow, i.e., characteristics that are specific to the firm-source country match are important for foreign financing determination, as suggested by the evidence on Brazil presented in Subsection 2.2; (ii) an increase in a foreign country's interest rate raises the interest payments of firms that borrow in this country, reducing their export survival probabilities and (iii) given that this increase raises the shadow price of foreign financing, it also affects firms that would have borrowed in the referred country at smaller interest rates. Moreover, the fact that the theoretical model is developed in two steps, mimicking the two steps of the IV approach, eases the comparison with the empirical analysis undertaken in Section 5.

2.3.1 Model Setup

Consider a continuum of firms from the same country and a representative period after they have entered an also representative export market, i.e., they became exporters at some point in the past. Preferences in this market are given by the C.E.S. function $U = [\int_o^{\cap} q_f(w)^{\alpha} dw]^{1/\alpha}$, where $\cap$ is the set of varieties produced by the exporters, each variety is produced by a single firm, $\varepsilon = 1/(1-\alpha) > 1$ is the elasticity of substitution and $P = [\int_o^{\cap} p(w)^{1-\varepsilon} dw]^{1/(1-\varepsilon)}$ is the ideal price index, i.e., all the action will occur at the representative period; thus, we abstract from time subscripts.[8]

Exporters make two types of decisions. In the beginning of the period, an exporter decides whether to leave the export market or to stay as an exporter for an additional period. If an exporter stays, she must obtain external finance and, thus, chooses her optimal debt portfolio by going through a bargaining process with foreign investors, i.e., the theoretical model abstracts from domestic investors to focus on the link between foreign financing and export survival. Notably, the benefits of staying in the export market depend on the costs of external finance; thus, when deciding on whether to stay, exporters anticipate the characteristics of the bargaining process.

Conditional on staying, exporters face variable and fixed costs that are modelled as in Manova (2013). Because at the point of departure firms have already entered the export market, none of these costs can be interpreted as costs of entry. Instead, given that exporters face these costs in every period, including the representative one, they must be interpreted as recurrent costs.

Variable costs depends on two components. There are unitary costs, which are denoted by a_i for firm i and follow a cumulative distribution $G(a_i)$ with support $[a_L, a_H]$, and there are iceberg trade costs, i.e., $\tau > 1$ units of a product must be shipped for 1 unit to arrive.[9] Fixed costs equal f_e, they must be borne upfront and involve the purchase of tangible assets. In financing them, exporters confront liquidity constraints: a fraction d of f_e must be covered externally. The simplifying assumptions that external finance is used to cover only fixed costs and that they do not correlate with variable costs implies that, in this model, finance will not affect export volumes (see footnote 8 for comparison with Manova 2013). However, as noted in the literature presented in 2.1, there are other channels through which finance affects these volumes and the mechanism described in this model must be thought of as being complementary to them.

[8]Local producers are not considered for simplicity. This assumption does not affect the fact that the LHS in Equation (2) increases with a_i as long as there is no strategic integration and, therefore, does not affect the qualitative results.
[9]The model departs from Manova (2013) by assuming that the per-period fixed costs do not depend on *a*. Assuming otherwise does not change the fact that the LHS in (2) falls with *a*. and, thus, does not affect the qualitative results.

To obtain external finance, firms must contract with foreign investors and pledge collateral by using tangible assets. There are two foreign investors, each of which is from a different country ("country 1" and "country 2") and exporters can contract with one of them or with both. Financial contracting proceeds as follows. Just as in Manova (2013), there is an exogenous probability $1-\lambda$ that the firm ends up defaulting, disappearing and, thus, the contract is not enforced and the collateral is seized. Anticipating this, firms and investors bargain over the contract terms: the size of the loan, the repayment F in case the contract is enforced and the fraction of the collateralizable asset each investor accepts as collateral.

The foreign investors differ in two ways. First, depending on their nationality, they accept a different fraction of the collateralizable asset to a given firm, i.e., γ_{i1} and γ_{i2} are the fractions accepted by investors from countries 1 and 2, respectively. This reflects that: (i) for idiosyncratic reasons, firms have different abilities to deal with foreign investors and, particularly, to overcome asymmetric information constraints; and (ii) for a given firm, this ability varies across investors from different nationalities, e.g., some Argentine firms may be particularly good at dealing with Brazilian investors. Second, investors from different countries face distinct opportunity costs, reflecting differences in interest rates and liquidity conditions prevailing in the financial market of their own nations. For simplicity, we assume that investors break even in expectation.[10]

Finally, we assume that the decision on whether to stay in the export market depends on the profits obtained in the representative period. Under this assumption, a firm will optimally stay whenever the contract terms of foreign financing are sufficiently good. Thus, the assumption allows abstracting from other factors that determine survival and focus on its link with finance.

2.3.2 Two-Step Optimization Process

The optimization is approached in two steps. First, we assume that a firm remains in the export market and, under this assumption, find the amount of debt contracted with each foreign investor by minimizing its interest payments and financial costs. Second, using this solution, we derive the conditions under which the firm remains in the export market. For a given firm i, financial cost minimization is represented by the following optimization problem

$$min_{\phi_{i1};\phi_{i2}} F_i = F_{i1} + F_{i2} \tag{1}$$

subject to:

$$\lambda F_{i1} + (1-\lambda)\phi_{i1}\gamma_{i1} fe = \phi_{i1} dfe(1+r_1)(1+\phi_{i1}); \tag{1.1}$$

$$\lambda F_{i2} + (1-\lambda)\phi_{i2}\gamma_{i2} fe = \phi_{i2} dfe(1+r_2)(1+\phi_{i2}); \tag{1.2}$$

[10]Assuming that investors keep a positive fraction of the quasi-rents would add an unnecessary dimension of heterogeneity between foreign and domestic investors, without impairing the main mechanism described in the model.

$$\phi_{i2} = 1 - \phi_{i1} \; ; \; 0 \leq \phi_{i1} \leq 1. \tag{1.3}$$

where ϕ_{i1} and ϕ_{i2} are the fractions of debt contracted with investors from countries 1 and 2, respectively, Equations (1.1) and (1.2) are their participation constraints, r_1 and r_2 are the interest rates in these countries and, to avoid collateral duplication, the collateralizable asset has been assumed not to surpass the size of the loan, i.e., no firm can collateralize more than $\phi_{ij} fe$ when contracting with the investor from country j, where $j \in [1,2]$. Note in the right hand-side of Equations (1.1) and (1.2) that investors' outside options increase with the size of the loans; this feature is critical to preserve the model's tractability and can be justified, for instance, by arguing that investors have a preference for diversified portfolios.

The solution to the optimization problem in Equations (1)-(1.3) is fully derived and shown in the Appendix. Using the expression for ϕ_{i1} that results from this solution, it is possible to write the following propositions concerning γ_{ij} (See the Appendix for a proof):

Proposition 1. Under the assumptions stated in Subsection 2.3.1, there is a cutoff ability to deal with the investor from country j ($j \in [1,2]$) that we call $\overline{\gamma_{ij}}$ below which exporters with a smaller ability do not borrow in this country. Formally, we write: if the above-mentioned assumptions are satisfied and $\gamma_{ij} < \overline{\gamma_{ij}}$ then $\phi_{ij} = 0$.

Proposition 2. Assume that the assumptions stated in Subsection 2.3.1 are satisfied. Then, if firm i borrows from countries j and j' (j and $j' \in [1,2]$ and $j \neq j'$), a greater ability to deal with the investor from j, holding the remaining parameters of the model constant, implies that the firm contracts a greater proportion of its debt in this country. More formally, we write: call two different values of firm i's ability to deal with the foreign investor from country j γ'_{ij} and γ''_{ij} such that $\gamma'_{ij} > \gamma''_{ij}$, and her ability to deal with the foreign investor from country j' $\gamma_{ij'}$. Thus, if the assumptions in 2.3.1 are satisfied, $\gamma''_{ij} > \overline{\gamma_{ij}}$ and $\gamma_{ij'} > \overline{\gamma_{ij'}}$ so that the firm borrows in both countries when $\gamma_{ij} = \gamma''_{ij}$ and $\gamma_{ij'}$ remains constant, the fact that $\gamma'_{ij} > \gamma''_{ij}$ implies that $\phi'^{*}_{ij} > \phi''^{*}_{ij}$, where ϕ'^{*}_{ij} and ϕ''^{*}_{ij} are the solutions to (1)-(1.3) associated with γ'_{ij} and γ''_{ij}.

Propositions 1 and 2 state the importance of abilities to deal with foreign investors in the determination of the foreign financing portfolio. The intuition is that exporters tend to borrow in countries in which they find it easier to overcome asymmetric information constraints. In other words, there are factors other than interest rates that determine the optimal debt choice of a firm. As for Proposition 1, it can be used to derive the following propositions on changes in country j's interest rate (See the Appendix Section for a proof):

Proposition 3. Under the assumptions stated in Subsection 2.3.1, a rise in country *j*'s interest rate increases the financial costs of firms that borrow in this country. Formally, we write: if the above-mentioned assumptions are satisfied and $\gamma_{ij} > \overline{\gamma_{ij}}$, then $\partial F_i^* \,/\, \partial r_j > 0$, where F_i^* is the expression that results from plugging the cost-minimizing values of ϕ_{i1} and ϕ_{i2} in F_i.

Proposition 4. Under the assumptions stated in Subsection 2.3.1, a rise in country *j*'s interest rate induces some of the exporters to no longer borrow in this country. Formally, we write: if the above-mentioned assumptions are satisfied, then $\partial\overline{\gamma_{if}}/\partial r_f > 0$.

Proposition 5. Assume that the assumptions stated in Subsection 2.3.1 are satisfied. Then, if a rise in country *j*'s interest rate leads a firm to stop borrowing in this country, this rise also increases its financial costs. Formally, we write: define ε as a positive number, *j* and *j'* ($j \neq j'$) as the two foreign countries and $\overline{r_{ij}}$ as the minimum level of r_j under which the firm does not borrow in country *j*. If the above-mentioned are satisfied, then $F_{ij}(\overline{r_{ij}} - \varepsilon) + F_{ij'}(\overline{r_{ij}} - \varepsilon) < F_{ij'}(\overline{r_{ij}})$.

