Export Survival and Foreign Financing

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Exporting is a finance intensive activity. However, domestic financing tends to be more expensive than foreign financing and domestic financial institutions may be unwilling to lend. In this context, the paper investigates whether foreign financing provides better financing conditions or external finance and, through this channel, increases export survival probabilities. To this end, it assembles a unique dataset with information on credit obtained by Argentine exporters abroad that is most frequently unavailable in other databases or other countries. Moreover, it builds a simple theory model that identifies threats for identification and, using it as a guide, develops a novel instrumental variable approach that addresses endogeneity and reverse causality concerns. Hence, in contrast with the standard survival techniques used in the literature, such as the probit random effects and clog-log duration setups, this model is able to empirically show that foreign financing exerts a positive causal impact on export survival.

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

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1. Introduction

Exporters need large amounts of working capital to pay upfront costs associated with product customization, marketing expenses, distribution networks and financial insurance for additional transactional risks (Amiti and Weinstein, 2011). While exporters could pay for these costs with internal funds, the longtime lags between production and receipt sales revenue complicates this possibility, turning external finance particularly important for exceling in export markets (Amiti and Weinstein, 2011; Chor and Manova, 2012). Related to this point, a now consolidated strand of literature shows that finance and export volumes are linked, suggesting that external finance allows affording exporting costs and that better financing conditions increase exports, for

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instance, by reducing interest payments (Manova, 2008; Muûls, 2008; Manova, 2013; Feenstra, Li and Yu, 2014; Paravisini, Rappoport, Schnabl and Wolfenson, 2015; Molina and Roa, 2015).[1]

Nonetheless, beyond the progress it has made, this literature has paid little attention to a different but relevant export dimension, export survival. This is surprising because export volumes and export survival depend on a similar type of exporting costs, fixed and variable costs that are faced recurrently, multiple times, and after entry into the export market. Hence, it is natural to think that, if external finance and better financing conditions allow affording and reducing these costs, they also increase export survival rates.

Moreover, the little attention paid on survival is surprising because trade relationships are significantly shorter in developing countries, suggesting that part of this low survival is inefficient and prevents the consolidation of their exporting sector (Besedeš and Blyde, 2010; Besedeš and Prusa, 2006a and 2011; Brenton, Saborowski and Von Uexkull, 2010; this, of course, does not preclude the possibility that low survival reflects experimentation and thus, in some cases does not entail welfare losses as in Cadot, Iacovone, Pierola, and Rauch, 2013 and in Fanelli and Hallak, 2015).[2] In this context, assessing whether external finance and better financing conditions increase export survival can reveal the need for providing them to exporters in developing nations.

The present paper addresses this issue for a developing country, Argentina. Moreover, it does it in a manner that contributes to the literature on export survival in general and to Besedeš and Blyde (2010) and Jaud, Kukenova, and Strieborny (2015), the only two papers in this literature that, without explicitly having the goal to explore the impact of finance on export survival, link these two variables empirically.[3] The first contribution is that the paper assembles a rich dataset on trade flows and financing at the level of firms. This dataset distinguishes between domestic and foreign financing, providing information on credit obtained by exporters abroad that is most frequently unavailable in other datasets or even in other countries. Most importantly, this

[1] Furthermore, 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, Wei, and Zhang, 2011).

[2] In Fanelli and Hallak (2015) firms experiment since they have uncertainty on market-specific demand. Albornoz, Fanelli and Hallak (2016) suggest this can explain how the relative magnitude of sunk and fixed costs vary with distance and experience. Cadot, Iacovone, Pierola, and Rauch (2013) also provide evidence of experimentation.

[3] While Berman and Héricourt (2010) and Paravisini, Rappoport, Schnabl and Wolfenson (2015) are excellent works that link some notion of export survival to some notion of finance in extensions of their analyses, they have not been included in this list because the main focus of these studies are export volumes and entry decisions into the export market. They find that external finance and better financing conditions increase export volumes and entry. Thus, these extensions do not follow standard practices in the survival literature, having implications for the interpretations of the results. For instance, neither of these studies constrains its sample to the new exporters, as frequently done, that are precisely the type of firms that mostly determine the consolidation of an exporting sector and for whom financing conditions may be more relevant. Consistent with the fact that Berman and Héricourt (2010) does not strictly pertain to the strand of literature on survival, they concentrate on a particular set of industries and, most importantly, work with a sample they argue is likely to be oriented to large firms. Moreover, they do not directly address endogeneity because this is not their main goal. For Paravisini, Rappoport, Schnabl and Wolfenson (2015), see Subsection 2.1.

distinction enables us to exploit heterogeneity across financing forms that, as noted below, is important to identify variation in external finance and financing conditions across firms.