Putting Propositions (3)-(5) together reveals that an increase in r_j raises the financial costs of both firms that borrow in country *j* and firms that stop borrowing in this country due to the increase. In this sense, it can be argued that the increase in r_j raises the shadow price of foreign financing. This theoretical result is used to construct the instrument in Sections 4 and 5.

Once the propositions have been derived, we proceed with the second step of the analysis and obtain results on export survival A firm will remain in the export market as long as its exporting project is profitable, i.e., if $p_i(a_i)q_i(a_i) - q_i(a_i)\tau a_i - (1-d)fe \geq F_i^*$. By plugging in this profit-function the expression for $p_i(a_i)$ that results from utility maximization and the associated profits-maximizing price, and by using the results of the first step, we can derive all $(1/a_i; \gamma_{ij})$ combinations under which a firm remains in the export market. For a given value of $\gamma_{ij'}$, the frontier of these combinations is depicted in Figure 3 and written as follows

$$(\alpha P/\tau a_i)^{\varepsilon-1} Y - (1-d)fe = F_i^*(\gamma_{ij}, r_j) \qquad (2)$$

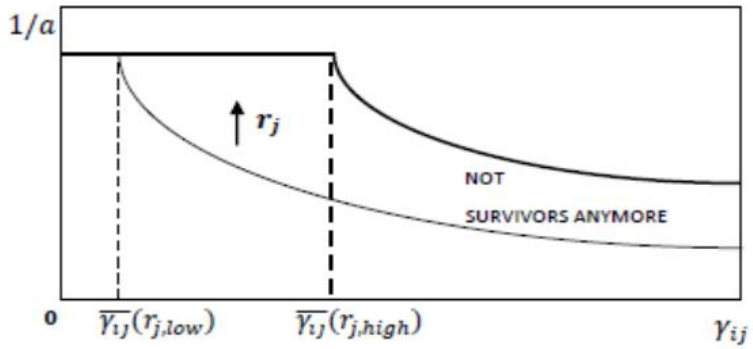
where *Y* denotes income in the export market. Figure 3, along with Propositions (1)-(5), implicitly states that an increase in r_j raises financial costs in the first step of the model, diminishing the export survival prospects in the second step, i.e., see the frontier shift in Figure 3. This negative relationship between foreign interest rates and export survival is the cornerstone of the instrument used in our two-step IV approach in Sections 4 and 5.

Figure 3 also states that factors defined at the firm-source country level, i.e., a firm's abilities to deal with investors from foreign countries, affect financial costs and, through this channel,

export survival prospects. In other words, there are unobserved characteristics defined at the firm-source country level that are correlated with export survival. Note, however, that this correlation generates a threat for identification. In particular, if the characteristics were correlated with money market interest rates, which we use to construct the instrument in the empirical approach, our result would be biased, i.e., this would happen, for instance, if some of the source countries had consistently higher interest rates, as it was for the case of Brazil.

Thus, we will add dummy variables defined at the firm-source level, just in the same manner that γ_{if} is defined, in the empirical analysis. Following the intuition drawn from Figure 3, we will incorporate dummies identifying firms that have a tendency to borrow in Latin American countries, i.e., see Section 4 for further explanation. Furthermore, to tackle the threat more directly, we will also incorporate dummies identifying firms that have consistently borrowed in countries with smaller interest rates.

Figure 3. Frontier of Export Survival



Notes: The level of γ_{ij}, remains unchanged.

3. Data and Unconditional Means

3.1 Data Collection

The information comes from four different sources. The data on financing was obtained from the Central Bank of Argentina ("Banco Central de la República Argentina"); the data on exports was obtained from the Argentinian Custom Office ("Dirección General de Aduanas"), the data on characteristics of the firms was retrieved from the Argentinian Tax Collection Agency ("Administración Federal de Ingresos Públicos"); and the data on money market interest rates was retrieved from the International Financial Statistics (IFS) of the International Monetary Fund (IMF). In all cases, the information covers a period that begins in 2004 and ends in 2008.

The analysis undertaken in Section 5 uses data on financing obtained by firms in the domestic and the international markets, i.e., domestic and foreign financing, respectively. The data on

foreign financing was obtained from a survey that was first conducted by the Central Bank of Argentina in 2002. In that year, the Argentinian Government established a new information-reporting regime called "Sistema de Relevamiento de Pasivos Externos y Emisiones de Títulos de los Sectores Financiero y Privado no Financiero," which required that regulated financial institutions collect and report data on financial relationships linking foreign creditors with financial and non-financial firms. Compliance with the new regime generated a unique and valuable dataset that contains detailed information on foreign financing. The survey provides data on the origin country of the funds and on the type of creditor involved in each financial relationship, among other information. In particular, the dataset groups foreign creditors into three categories: financial institutions located abroad, related companies, and clients and suppliers.

However, and notwithstanding the value of the unique dataset, the survey does not provide information on bond issuance in international markets. While this form of financing did not use to be common practice in developing countries, and thus not accounting for it may have not been relevant in the past, it gained predominance in the aftermath of the 2007-2009 crisis, following the reduction in the interest rates of advanced economies and the ensuing surge in global liquidity. Nonetheless, as noted in other studies, this phenomenon seems to have been much more relevant for the corporate sector in Latin American economies such as Mexico and Brazil than in Argentina (Acharya, et al., 2015; Bastos, Kamil, and Sutton, 2015). In line with this debate, Table 1 in the Appendix 2 shows the amount of foreign debt contracted by the Argentine non-financial private sector between 2004 and 2008, by type of foreign debt. Note in this table that both the ratio of financial-to-commercial debt and the proportion of securities in foreign financial debt decrease towards 2007 and 2008, reaching the latter a value of around 14 percent in 2008.

The information on domestic financing was retrieved from a second survey that was also conducted by the Central Bank of Argentina. This survey informs on all financial transactions involving at least one domestic financial institution. Thus, in this sense, and in contrast with the survey on foreign financing mentioned above, this second survey provides information that is available in the majority central banks, i.e., for the corresponding countries, and whose collection takes part of their daily work. Among the different dimensions of domestic financing covered in the survey, we focus on the financing granted by obtained by domestic households and firms non-financial sector firms from domestic banks in the form of debt.

The information on exports was retrieved from the records of the Argentinian Custom Office, which collect data on trade transactions on a monthly basis. For each export transaction, we identify the Argentine firm involved in the transaction, the export product code at the 6-digit HS

level, the country of the export destination, and the export value in U.S. dollars. As noted below, we use information on all of these variables to undertake the empirical in Section 5.

This analysis also uses data on the number of employees by exporting firm. The data were obtained from the Argentinian Tax Collection Agency and are available at a yearly frequency. Finally, to construct our instrument, we collect information on the money market interest rates of the source countries from the IFS of the IMF. This database provides a definition for money market interest rates and information on these rates for a relatively large number of countries. After excluding 13 nations for which the data were not available for every of the 5 years under consideration, we end up with a dataset with information on 93 source countries.

To match the data coming for the four sources, we use the firms' identifier. Taking the resulting dataset as a benchmark, we undertake sequential cuts of the sample for different reasons. First, to avoid measurement error, we exclude firms that have less than five employees on average over the five years.[11] This leaves us with a sample of 6,826 manufacturing exporters, some of which obtained foreign financing over 2003-2008 and some of which did not. Second, following the literature on survival, we retain only the firms that are known in the jargon as "starters", i.e., firms that began to export in the first year of the sample.[12] Thus, we exclude firms that exported in 2003, which gives us a sample of 3,379 firms that exported at least one year over 2004-2008.

The strategy of keeping only starters is standard practice in the literature on survival. The argument is that the exclusion of non-exporters avoids potential bias arising from left censored samples (see Besedes and Prusa, 2006b, for further details). Because the present paper focuses on export survival, and one of its contributions is to complement standard survival techniques with the use of an IV strategy, it follows the literature in constraining our sample to starters. Note, in this regard, the difference with respect to Rappoport, Schnabl and Wolfenson (2015), which does not discriminate between starters and non-starters. While the advantage of their approach is that it enables them to preserve a sample of a larger size, and thus probably increased variability, we believe that our approach fits much better the research question posed in this paper. In particular, given that our research question deals with export survival in a developing country, we believe that keeping only starters is not only technically more correct but also more intuitive.

3.2 Unconditional Means

In the sample of 6,826 manufacturing exporters, 3,379 firms are starters, a considerably large

[11] As a robustness check, all estimations presented in this paper were replicated including firms reporting less than 5 employees and the obtained results did not change significantly. These estimations are available upon request.

[12] Just as Besedes and Prusa (2006a) and Fu and Wu (2014) do, we represent firms in our sample by their first spell.

fraction of the sample. This is consistent with the evidence on Argentine firms presented by Albornoz et al. (2012) for the same period. Moreover, focusing on the sample of 3,379 starters, the average spell duration is 2.2 years and 42 percent of the firms exported for a single year. That is, export relationships are on average short-lived, which is consistent with the findings of Besedes and Prusa (2006b) for a sample containing a large number of developing countries. Overall, consistency with other empirical works is reassuring and provides external validity to our sample.

Focusing from now on the sample of 3,379 starters, Table 3 shows, for each spell duration, the percentage of firms across two categories of financing, domestic and foreign. This table shows that, generally speaking, longer spells tend to be related to a larger proportion of firms with financing. Nonetheless, the table also identifies a remarkable difference between the two forms of financing: for the case of domestic financing the increase in the abovementioned proportion is non-monotonic, while for the case of foreign financing this increase is monotonic and sharper.

Table 3. Spell Duration and Different Forms of Financing

Spell	**1**	**2**	**3**	**4**	**5**
Foreign Financing	20.6	29.5	41.2	44.6	57.0
Domestic Financing	43.3	58.8	67.4	72.2	68.7

Notes: Percentage of firms with financing by spell duration.
Sources: Tax collection agency, Customs Office and Central Bank of Argentina.

Table 4 in Appendix 2 also studies the link between export survival and financing by showing the mean spell duration corresponding to foreign and domestic financing, respectively. Just as Table 3 does, this table identifies a difference between the forms of financing: while domestic financing is associated with an increase in the mean spell duration of six and a half months (0.59 year), foreign financing is associated with a higher increase of nine months (0.78 years).

4. Estimation Methodology

4.1 Traditional Methods

Most studies on export survival used the Cox model to perform their estimations (Besedes and Prusa 2006b, Brenton et al 2009, Brenton, Pierola and von Uexküll 2009, Nitsch 2009, Fugazza and Molina 2009). Nonetheless, after the appearance of an influential work by Hess and Persson (2012), the Cox framework was associated with three major flaws and its widespread use came to an end (see also Esteve-Pérez et al. 2007). First, the authors argue that while the Cox model is a continuous-time specification, trade data is recorded in discrete units of time and this tends to

generate "heavy ties" yielding biased results.[13] Second, they argue that the Cox model can only incorporate the effects of unobserved heterogeneity by complicating the estimation procedure, or even making it impossible, from a computational point of view. Third, they argue that Cox models ignore that the effects of the covariates on survival can be non-linear, either due to intrinsic non-linearities in the specification or to dependence on duration time.

In response to these flaws, later studies started to use discrete-time methods, such as the probit model with random effects or the cloglog model (Cadot et al. 2013; Fugazza and McLaren 2013; Stribat et al. 2013 and Fu and Wu 2014). In contrast with the Cox framework, these models are able to deal with grouping of continuous time observations and to control for random unobserved heterogeneity by introducing frailty and random effects, respectively. Furthermore, the probit model has the advantage of not making any assumption on the proportionality of the covariates effects. For this reason, Section 5 performs a probit estimation with random effects and, as a robustness check, Section 6 performs the same estimation with a cloglog model.

The probit and the cloglog frameworks base their analysis on hazard rates. In this paper, the hazard rate is understood as the probability that a firm ceases exporting in a given interval of time $[t_k, t_{k+1})$, with $k = 1,2, \ldots, k_{max}$ and $t_1 = 0$, conditional on its survival up to the beginning of that interval and on the covariates considered. Hence, this rate can be summarized as follows

$$h_{ik} := P(T_i < t_{k+1} | T_i \geq t_k, x_{ik}) = F(x'_{ik}\beta + \gamma_k) \quad (3)$$

where T_i is a continuous, non-negative random variable that measures a firm's survival time, i indexes spells, x_{ik} is a vector of covariates, γ_k controls for duration dependence by allowing the hazard to vary over time, and $F(.)$ is a distribution function ensuring that $0 \leq h_{ik} \leq 1$ for all i, k. Given that this paper considers a single spell per-firm, i.e., only the first spell is considered, in the context of our work the i index denotes not only a spell but also a particular exporting firm. Moreover, as noted below, the x_{ik} vector will contain information on characteristics defined at three levels: the levels of firms, industries and export destinations.

Using Equation (3), one can represent the log-likelihood for the data observed in a given sample. Denoting the terminal time for firm i by k_i, we define a binary variable that takes the value one if the firm ceases exporting during the k^{th} time interval and zero otherwise and write the log-likelihood as follows

$$ln\,\mathcal{L} = \sum_{i=1}^{n} \sum_{k=1}^{k_i} [y_{ik} ln(h_{ik}) + (1 - y_{ik}) ln(1 - h_{ik})] \quad (4)$$

[13]In this context, "heavy ties" are trade relationships of equal length.

To estimate the parameters of the model, it suffices to use Equation (4) and a particular choice for the $F(.)$ distribution. As for the choice of the distribution, we consider two cases. In estimating the probit model we assume that $F(.)$ is Normal and, in estimating the cloglog model, we assume that it is an extreme value. Furthermore, these two models account for random unobserved heterogeneity by introducing random effects and a frailty term, respectively. However, neither of them accounts for the potential existence of systematic correlation between unobserved heterogeneity at the firm level and the amount of foreign financing obtained by a firm.

4.2 Instrumental Variables Linear estimation: Overcoming Flaws in Existing Literature

4.2.1 Constructing the Financial Index

Because the time-discrete methods are unable to account for systematic correlation between unobserved heterogeneity and covariates, these models can generate biased results, i.e., they may not allow disentangling the impacts of the unobservable characteristics from those of the covariates. That is, in the presence of such correlation, the probit and cloglog models cannot identify the causal effects of foreign financing on export survival. Hence, the present paper departs from the frameworks that have been traditionally used in the literature.

To overcome the flaws of the time-discrete methods, the paper uses a linear probability model that allows identifying causal effects by means of instrumental variables (LIVM, henceforth). In particular, the paper instruments for foreign financing with the money market interest rates of the source countries, where the funds obtained by the Argentine firms came from. The use of money market interest rates has the advantage that it helps construct a valid instrument, that is, an instrument that is relevant and that, at the same time, fulfills the exclusion restriction.

Money market interest rates help construct a relevant instrument because they are correlated with foreign financing. Indeed, these interest rates capture relevant information on the monetary and liquidity conditions prevailing in a country, which are in turn important determinants of financing costs. Thus, for instance, to the extent that agents can at least partially arbitrage, a smaller interest rate in the money market goes in hand with smaller interest rates in other financial markets of the same country. Hence, a smaller money market interest rate also indicate that investors are more willing to lend and, therefore, that Argentine firms are more likely to borrow in that nation, i.e., formal tests on validity of the instrument are presented in Section 5.

Moreover, money market interest rates help construct an instrument that fulfills the exclusion restriction because they are not correlated with unobservable features of Argentine firms. Indeed, these interest rates are characteristics of foreign countries and, as such, they are also exogenous to unobservable features of the firms that could determine their export survival, and are not

affected by decisions they make, i.e., Argentine firms are price-takers in foreign financial markets. To put it more formally, the use of foreign interest rates allows isolating time variation that arises exclusively from the supply-side of foreign financial markets.

In this regard, the present paper is related to other studies that also use financial information to disentangle credit supply shocks from determinants of the credit demand. For instance, the influential work of Peek and Rosengren (2002) links finance with foreign investment undertaken by Japanese firms. They proxy for the health of Japanese banks with Moody's ratings and match this bank-level data with firm-level information. Using this match, they show firms that were more exposed to troubled banks reduced foreign investments by a greater amount. In a different paper, Peek, Rosengren and Tootell (2003) employ a set of ratings called CAMEL, frequently used by financial institutions regulators, to construct a composite financial index. This index captures exogenous time-variation in the financial conditions faced by U.S. firms and is used to show that credit supply conditions affect economic activity.[14] In the manner of Peek, Rosengren and Tootell (2003), this paper constructs an index that reflects financial conditions faced by firms.

When constructing the index for a specific firm, we are confronted with two relevant choices: we must choose what the relevant money market interest rates for the firm are, i.e., the set of relevant foreign countries and, when there are at least two relevant interest rates, we must choose how to combine them in producing a single index. Thus, we impose two conditions ensuring that our index captures the "actual price" of foreign financing faced by the firm and rely on the intuition that falls out of the theoretical model we have presented in Section 2.

The first condition is motivated by Propositions 1 and 2. We assume that, for idiosyncratic reasons, firms have a tendency to borrow from a particular set of countries, i.e., source nations, which can be thought of as those for which $\gamma_{ij} > \overline{\gamma_{ij}}$ for firm i. The second condition is motivated by Propositions 3-5 and imposes that a rise in one of the source countries' interest rates increases the index of: (a) firms that borrow there at the time of the rise; and (b) firms for which the referred country is a source nation, even though they may not borrow there at the time of the rise. Under these conditions, a rise in the interest rate of a country in which a firm has a tendency to borrow always increases its index. This, in turn, ensures that the index captures the "actual price" of foreign financing faced by the firm and, in particular, not merely its financing costs. Considering this, we construct the time t financial index for a firm i that has borrowed abroad at least once over the whole sample period, i.e., r_{it}^{B} in the following manner

[14]CAMEL ratings are based on five categories: capital, assets, management, earnings, and liquidity.

$$r_{it}^{B} = \sum_{j=1}^{N_i} w_{ij} r_{ijt} \quad (5)$$

where:

$$FF_{ij} = \sum_{j=1}^{T} FF_{ijt}\,; \quad FF_i = \sum_{t=1}^{T} \sum_{j=1}^{N_i} FF_{ijt}\,; \quad w_{ij} = FF_{ij}/FF_i; \quad (6)$$

r_{ijt} is the money market interest rate at time t in a nation j that is a source country for firm i; FF_{ijt} is the dollar amount of financing obtained by the firm from this country at time t; N_i refers to its number of source countries; thus, FF_i and F_{ij} are the dollar amounts of foreign financing obtained by the firm from all source countries and from country j, respectively, over the whole period; r_{it}^{B} is a weighted average of the source countries' interest rates, w_{ij} is the relative weight assigned to country j in all years, and r_{it} is obtained by dividing FF_{ij} through FF_i.

Note that r_{it}^{B} fulfills the two conditions mentioned above. First, the definition in (5) presumes that firms have a tendency to borrow from a particular set of countries, i.e., N_i. Moreover, when applying the ideas of Propositions 1 and 2 to the construction of r_{ijt}, we consider as source countries all nations in which a firm borrows at least once over the whole sample period, i.e., countries for which idiosyncratic factors have not been sufficiently unconducive to avoid borrowing. Second, note in (6) that every source country receives a relative weight that is greater than zero and that remains fixed over time. Thus, a rise in r_{ijt} increases the index of all firms for which nation j is a source country, and not only of firms borrowing in country j at time t.