The paper also contributes to the export survival literature because it uses a linear instrumental variable model (LIVM) that tackles endogeneity and reverse causality concerns and, thus, allows establishing causal impacts of financing on export survival. This contribution is important because, borrowing from other sciences, this literature has traditionally relied on time-discrete or time-continuous econometric models that do not account for endogeneity or reverse causality concerns. Finally, the paper contributes by theoretically founding the empirical approach taken in the LIVM with a new simple theory model of survival. Borrowing from Manova (2013), it builds a simple theory that identifies threats for identification and motivates the use of foreign interest rates to instrument for the foreign financing of a firm.

To find variation in external finance and financing conditions across firms, the paper distinguishes between foreign and domestic financing and, while the first type is defined as the financing obtained by Argentine firms from financial institutions located abroad, related companies, clients and suppliers, the second type is defined as the financing obtained by these firms in domestic markets. In particular, the paper directly associates the concepts of external finance and better financing conditions to the concept of foreign financing, motivated by two characteristics of foreign credit that we observe in the data and have theoretical appeal.

The first characteristic is that, over 2003-2009, exporters exhibited a tendency to borrow in countries in which the money market interest rate was smaller than in Argentina, suggesting that monetary and liquidity conditions were easier in these economies and, thus, funds suppliers were more willing to lend. Indeed, since foreign financing entails greater asymmetric information than domestic financing (as suggested by Ahn, 2011), the former financing form would be harder to justify if it did not offer better conditions to firms.[4] A second characteristic is that the only period in which exporters did not exhibit this tendency to borrow in countries with smaller interest rates was precisely the year in which Argentine lenders seem to have been more unwilling to lend. This suggests that they also used foreign financing to obtain otherwise unavailable external finance.

Having shown that foreign financing has distinctive characteristics, the paper develops a simple theory model. Using this model, it shows the following three results that are then used to guide the LIVM: (i) each exporter has a tendency to borrow in a specific set of foreign countries and this set is determined by idiosyncratic characteristics defined at the exporting firm-foreign country

[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.

level, e.g., links easing the financial contracting process for some firms in some foreign countries; (ii) a rise in a foreign country's interest rate increases the financial costs of firms that were borrowing there and this reduces their export survival probability; (iii) this rise also increases the financial costs of firms that were not borrowing there at the time of the increase but, nonetheless, exhibit a tendency to borrow in the referred country. In this sense, we argue, the rise in the interest rate increases the "shadow price" of foreign financing.

The paper employs the standard survival techniques that have traditionally been used in the export survival literature and then proceeds with the LIVM. In particular, it considers two standard time-discrete models: a clog-log model with frailty and a probit model with random effects. These frameworks can deal with potential bias stemming from annual aggregation of trade data and stochastic unobserved heterogeneity, while the probit model also avoids the restrictive assumption of proportionality, according to which the effects of regressors on the hazard is constant over duration time (Hess and Persson, 2012; Esteve-Pérez, Requena-Silvente and Pallardó-Lopez, 2013). The results show that even after controlling for firm-level characteristics, such as domestic financing and size, the amount of foreign financing obtained by an exporter is significantly and positively correlated with its export survival probability.

However, these techniques traditionally used in the literature are not well suited for addressing endogeneity or reverse causality concerns that can affect our results. For instance, the omission of a variable that is positively correlated with both foreign financing and export survival, such as firm productivity, generates upwards bias. Furthermore, within the set of firms that export at a given moment in time, survivors are likely to make higher profits than non-survivors and, therefore, to be in less need of foreign financing. This tendency to obtain less foreign financing can generate reverse causality and, thus, generate downwards bias in our results. More generally, endogeneity and reverse causality can bias our results and, while the paper does not take a stance on the specific direction of this bias, it proposes an empirical strategy to address it.