Regarding the firms that have not borrowed abroad, and are thus not considered in (5) and (6), we start from the observation that they have not shown a tendency to borrow in any particular set of countries. Thus, when constructing the financial index for these enterprises (r_{it}^{NB}), we ensure that it reflects global financial conditions, but always acknowledging that they are Argentine exporting firms. Thus, we capture these two features by constructing the index as follows

$$r_{it}^{NB} = \sum_{j=1}^{N} w_j r_{jt}\,; \quad (7)$$

where:

$$w_j = \sum_{i=1}^{\omega} w_{ij}\,/\omega; \quad (8)$$

N is to the total amount of source countries in the sample; r_{jt} is source country j's money market interest rate; ω is the number of Argentine exporters having borrowed abroad at least once over 2004-2008; and w_j, the relative weight of country j, is the average over the weights of all exporters having borrowed abroad. That is, just as the index defined in (5) and (6), the index for firms that have not borrowed is a weighted average of money market interest rates prevailing in source countries. However, in contrast with r_{it}^{B}, r_{it}^{NB} considers the interest rates of all source countries and computes relative weights by taking averages across all of the Argentine exporters

having borrowed abroad. These features ensure that r_{it}^{NB} captures global financial conditions and acknowledge that the exporters are Argentine firms.

4.2.2 Threats for Identification

We require that, when foreign financing provides better funding conditions, the index takes a higher value for firms that have not borrowed abroad, i.e., reflecting that, for whatever reason, these exporters do not borrow in countries with smaller interest rates. Therefore, for these firms, the index is defined as a weighted average of the money market interest rates prevailing in all of the source countries; moreover, in this index, the relative weight of a country is a simple average of the weights taken by this nation over all firms having borrowed abroad. Calculated this way, the index reflects the "average global financial conditions" faced by Argentine exporters. Ultimately, the idea is that firms that borrow abroad can obtain better than "average global financial conditions" by directing their borrowing to source countries with smaller than average interest rates. In other words, this way of calculating the index ensures that its value is higher for firms that have not borrow abroad.

Turning back to firms with foreign financing, note that variation in the index comes from two sources. A first source results from changes in the interest rates of the countries. These rates are defined at the foreign country-level; hence, this variation is orthogonal to unobservable characteristics of the firms and does not represent, thus, a threat for identification. A second source results from differences in the set of source countries. This variation results, for instance, from the fact that some firms have a tendency to borrow in specific nations, and thus, their index assigns them a higher relative weight. Unlike the first form of variation, this second source represents a threat for identification. In particular, if some unobservable characteristics were on average correlated with export survival, our empirical results would be biased. This would happen, for instance, if exporters had a tendency to borrow in countries with consistently higher (or smaller) interest rates, Note in this regard that, even though sometimes it is not explicitly mentioned, this empirical threat is present in most papers linking firm-level information with bank-level data, i.e., these papers frequently associate firms with banks, without of course controlling for all of the characteristics explaining the match.

To tackle this threat, we will follow the intuition that falls out of the theoretical model and Figure 1, and will incorporate different dummy variables in the empirical approach. A first type of dummies will identify firms with a tendency to borrow in Latin American countries. The idea is that, for idiosyncratic reasons, some exporters find it easier to borrow in these countries and that, just as for the case of Brazil, these countries may have consistently different interest rates.

The second type of dummies we will incorporate is agnostic abd addresses more directly a potential correlation between unobservable characteristics and money market interest rates. This type of dummies will also be defined at the firm-source country level and will, therefore, identify exporters that have borrowed in nations with consistently different interest rates.

Finally, we will complement the identification with macroeconomic variables., such as a weighted average of GDP groth in the export destination countries. To illustrate how GDP Growth improves identification, consider a firm that exports to and obtains foreign financing from the same country, and assume that a shock hits simultaneously the real and the financial sides of this country, e.g., the crisis of 2008. In this context, the shock and the lack of macroeconomic controls would increase the correlation between export survival and foreign financing, biasing our results.

Before proceeding with the empirical results, it will be useful to go over a second main threat for identification. This threat is relevant when a firm sells its product to and obtains foreign financing from the same set of nations. In these cases, a change in the interest rate in the source country may affect export survival through its impact on the country's output, i.e., above and beyond foreign financing. Thus, to address this concern, we will also include in the empirical analysis dummy variables identifying firms that sell to and borrow from the same countries.

5. Empirical results

5.1 Random-effects Probit Estimation

Table 5 shows the probit random-effect estimation. The dependent variable takes the value of one in the event of exports ceasing and zero otherwise; thus, a negative coefficient indicates a negative impact of the covariate on the hazard of export ceasing. To follow standard practices in the literature of survival, we control for duration dependence by incorporating the variable *Ln(Export year)*, the natural logarithm of each firm's export year, in all specifications.[15] Columns (1)-(6) sequentially introduce firm, industry and destination specific characteristics.

Before proceeding with Columns (1)-(6), note that *Ln(Foreign financing)*, defined as the natural logarithm of one plus the dollar amount of foreign financing obtained by a firm, is significant at the 1% level and has the expected sign in all cases. That is, an increase in foreign financing reduces the hazard of export ceasing. Notably, this result remains robust to the introduction of different covariates in all specifications for the three empirical models.

Column (2) incorporates two firm-specific variables: *Ln(Size)*, defined as the natural logarithm of a firm's number of employees, and *Ln(Domestic financing)*, defined as the natural logarithm

[15]For exporters that did not borrow abroad, the values of *Ln(Foreign financing)* and *Ln(Domestic financing)* are zero.

of one plus the dollar amount of debt contracted with domestic banks (see Table 5 for the definition of the other variables). The fact that *Ln(Size*) correlates with unobservable determinants of export survival and foreign financing implies that the introduction of this variable should help identify the desired effects (Forbes, 2007; Manova and Zhang, 2009; Manova, 2013 provide evidence that size correlates, for instance, with productivity). Along these lines, several of the unobservable determinants of domestic financing also affect foreign financing (and export survival) and, thus, the introduction of *Ln(Domestic financing*) should also help identification.

Table 5. Random-effect Probit Model: Estimation Results *

	(1)	(2)	(3)	(4)	(5)	(6)
Ln(Foreign financing)	-0.0634***	-0.0608***	-0.0624***	-0.0577***	-0.0572***	-0.0569***
	[0.0147]	[0.0141]	[0.0163]	[0.0157]	[0.0153]	[0.0148]
Ln(Export year)	-0.583***	-0.542***	-0.142	-0.185	-0.217	-0.237*
	[0.152]	[0.150]	[0.163]	[0.158]	[0.150]	[0.141]
Ln(Size)		-0.0195	0.0143	0.00293	0.000762	0.00138
		[0.0227]	[0.0324]	[0.0314]	[0.0306]	[0.0299]
Ln(Domestic financing)		-0.0221**	-0.0224	-0.0219	-0.0210	-0.0196
		[0.0109]	[0.0144]	[0.0140]	[0.0136]	[0.0134]
Ln(Initial exports)			-0.252***	-0.246***	-0.239***	-0.235***
			[0.0391]	[0.0377]	[0.0356]	[0.0335]
Medium technology				-0.271***	-0.255***	-0.228**
				[0.101]	[0.0983]	[0.0957]
High technology				-0.187***	-0.170***	-0.154**
				[0.0652]	[0.0632]	[0.0613]
GDP growth					-2.394**	-1.588
					[1.076]	[1.079]
Mercosur						-0.162***
						[0.0537]
Constant	-0.378***	-0.308***	0.0463	0.161	0.272**	0.325***
	[0.0550]	[0.0717]	[0.101]	[0.107]	[0.118]	[0.119]
Observations	7,303	7,303	7,303	7,303	7,303	7,303
Number of firms	3,379	3,379	3,379	3,379	3,379	3,379
rho	0.145	0.184	0.543	0.509	0.485	0.465
rho s.d.	0.223	0.202	0.107	0.112	0.112	0.109
Log likelihood	-3,749	-3,745	-3,622	-3,615	-3,613	-3,608
Likelihood-ratio test of rho=0	0.282	0.204	0.000	0.000	0.000	0.000

Standard errors in brackets

*** Significant at 1%, ** at 5%, * at 10%.

Sources: Tax collection agency, Customs office and Central Bank of Argentina.

Notes: The dependent variable is a dummy equal to one if the firm fails, and to zero otherwise. *Ln(Foreign financing)* is the natural logarithm of 1 plus the foreign financing in dollar terms obtained by a firm. *Ln(Size)* is the natural logarithm of a firm's number of employees. *Ln(Export year)* is the natural logarithm of each firm corresponding export year. *Ln(Domestic financing)* is the natural logarithm of 1 plus the domestic banks' financing in dollar terms obtained by a firm. *Ln(Initial exports)* is the natural logarithm of a firm's exports in dollar terms in its first year as an exporter. *High* and *Medium technology* are dummy variables equal to one for high-tech and medium-tech intensive industries, respectively, and zero otherwise. *GDP Growth* is the weighted average (by share in the total exports in each year) of the GDP growth rates in the export destination countries. *Mercosur* is a dummy variable equal to one if more than 50% of firm's export value goes to Mercosur, and zero otherwise.

Turning to the results, the effect of *Ln(Size*) on hazard is not statistically significant, once *Ln(Domestic financing)* is in the estimation. This contrasts with the results obtained by Fu and Wu (2014), who argue that larger exporters have higher survival rates because, among other

reasons, they have better access to capital. However, in our model, this effect is already captured by *Ln(Foreign financing)* and *Ln(Domestic financing)*. This, and the fact that they do not define size in a continuous space as we do may explain the difference between theirs and our results. As for *Ln(Domestic financing)*, it is significant at the 5% level and has the expected sign. However, its coefficient loses statistical significance once the variable on initial exports is considered.

Column (3) incorporates this variable, i.e., a firm's exports in its first year as an exporter. As noted by Rauch and Watson's model of search (2003), initial exports and trade duration may be positively correlated. This model shows that relationships with lower-cost suppliers (from less developed countries) feature both large buyers' initial orders and long durations. Moreover, several studies provide empirical support for this result (Besedes and Prusa, 2006b, Brenton et al, 2010, Fugazza and Molina, 2009, Albornoz et al., 2012, Stribat et al., 2013 and Cadot et al., 2013). Along the same lines, Albornoz et al. (2012) show that a large value of initial exports signals a high ability to earn profits abroad. This ability requires knowledge on local consumer preferences, business practices and institutional environments that may have been acquired through the formation of foreign networks or exporters' previous experiences (see Artopoulos et al., 2011).[16] Thus, *Ln(Intial exports)* should capture information on unobserved abilities of the firms that are correlated with export survival and help them, at the same time, to obtain foreign financing.

Table (5) shows that the effect of *Ln(Intial exports)* on export survival is positive (negative sign), as expected, and significant at the 1% level for all specifications. This result is consistent with the outcomes obtained by Fugazza and Molina (2009), Besedes and Prusa, (2006b), Brenton et al. (2010), Albornoz et al. (2012), Stribat et al. (2013) and Cadot et al. (2013), among others.

Column (4) incorporates two industry-specific dummies that take the value of one for high-tech and medium-tech intensive industries, respectively, and zero otherwise. To classify industries, we adopt a similar criteria to Esteve-Perez et al. (2007). The authors argue that, given that in tech-intensive industries firms exert greater R&D efforts and supply more vertically differentiated products, they have larger price-cost margins and survive longer. Consistently, our results show that both dummies are significant at the 1% level in all specifications.

In Column (5), we add a dummy controlling for macroeconomic conditions in the countries of export destination (GDP growth), along the lines of other studies, e.g., Besedes and Blyde, 2010; Fu and Wu, 2014; Stribat, 2013; Hess and Person, 2011b and Fugazza and McLaren, 2013. The result of Column (5) show that the effect of GDP growth on the hazard rate of export ceasing is statistically significant at the 5% level.

[16]Artopoulos et al. (2011) find that knowledge advantage is critical in understanding export pioneering.

Nonetheless, this result is overturned in Column (6) incorporates the variable Mercosur, which takes the value of 1 if more than 50% of a firm's export value goes to Mercosur and zero otherwise. Given that tariffs within the custom union are lower and that members have similar GDP per capita and potentially similar tastes (Fugazza and McLaren, 2013; Hallak, 2010 and Esteve-Perez et al., 2007), Argentinean firms may find it easier to survive in Mercosur.[17] Thus, exporters that mainly sell to Mercosur may be intrinsically different from others, e.g., they may have lower productivity, and this would bias our results unless we control for the differences. Column (6) shows that Mercosur is significant at the 5% level and turns GDP growth insignificant. Possibly, this is because between 2003 and 2008 Mercosur countries grew at relatively higher rates.

Regarding the quantitative impacts on the hazard rate, the coefficients in Table 5 inform on the relative importance of different covariates and of each covariate across specifications. Thus, for instance, in Column (2) the effect of foreign financing on the hazard rate is 2.75 larger than the effect of domestic financing $(-0.0608/-0.0221) = 2.751$. Moreover, the impact of foreign financing is 0.897 larger in the specification with all controls than in Column (1). As for the impacts in absolute terms, we calculate hazard rates for a firm with no foreign financing and for a firm with a value of foreign financing that is at the 75th percentile, both with mean values of the remaining covariates, and plot them in Figure 3 of the Appendix. In this figure, the hazard rate of export ceasing is is around 2 percent smaller each export year. Nonetheless, the fact that the probit-random effect estimation does not account for systematic correlation between the covariates and unobservable implies that these figures must be interpreted with caution.

5.2 Instrumental Variable (IV) Linear Probability Model Estimation

In the first stage of the IV estimation, we regress *Ln(Foreign Financing)* against the financial index and the dummy variables other covariates explained in detail below. In the second stage, the dependent variable is not exactly a hazard rate, but it takes the value of one in the event of export ceasing and zero otherwise; thus, the sign of the estimated coefficients can be interpreted as in Subsection 5.1. While a natural extension to 5.1 is an IV model with random effects, in this subsection we opt for not including these effects. This choice allows testing for both weakness and endogeneity of the instrument, and for under-identification in relatively simple manners.[18] Moreover, we partially address the issue of not accounting for random effects by clustering errors

[17]Fugazza and McLaren (2013) deal with the effect of market access in Mercosur on export survival. Hallak (2010) explores the Linder hypothesis on trade volumes and Esteve-Perez et al. (2007) study export survival in closer markets.
[18] The under-identification problem arises when the excluded instruments are uncorrelated with the endogenous regressors, what leads to an increased bias in the estimated IV coefficients. The weak instruments problem is present when the correlations between the endogenous regressors and the excluded instruments are non-zero but small.

at the level of firms.

In addition, this subsection does not incorporate the covariates considered in Subsection 5.1, with the exception of GDP growth, which we incorporate only in the last two specifications of Table 6. Two relevant reasons motivate this approach. First, most of the covariates in Subsection 5.1 are correlated with either the instrument or the additional dummy variables we control for

may hinder our identification strategy by impeding us from fully exploiting the variability of the instrument, i.e., or the dummy , which is in fact the central element of identification in any IV approach. Second, and foremost, we opt for not compromising our empirical strategy by considering multiple endogenous variables. Because some of the controls considered in 5.1 are endogenous, e.g., *Ln(Size)* and *Ln(Domestic financing)*, introducing these variables in the model of the present subsection would require the inclusion of additional instruments. However, given that our variable of interest is *Ln(Foreign financing)*, this would not add much in addressing our empirical research question. Moreover, we feel comfortable with the ability of our one-instrument based strategy to instrument for foreign financing and, thus, take a parsimonious approach and consider a single variable. As for GDP growth, we introduce it in some of the specifications because of its potential ability to control for macroeconomic conditions.

To be more precise, the IV estimation incorporates dummy variables to tackle some of the threats for identification mentioned above, i.e., the potential existence of unobservable characteristics that affect the time-invariant relative weights used in the instrument, as well as changes the occurrence of macroeconomic conditions when firms mainly exports to and borrows from the same country.

Following the intuition of the theoretical model, we include three types of dummy variables to tackle these threats, and define these variables at the firm-source level, just in the manner as γ_{if} is defined. However, and beyond the intuition that falls out of the theoretical model, one may argue that introducing firm fixed effects is a better option in the empirical approach. Note, however, that regardless of whether this option is desirable or not, the fact that we have an unbalanced panel greatly reduces our ability to do so. Focusing on starters enables us to place our contribution in the recent literature on export survival; however, it comes at the cost of having on average only 2.2 observations per firm (see Section 3).

Having made this remark, we proceed with the dummies. We introduce a dummy LATAM-foreign financing that takes the value of one if at least of the sources countries of the firm is Latin-American. This accounts for the fact that, for idiosyncratic motives, some of the firms may have a tendency to borrow in countries with consistently different interest rates. Moreover, as also

noted above, to more directly tackle this potential source of endogeneity, we incorporate an additional dummy to identify firms that have borrowed in countries with consistently different rates, i.e., we label this variable "Dummy above mean interest." It takes the value of one when a firm receives funds from at least one of the countries for which the time-average interest rate is above the time-average interest rate of the entire cross-section, and zero otherwise.

Table 6: IV linear probability model: first stage estimation results

	(1)	(2)	(3)	(4)	(5)	(6)
Interest rate	9.240***	-6.381***	-8.204***	-7.943***	-8.089***	-7.847***
	[1.676]	[1.664]	[1.688]	[1.712]	[1.682]	[1.708]
Dummy LATAM foreign financing		2.475***	2.377***	2.135***	2.386***	2.153***
		[0.0945]	[0.0933]	[0.124]	[0.0933]	[0.123]
Dummy above mean interest rate			0.479***	0.526***	0.478***	0.524***
			[0.0693]	[0.0698]	[0.0691]	[0.0695]
Dummy export-foreign financing				0.567***		0.545***
				[0.158]		[0.156]
GDP growth					-5.704***	-5.258***
					[1.139]	[1.085]
Constant	0.591***	0.710***	0.622***	0.570***	0.890***	0.820***
	[0.0959]	[0.0891]	[0.0859]	[0.0857]	[0.107]	[0.103]
Observations	7,303	7,303	7,303	7,303	7,303	7,303
R-squared	0.014	0.269	0.281	0.289	0.285	0.292

Robust standard errors in brackets

*** Significant at 1%, ** at 5%, * at 10%.

Sources: Tax collection agency, Customs office and Central Bank of Argentina.

The dependent variable is the natural logarithm of one plus the foreign financing in dollar terms obtained by a firm. *Interest rate* is an index constructed as the fixed weighted average of the money market interest rate in the different source countries. *GDP Growth* is weighted average (by share in the total exports in each year) of the GDP growth rates in export destinations. *Dummy export-foreign financing* is a dummy equal to one if fund's main origin country coincides with the main export destination of the firm, and zero otherwise. *Dummy LATAM foreign financing* equals one if at least one country of origin of funds is part of the LATAM area, and zero otherwise. *Dummy above mean interest rate* is dummy variable equal to one if the firm receives funds from at least one country whose time dimension collapsed money market interest rate mean is above the cross-section (time dimension collapsed) sample mean, and zero otherwise.

The third dummy we consider is dummy export-foreign financing, which takes the value of 1 if the main export destination coincides with the main source country of the firm, i.e., the robustness check subsection provides different definitions of the dummy, in which the variable also takes the value of one if the referred nation is within the set of the five most important financial source countries. The purpose of introducing this dummy is to control for the potential identification problems created by the fact that some firms could receive foreign funds mostly from their main export destination. Thus, we think of this dummy as a complement of GDP

growth in tackling this threat (Columns (4)-(6) estimate the model by considering all possible combinations with these two variables). In the robustness check of the next subsection, the criterion used to determine what is considered as a coincidence of main origin of funds and main destination is relaxed to test whether the results remain unchanged.

Having defined the covariates, we proceed with the results. Table 6 presents the outcomes of the first stage, in which foreign financing is the dependent variable and the financial index is a covariate. Interesting conclusions can be drawn. Note that when foreign financing is regressed only against the financial index (Column 1), the coefficient of the latter variable is significant and, unlike what would have been expected, has a positive sign, i.e., one would expect a negative sign so that an increase in the shadow price reduces the amount of foreign financing. Interestingly, though, these results are overturned by the introduction of LATAM-foreign financing: from Column (2) to Column (6), the coefficient on the financial index is statistically significant at the 1% level and has a negative sign.