In particular, the paper uses the three theoretical results mentioned above and insights from Peek and Rosengren (2002) and Peek, Rosengren and Tootell (2003) to build a new financial index and use it as an instrument for foreign financing. For a given exporter, this index increases with the interest rates of the foreign countries in which it borrows or tends to borrow; thus, it reflects the shadow price of foreign financing, as defined in the simple theory. In constructing it, we use interest rates of foreign countries that are exogenous to unobservable characteristics the firms of or to any of the decisions they make. Hence, the index captures exogenous time-variation in financing costs that stem only from the supply side of financial markets. In this setup, time-

unvarying unobservable characteristics that determine the set of foreign countries in which a firm borrows or tends to borrow may bias our results. Nonetheless, in the LIVM approach we use both the theory model and an agnostic approach to incorporate variables that control for this fact.

The results of the LIVM show that foreign financing exerts a statistically significant and positive impact on export survival rates. In interpreting this result, we rely on the two characteristics of foreign financing we have mentioned above. In particular, we interpret the outcome as evidence that foreign financing allows affording and reducing exporting costs that are faced recurrently and, through this channel, increases export survival probabilities. These results remain robust to the introduction of clustered errors at the level of firms, of the sets of variables mentioned above and of regressors controlling for macroeconomic shocks.

Regarding the quantitative results, the difference between the export survival probability for a firm with no foreign financing and a firm with a level of foreign financing that is at the 75th level of the distribution equals 32%. While this result is not directly comparable to those obtained with standard survival techniques, one could at least explore (caveats aside) if these outcomes are of the same order of magnitude. This comparison shows that, since in the probit model the difference in the probability of export ceasing between a firm with a level of foreign financing at the 75^{th} percentile and a firm with no foreign financing is between 2% and 3% for every of the five years considered, the order of magnitude of the impact is larger in the LIVM. This suggests that not accounting for endogeneity or reverse causality generates downward bias. We further investigate this hypothesis by comparing the LIVM with an OLS, and find that in the latter model the effects of foreign financing are not statistically different from zero. This reinforces the idea that not accounting for endogeneity or reverse causality concerns creates downward bias.

The paper relates to different strands of the literature. It relates to the strand of research on finance and export volumes mentioned above. It also relates to the export survival literature (Besedeš and Prusa, 2006a, 2006b and 2011; Esteve-Pérez, Mañez-Castillejo, Rochina Barrachina and Sanchis-Llopis, 2007; Fugazza and Molina 2009; Nitsch, 2009; Brenton, Pierola and von Uexkull, 2009; Volpe-Martincus and Carballo 2009; Brenton, Saborowski and Von Uexkull, 2010; Iacovone and Javorcik, 2010; Hess and Persson, 2011; Stribat, Record and Nghardsaysone, 2013; Fu and Wu 2014; Fugazza and McLaren 2014; Jaud, Kukenova and Strieborny, 2015; Araujo, Mion and Ornelas, 2016; among others), and to Albornoz, Pardo, Corcos and Ornelas (2012), which shows that export survival rates in Argentina are low. It also relates to studies suggesting that external finance allows increasing the production scale and thus diminishes exporting costs (Gross and Verani, 2013; Kohn, Leibovici and Szkup, 2016).

The paper is organized as follows. Section 2 revises the main reasons why finance matters for export survival and builds a model that motivates our empirical exercise, illustrating channels through which foreign financing can improve export survival. Section 3 describes the dataset and provides summary statistics. Section 4 presents the empirical approach. Section 5 presents the results and robustness chekcs. Finally, Section 6 concludes.

2. Links between Foreign Financing and Export Survival

2.1 Finance Conditions and Exporting Costs

Beyond the costs of entering the export-market emphasized by Melitz (Melitz 2003), there are exporting costs that affect other export-related decisions, among which export volumes stand out. Once a firm enters the export market, it continues to face fixed and variable costs associated with increases in the scale of production, manufacturing for export sale, shipping, duties, financial insurance, compliance with regulatory requirements and maintenance of distribution networks. Unlike entry costs, these other costs are faced multiple times over the export experience, i.e., they are "recurrent" and are faced upfront, partially explaining why exporters rely on external finance. Indeed, there is a large strand of literature showing that finance and exports are linked.