Using the same model specifications as in Table 6, Table 7 presents the results of the second stage. The coefficient of foreign financing in Column (1) is statistically significant at the 1% level; nonetheless, this column should not be interpreted in economic terms, given that the coefficient of the index in the first stage has an unexpected sign. Starting from Column (2) then, we observe that in all of the specifications the coefficient of foreign financing is negative, as expected, and statistically significant (with the only exception of that column). Note, however, that it is only the introduction of the dummy above mean interest that turns the relevant coefficient statistically significant at the 1% level and of the right sign. This suggest that, while controlling for LATAM-foreign financing is sufficient in the first stage, it is not sufficient in the second stage. Indeed, directly controlling for the fact that some exporters borrow in countries with higher interest rates is crucial in the second stage of the estimation. Intuitively, one would think that above mean interest greatly contributes to the model's identification by addressing the threats associated with the relative weights of the financial index and, therefore, by enabling the instrument to work to the highest extent. In summary, the IV estimation confirms that foreign financing exerts a positive impact on export survival rates, possibly because it provides exporters with opportunities for obtaining external finance and for improving their financing conditions.

The lower part in Table 7 shows the results of tests on under-identification and weak instruments. Robust statistics for testing under-identification has been proposed by Kleibergen and Paap (2006). Here the LM version of the Kleibergen—Paap rk statistic is implemented, which is robust to heteroskedasticity, autocorrelation or clustering. According to the LM rk statistic, the

null hypothesis that the matrix of reduced form coefficients has rank=K1-1 can be rejected, what is an indication that the model is not under-identified (i.e. the instrument is relevant). Regarding a potential problem with weak instruments, we evaluate this using the Kleibergen-Paaprk Wald test. The value of the Wald F t statistics indicates that we can reject the null hypothesis that the estimated equation is weakly identified for all of the considered specifications. Note also that Table 7 shows no signs of endogeneity in our instrument.

Table 7: IV linear probability model: second stage estimation results

	(1)	(2)	(3)	(4)	(5)	(6)
Ln(Foreign financing)	-0.0946***	-0.0325	-0.103***	-0.106***	-0.106***	-0.108***
	[0.0265]	[0.0325]	[0.0336]	[0.0351]	[0.0342]	[0.0358]
Dummy LATAM foreign financing		-0.0910	0.109	0.0958	0.117	0.104
		[0.0772]	[0.0759]	[0.0713]	[0.0777]	[0.0732]
Dummy above mean interest rate			-0.119***	-0.114***	-0.118***	-0.113***
			[0.0194]	[0.0215]	[0.0197]	[0.0217]
Dummy export-foreign financing				0.0449		0.0420
				[0.0305]		[0.0304]
GDP growth					-1.015***	-0.994***
					[0.339]	[0.335]
Constant	0.339***	0.298***	0.371***	0.368***	0.420***	0.417***
	[0.0292]	[0.0154]	[0.0130]	[0.0124]	[0.0249]	[0.0239]
Observations	7,303	7,303	7,303	7,303	7,303	7,303
Centered R^2	-0.125	0.013	-0.133	-0.141	-0.139	-0.147
Underidentification test (Kleibergen-Paap rk LM statistic)	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000
Weak identification test (Kleibergen-Paap rk Wald F statistic)	30.41	14.71	23.62	21.54	23.13	21.11
Hansen J statistic (overidentification test of all instruments)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Endogeneity test of endogenous regressors	0.0005	0.2850	0.0000	0.0000	0.0000	0.0000

Robust standard errors in brackets

*** Significant at 1%, ** at 5%, * at 10%.

Sources: Tax collection agency, Customs office and Central Bank of Argentina.

The dependent variable equals one if the firm fails, and zero otherwise. *Ln(Foreign financing)* is the natural logarithm of 1 plus the foreign financing in dollar terms. *Ln(Size)* is the natural logarithm of a firm's number of employees. *GDP Growth* is weighted average (by share in the total exports in each year) of the GDP growth rates in the export destinations. *Dummy export-foreign financing* is a dummy variable equal to one if fund's main origin country coincides with the main export destination of the firm, and zero otherwise. *Dummy LATAM foreign financing* is dummy variable equal to one if at least one country of origin of funds is part of the LATAM area, and zero otherwise. *Dummy above mean interest rate* is dummy variable equal to one if the firm receives funds from at least one country whose time dimension collapsed money market interest rate mean is above the cross-section (time dimension collapsed) sample mean, and zero otherwise.

5.3 Robustness checks

As a robustness check, this subsection estimates a clog-log model and modifies the definition of the export-foreign financing variable, which controls for macroeconomic shocks that are particularly relevant when firms tend to borrow export to and borrow from the same countries. The estimation of the clog-log model helps to corroborate the results presented above under an alternative estimation methodology. In particular, the use of a clog-log places our results in the context of existing literature on export survival, which has been recently using continuous-time

duration models. In our clog-log specification, the heterogeneity term is assumed to be normally distributed, and the results are presented in Table 8.

In this table, a coefficient smaller than 1 indicates the covariate reduces the probability of exiting the export market (and the closer its magnitude to the value of 1 indicates a smaller impact). Just as for the case of the probit model with random effects, all columns incorporate the variable *ln(Export year)* to explicitly control for duration dependence. The most notable result in Table 8 is that in all of the model specifications foreign financing significantly contributes to reduce the probability of exiting the export markets (it remains significant at the 1% level across all of the specifications). However, the similarities with the probit model are not limited to this fact: In Table 8, the variable on domestic financing stops being significant as Initial Exports is included in the regression, while the latter variable is significant across all of the specifications. By the same token, size is non-significant, GDP growth is only statically significant in the absence of the dummy variable Mercosur, and Medium technology is relatively more important than High technology.[19]

Table 9 presents the result of an additional robustness exercise that consists on modifying the definition of the control variable for the presence of cases in which the country of destination coincides with the country of origin of the funds. The different columns show alternative definitions for this dummy in which the country of origin of the funds that coincides with export destination can be the first up to the fifth in importance in terms of the destination of exports. Starting from the column located on the left, and going from there to the right of the table, we find that the definition of what it means to have a coincidence between the main export destination and the main source country is relaxed, i.e., a higher number of cases are considered. Note that, regardless on how the dummy export foreign financing is defined, the corresponding coefficient is statistically significant at the 1% level across all of the specifications. Most importantly, in all of the specification, the coefficient on foreign financing is statistically significant at the 1% level. Moreover, as we go from left to right, the magnitude of this coefficient in absolute value increases, possibly suggesting that the dummy export-foreign financing is better defined.

[19] The predicted survival probabilities of the estimated models, including the instrumental variables linear probability model are reported in Appendix 3.

Table 8. CLOG-LOG with frailty model estimation results

	(1)	(2)	(3)	(4)	(5)	(6)
			$e^{(\beta)}$			
Ln(Foreign financing)	0.918***	0.922***	0.927***	0.932***	0.931***	0.931***
	[0.0131]	[0.0149]	[0.0188]	[0.0181]	[0.0177]	[0.0174]
Ln(Export year)	0.366***	0.378***	0.641**	0.605**	0.587***	0.578***
	[0.0219]	[0.0668]	[0.140]	[0.123]	[0.113]	[0.105]
Ln(Size)		0.978	1.021	1.007	1.004	1.005
		[0.0277]	[0.0400]	[0.0381]	[0.0373]	[0.0369]
Ln(Domestic financing)		0.971**	0.973	0.973	0.974	0.975
		[0.0136]	[0.0175]	[0.0170]	[0.0167]	[0.0166]
Ln(Initial exports)			0.744***	0.750***	0.755***	0.757***
			[0.0336]	[0.0315]	[0.0299]	[0.0285]
Medium technology				0.733**	0.746**	0.770**
				[0.0886]	[0.0882]	[0.0898]
High technology				0.798***	0.812***	0.827***
				[0.0611]	[0.0610]	[0.0610]
GDP growth					0.0517**	0.169
					[0.0701]	[0.230]
Mercosur						0.811***
						[0.0539]
Constant	0.452***	0.493***	0.671***	0.775**	0.895	0.954
	[0.0157]	[0.0560]	[0.0782]	[0.0924]	[0.121]	[0.129]
Observations	7,303	7,303	7,303	7,303	7,303	7,303
Number of firms	3,379	3,379	3,379	3,379	3,379	3,379
rho	0.006	0.023	0.432	0.389	0.368	0.354
rho s.d.	0.037	0.202	0.130	0.130	0.126	0.120
Log likelihood	-3754	-3750	-3628	-3621	-3619	-3614
Likelihood-ratio test of rho=0	0.485	0.456	0.000	0.000	0.001	0.001

Standard errors in brackets

*** Significant at 1%, ** at 5%, * at 10%.

Sources: Tax collection agency, Customs office and Central Bank of Argentina.

The dependent variable is a dummy equal to one if the firm fails, and zero otherwise. *Ln(Foreign financing)* is the natural logarithm of 1 plus the foreign financing in dollar terms obtained by a firm. *Ln(Size)* is the natural logarithm of a firm's number of employees. *Ln(Export year)* is the natural logarithm of each firm corresponding export year. *Ln(Domestic financing)* is the natural logarithm of 1 plus the domestic banks' financing in dollar terms obtained by a firm. *Ln(Initial exports)* is the natural logarithm of a firm's exports in dollar terms in its first year as an exporter. *High* and *Medium technology* are dummies variables equal to one for high-tech and medium-tech intensive industries, respectively, and zero otherwise. *GDP Growth* is weighted average (by share in the total exports in each year) of the GDP growth rates in the export destination countries. *Mercosur* is a dummy variable equal to one if more than 50% of firm's export value goes to Mercosur, and zero otherwise. Unobserved heterogeneity is assumed to follow a Normal distribution.

Table 9. IV model estimates using alternative control variables

	1st or 2nd country	1st, 2nd or 3rd country	1st, 2nd, 3rd or 4th country	1st, 2nd, 3rd, 4th or 5th country
Ln(Foreign financing)	-0.133***	-0.146***	-0.152***	-0.154***
	[0.0448]	[0.0514]	[0.0541]	[0.0550]
Dummy above mean interest rate	-0.0868***	-0.0801**	-0.0776**	-0.0769**
	[0.0285]	[0.0316]	[0.0327]	[0.0331]
Dummy LATAM foreign financing	0.0622	0.0681	0.0692	0.0701
	[0.0645]	[0.0700]	[0.0719]	[0.0727]
GDP growth	-0.852***	-0.843***	-0.841**	-0.847**
	[0.319]	[0.326]	[0.330]	[0.332]
Dummy export-foreign financing 2	0.340***			
	[0.113]			
Dummy export-foreign financing 3		0.391***		
		[0.134]		
Dummy export-foreign financing 4			0.418***	
			[0.143]	
Dummy export-foreign financing 5				0.424***
				[0.147]
Constant	0.402***	0.403***	0.403***	0.404***
	[0.0215]	[0.0224]	[0.0228]	[0.0230]
Observations	7,303	7,303	7,303	7,303
Centered R^2	-0.199	-0.245	-0.263	-0.269
Underidentification test (Kleibergen-Paap rk LM statistic)	0.000	0.000	0.000	0.000
Weak identification test (Kleibergen-Paap rk Wald F statistic)	16.78	14.27	13.50	13.23
Hansen J statistic (overidentification test of all instruments)	0.000	0.000	0.000	0.000
Endogeneity test of endogenous regressors	0.000	0.000	0.000	0.000

Robust standard errors in brackets

*** Significant at 1%, ** at 5%, * at 10%.

Sources: Tax collection agency, Customs office and Central Bank of Argentina.

The dependent variable equals one if the firm fails and zero otherwise. *Ln(Foreign financing)* is the natural logarithm of 1 plus the foreign financing in dollar terms. *Ln(Size)* is the logarithm of a firm's number of employees. *Ln(Domestic financing)* is the logarithm of 1 plus the domestic banks' financing in dollar terms. *Ln(Initial exports)* is the logarithm of a firm's exports in dollar terms in its first year as an exporter. *High* and *Medium technology* are dummies variables equal one for high-tech and medium-tech intensive industries, respectively, and zero otherwise. *GDP Growth* is weighted average (by share in the total exports in each year) of the GDP growth rates in the export destinations. *Mercosur* is a dummy equal to one if more than 50% of firm's export value goes to Mercosur, and zero otherwise. *Dummy export-foreign financing 2* is a dummy variable equal to one if fund's first or second main origin country coincides with the main export destination of the firm, and zero otherwise. *Dummy export-foreign financing 3* is a dummy variable equal to one if fund's first, second or third main origin country coincides with the main export destination of the firm, and zero otherwise. *Dummy export-foreign financing 4* is a dummy variable equal to one if fund's first, second, third of fourth main origin country coincides with the main export destination of the firm, and zero otherwise. *Dummy export-foreign financing 5* is a dummy variable equal to one if fund's first, second, third, fourth or fifth main origin country coincides with the main export destination of the firm, and zero otherwise. *Dummy LATAM foreign financing* is dummy variable equal to one if at least one country of origin of funds is part of the LATAM area, and zero otherwise. *Dummy above mean interest rate* is dummy variable equal to one if the firm receives funds from at least one country whose time dimension collapsed money market interest rate mean is above the cross-section sample mean, and zero otherwise. The results of the First Stage are presented in the Appendix.

6. Conclusions

We use a rich data set that contains valuable information on Argentine new exporters domestic and their domestic and foreign debt to we evaluate the importance of foreign financing for their survival in the presence of financial distress or high costs of funding in the domestic market.

The fact that the sample covers the period 2004-2008 makes our exercise particularly appealing because it corresponds to the aftermath of the deep financial and external crisis that Argentina experienced in 2001, which was followed by a sharp depreciation of the currency. While the credit crunch that followed the financial crisis increased the need of alternative sources of financing, the sharp depreciation of the Argentine peso in January 2002 triggered a dramatic increase in the number of new exporters, what makes our data set particularly attractive for survival analysis.

We develop an estimation strategy that involves the estimation of an IV probit model to explicitly account for non-stochastic unobserved heterogeneity, in which foreign financing is instrumented with the money market interest rate of the country where the funds originate as well as a random effects probit to control for stochastic unobserved heterogeneity. The estimation of a clog-log model with frailty and alternative specifications of the IV probit model are used as a robustness check.

Our results indicate that, after controlling for firm, industry and destination characteristics that have proved to be relevant for the survival of firms in export markets, and taking into account the effects of domestic financing, foreign financing contributes to the survival of exporters. This finding remains unchanged once we use a clog-log model and alternative specification of the IV probit model. Additionally, our results indicate that the greatest contribution of foreign financing to the increase in firms' survival probability occurs over the first exporting years, when survival rates have been shown to be significantly low. This result, although based on preliminary analysis, has potentially relevant policy implications.

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Appendix 1

Proof of Proposition 1-2 and 4

Using the participation constraints shown in Equations (1.1) and (1.2) and imposing $\phi_{i2} = 1 - \phi_{i1}$, F_{i1} and F_{i2} can be written as

$$F_{i1} = \frac{fe}{\lambda}(d\phi_{i1}(1+r_1)(1+\phi_{i1}) - (1-\lambda)\phi_{i1}\gamma_{i1}) \quad (1.1')$$

$$F_{i2} = \frac{fe}{\lambda}(d(1-\phi_{i1})(1+r_2)(1+1-\phi_{i1}) - (1-\lambda)(1-\phi_{i1})\gamma_{i2}) \quad (1.2')$$

Ignoring the inequality shown in Equation (1.3), the solution to the optimization problem yields:

$$\phi_{i1}^* = \frac{d(2+3r_2-r_1)-(1-\lambda)(\gamma_{i2}-\gamma_{i1})}{2d(2+r_2+r_1)} \quad (A.1)$$

Given that the optimization problem is symmetric, we can generalize expression (A.1) as follows

$$\phi_{ij}^* = \frac{d(2+3r_{j'}-r_j)-(1-\lambda)(\gamma_{ij'}-\gamma_{ij})}{2d(2+r_j+r_{j'})} \quad (A.1')$$

Note in this definition that the coefficient of γ_{ij} equals $(1-\lambda)/(2d(2+r_j+r_{j'}))$ and is greater than zero. This implies that, for given levels of the remaining parameters, if $\gamma'_{ij} > \gamma''_{ij}$ then $\phi'^*_{ij} > \phi''^*_{ij}$, where ϕ'^*_{ij} and ϕ''^*_{ij} are the solutions associated with γ'_{ij} and γ''_{ij}, respectively. Moreover, we know that $\phi_{ij} > 0$ as long as

$$\gamma_{ij} > \overline{\gamma_{ij}}(r_j) = \gamma_{ij'} - \frac{d(2+3r_{j'}-r_j)}{1-\lambda} \quad (A.4)$$

Note also that $\frac{\partial \overline{\gamma_{ij}}(r_j)}{\partial r_j} = \frac{d}{1-\lambda} > 0$ (A.5)

(A.4) and (A.5) prove Propositions 1 and 3.

Proof of Proposition 3 and 5

Consider the definitions of F_{ij} and $F_{ij'}$ given in Equations (1.1') and (1.2') and the definition of $\overline{r_{ij}}(d, \lambda, r_{j'}, \gamma_{ij'})$ given in proposition 4 and write

$$F_{ij}(\phi_{ij}^*(\lambda, \gamma_{ij}, \gamma_{ij'}, d, r_{j'}, \overline{r_{ij}} - \varepsilon), f_E, \lambda, \gamma_{ij}, d, \overline{r_{ij}} - \varepsilon) + F_{ij'}(\phi_{ij}^*(\lambda, \gamma_{ij}, \gamma_{ij'}, d, r_{j,}, \overline{r_{ij}} - \varepsilon), f_E, \lambda, \gamma_{ij'}, d, r_{j'}) < F_{ij}(0, f_E, \lambda, \gamma_{ij}, d, \overline{r_{ij}} - \varepsilon) + F_{ij'}(0, f_E, \lambda, \gamma_{ij'}, d, r_{j'}) \quad (A.6)$$

This inequality follows from the facts that: (i) when r_j equals $\overline{r_{ij}} - \varepsilon$, the optimal level of ϕ_{ij} equals ϕ_{ij}^* and this level is, by definition, greater than 0; (ii) thus, by the principle of minimization. Consider now the following equality:

$$F_{ij}\left(0, f_E, \lambda, \gamma_{ij}, d, \overline{r_{ij}} - \varepsilon\right) + F_{ij'}\left(0, f_E, \lambda, \gamma_{ij'}, d, r_{j'}\right) = F_{ij'}\left(0, f_E, \lambda, \gamma_{ij'}, d, r_{j'}\right) =$$
$$F_{ij'}\left(\phi_{ij}^{*}\left(\lambda, \gamma_{ij}, \gamma_{ij'}, d, r_{j'}, \overline{r_{ij}}\right), f_E, \lambda, \gamma_{ij'}, d, r_{j'}\right) \quad \text{(A.7)}$$

The equality follows from the fact that when ϕ_{ij}^{*} there is no foreign financing and, thus, $F_i\left(0, f_E, \lambda, \gamma_{ij'}, d, r_{j'}\right) = F_{id}\left(0, f_E, \lambda, \gamma_{ij'}, d, r_{j'}\right)$ and that, as a result, an increase in r_j does not affect financial costs.

Combining (A.6) and (A.7), we can write:

$$F_{ij}\left(\phi_{ij}^{*}\left(\lambda, \gamma_{ij}, \gamma_{ij'}, d, r_{j'}, \overline{r_{ij}} - \varepsilon\right), f_E, \lambda, \gamma_{ij}, d, \overline{r_{ij}} - \varepsilon\right) + F_{ij'}\left(\phi_{ij}^{*}\left(\lambda, \gamma_{ij}, \gamma_{ij'}, d, r_{j}, , \overline{r_{ij}} -\right.\right.$$
$$\left.\left.\varepsilon\right), f_E, \lambda, \gamma_{ij'}, d, r_{j'}\right) < F_{ij'}\left(\phi_{ij}\left(\lambda, \gamma_{ij}, \gamma_{ij'}, d, r_{j'}, \overline{r_{ij}}\right), f_E, \lambda, \gamma_{ij'}, d, r_{j'}\right)$$
(A.8)

This proves Proposition 3.

To prove Proposition 5, replace the definition of ϕ_{ij} given in (A.1) in (1.1) and (1.2) and write:

$$F_i = F_{if} + F_{id} =$$
$$\frac{f_e(12d^2 - d^2 r_{j'}^2 - d^2 r_j^2 + 2dr_{j'}\left(6d + 7dr_j + \gamma_{ij'} - \lambda\gamma_{ij'} - 3(1-\lambda)\gamma_{ij}\right) + 2dr_j\left(6d - 3(1-\lambda)\gamma_{ij'} + \gamma_{ij} - \lambda\gamma_{ij}\right) - (1-\lambda)(\gamma_{ij'}\left(4d + \gamma_{ij'} - \lambda\gamma_{ij'}\right) + 2\left(2d - (1-\lambda)\gamma_{ij'}\right)\gamma_{ij} + (1-\lambda)\gamma_{ij}^2))}{4d\lambda(2 + r_{j'} + r_j)}$$

Now take the following derivative

$$\partial F_i / \partial r_f$$
$$= \frac{f_e(2d + 3dr_{j'} - dr_j - (1-\lambda)\gamma_{ij'} + \gamma_{ij} - \lambda\gamma_{ij})(6d + 5dr_{j'} + dr_j - (1-\lambda)\gamma_{ij'} + \gamma_{ij} - \lambda\gamma_{ij})}{4d\lambda(2 + r_{j'} + r_j)^2}$$

If $\gamma_{ij} > \overline{\gamma_{ij}}$, the expression shown above is positive. This proves Proposition 4.

Appendix 2: Tables used for the development of Section 3

Table 1. Non-financial private sector' foreign debt (by type of debt, US million dollars)

	2004	2005	2006	2007	2008
Foreign debt	**48,846**	**43,699**	**43,995**	**46,960**	**53,579**
Financial debt	35,200	30,015	28,651	27,993	29,550
Securities	13,083	10,778	9,765	8,863	7,781
Loans	20,863	17,642	17,471	16,827	18,819
Other	1,254	1,595	1,415	2,303	2,949
Commercial Debt	13,646	13,684	15,344	18,967	24,029
Advances and exports' prefinancing (a)	3,882	3,803	3,945	4,704	5,185
Imported goods	8,385	8,157	9,371	11,716	15,876
Services	1,378	1,724	2,027	2,547	2,968
Proportion of Securities in Total Foreign Debt	0,267	0,246	0,221	0,188	0,145

Sources: Report on external debt, loans and deposits, Central Bank of Argentina. Informe sobre deuda externa del sector privado and Préstamos y depósitos del sector privado no financiero, desagregados por tipo de titular, saldos a fin de mes, Banco Central de la República Argentina.

Table 2. Percentage of New Exporters

Condition	**Number of firms**	**%**
Already exporters in 2003	3,447	50.5
Starters	3,379	49.5
Total	6,826	100

Number of Exporting Manufacturing firms
Sources: Tax Collection Agency (AFIP) and Customs Office

Table 4. Financing and spell length

Type of Financing	**Mean of spell**	**p-value**
Without Foreign Financing	1.92	0.000
With Foreign Financing	2.70	
Without Domestic Financing	1.84	0.000
With Domestic Financing	2.43	

Percentage of firms with access to financing by spell duration
Sources: Tax collection agency, Customs Office and Central Bank of Argentina

Appendix 3: Tables Section 4

Table 11. Foreign financing and duration

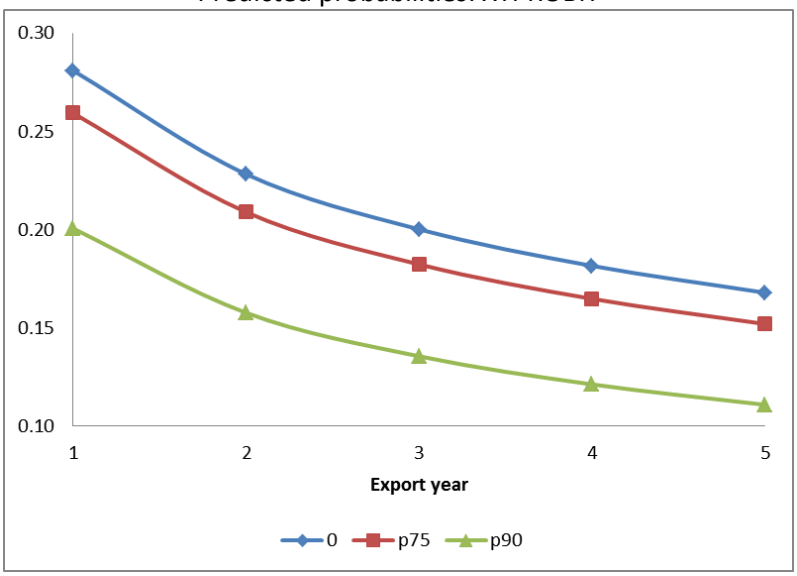
	1st or 2nd country	1st, 2nd or 3rd country	1st, 2nd, 3rd or 4th country	1st, 2nd, 3rd, 4th or 5th country
Interest rate	-6.507***	-5.958***	-5.761***	-5.699***
	[1.589]	[1.577]	[1.568]	[1.567]
Dummy above mean interest rate	0.607***	0.596***	0.589***	0.588***
	[0.0641]	[0.0635]	[0.0632]	[0.0631]
Dummy LATAM foreign financing	1.527***	1.443***	1.405***	1.395***
	[0.105]	[0.104]	[0.103]	[0.103]
GDP growth	-3.414***	-3.084***	-2.981***	-2.983***
	[0.966]	[0.955]	[0.944]	[0.944]
Dummy export-foreign financing 2	2.446***			
	[0.113]			
Dummy export-foreign financing 3		2.539***		
		[0.111]		
Dummy export-foreign financing 4			2.597***	
			[0.109]	
Dummy export-foreign financing 5				2.613***
				[0.110]
Constant	0.587***	0.545***	0.531***	0.529***
	[0.0917]	[0.0906]	[0.0899]	[0.0899]
Observations	7,303	7,303	7,303	7,303
R-squared	0.405	0.416	0.423	0.425

Robust standard errors in brackets

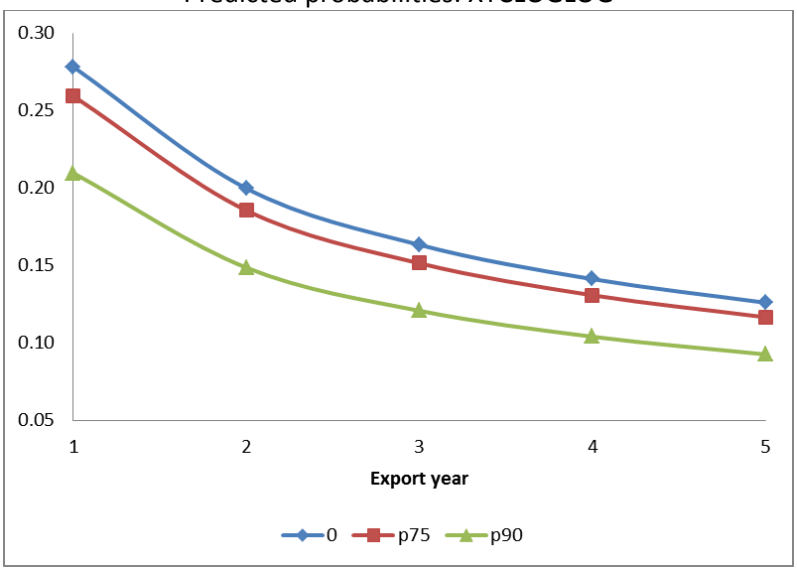
*** Significant at 1%, ** at 5%, * at 10%.

The dependent variable is the natural logarithm of 1 plus the foreign financing in dollar terms obtained by a firm. *Interest rate* is an index constructed as fixed weighted average of the money market interest rate in the different countries of origin of the funds received by the firm. *Ln(Size)* is the natural logarithm of a firm's number of employees. *Ln(Domestic financing)* is the natural logarithm of 1 plus the domestic banks' financing in dollar terms obtained by a firm. *Ln(Initial exports)* is the natural logarithm of a firm's exports in dollar terms in its first year as an exporter. *High* and *Medium technology* are dummies variables equal to one for high-tech and medium-tech intensive industries, respectively, and zero otherwise. *GDP Growth* is weighted average (by share in the total exports in each year) of the GDP growth rates in the export destination countries. *Mercosur* is a dummy variable equal to one if more than 50% of firm's export value goes to Mercosur, and zero otherwise. *Dummy export-foreign financing 2* is a dummy variable equal to one if fund's first or second main origin country coincides with the main export destination of the firm, and zero otherwise. *Dummy export-foreign financing 3* is a dummy variable equal to one if fund's first, second or third main origin country coincides with the main export destination of the firm, and zero otherwise. *Dummy export-foreign financing 4* is a dummy variable equal to one if fund's first, second, third of fourth main origin country coincides with the main export destination of the firm, and zero otherwise. *Dummy export-foreign financing 5* is a dummy variable equal to one if fund's first, second, third, fourth or fifth main origin country coincides with the main export destination of the firm, and zero otherwise. *Dummy LATAM foreign financing* is dummy variable equal to one if at least one country of origin of funds is part of the LATAM area, and zero otherwise. *Dummy above mean interest rate* is dummy variable equal to one if the firm receives funds from at least one country whose time dimension collapsed money market interest rate mean is above the cross-section (time dimension collapsed) sample mean, and zero otherwise.

Predicted probabilities: XTPROBIT



Predicted probabilities: XTCLOGLOG



Predicted probabilities: IV

IV		
0	p75	p90
0.354	0.229	-0.139

Export year	XTPROBIT			XTCLOGLOG		
	0	p75	p90	0	p75	p90
1	0.2809	0.2592	0.2006	0.2782	0.2594	0.2098
2	0.2282	0.2089	0.1577	0.1998	0.1856	0.1487
3	0.2002	0.1823	0.1356	0.1634	0.1516	0.1209
4	0.1816	0.1648	0.1213	0.1414	0.1310	0.1042
5	0.1680	0.1520	0.1109	0.1262	0.1168	0.0928