In this light, it is surprising that the link between finance and export survival has not received more attention. Because export survival also depends on recurrent costs of exporting, external finance and better financing conditions should increase export survival as well. Lack of external finance to afford recurrent costs may force market exit directly, and lack of liquidity to increase the scale of production may force it indirectly through higher variable costs. Moreover, high interest rates raise interest payments, diminishing export profitability and thus export survival.

As for the above-mentioned literature on finance and exports, the influential work of Paravisini, Rappoport, Schnabl and Wolfenson (2015) matches firm-level data with bank-level information and, using this database, explores whether bank credit fosters exports in Peru, thinking of the capital flow reversal of 2008 as an exogenous shock to credit supply. They find that export elasticities to credit are positive and interpret this result as evidence that external finance enables exporters to afford exporting costs that are unrelated to entry into the export market.[5]

Molina and Roa (2015) also match firm-level data with bank-level information for Colombian manufacturing firms. Using the ensuing dataset, they show that bank credit increases export

[5] In a different exercise, they find that credit does not affect entry or exit. Yet, their study 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. Moreover, unlike the present paper, their study focuses on financial resources intermediated by domestic banks.

volumes and reach, i.e., the number of destinations attained by a firm. Similar to Paravisini, Rappoport, Schnabl and Wolfenson (2015), they interpret this result as evidence that external finance allows affording exporting costs that are unrelated to entry into the export market.

An additional influential work is that of Manova (2013). She investigates how financial markets imperfections distort trade by exploiting heterogeneity in financial development and financial vulnerability across 107 countries and 27 sectors. The results show that most distortions are due to trade specific effects and that most of them are due to reductions in export volumes, rather than to limited entry into the export market. This result indirectly suggests that external finance is important in affording variable costs of exporting that are paid recurrently. Thus, in this sense, our result that external finance and better financing conditions increase export survival is supportive Manova's results (2013) (see also Besedeš, Kim and Lugovskyy, 2014).[6]

Moreover, as noted above, finance can diminish recurrent variable costs by allowing exporters to increase the scale of production. Kohn, Leibovici and Szkup (2016) provide evidence in this regard. After calibrating a model with plant-level data for Chile, they find that firms that are more dependent on external funds relative to productivity distort their scale by a greater amount. Gross and Verani (2013) develop a model in which firms need working capital to afford variable and fixed recurrent costs that are paid upfront. In this setup, new exporters begin operating below their desired level but then their constraints relax (see also Feenstra, Li and Yu, 2014).[7]

In summary, the literature suggests that external finance and better financing conditions allow affording and reducing fixed and variable recurrent costs of exporting. Considering this fact and that survival also depends on recurrent costs, it is natural to think that external finance and better financing conditions increase not only export volumes but also export survival rates. Finally, as a complement to the present subsection, Subsection 2.2 presents evidence suggesting that exporters use foreign financing to obtain otherwise unavailable external finance and better financing conditions, and the theoretical model of Subsection 2.3 illustrates an additional channel

[6] Besedeš, Kim and Lugovskyy (2014) investigate the link between market imperfections and export growth by developing a partial-equilibrium dynamic model in which, as a firm establishes, it reduces credit constraints by diminishing the perceived risk of its project. They test the model and show that credit constraints affect export growth but, nonetheless, 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 foreign credit, rather than on credit constraints. Moreover, while their main contribution is theoretical, we focus on empirics

[7] Feenstra, Li and Yu (2014) 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.

through which foreign financing can increase export survival rates.

2.2 Foreign Financing: External Finance and Better Financing Conditions

There are at least two reasons for which foreign financing provides otherwise unavailable external finance and better financing conditions. First, when domestic lenders are unwilling to lend, foreign financing is the only option to obtain external finance and, thus, afford recurrent costs. Second, since foreign financing involves greater asymmetric information than domestic financing (Ahn, 2011), it would be undesirable unless it offered better financing conditions, such as smaller interests, and thus diminishes financial recurrent costs. We look for these motivations in the data and show the results in Figures 1 and 2.

Figure 1 shows the distribution of Argentine firms according to the value of the index we will use as our instrument and that, as noted below, reflects the shadow price of foreign financing for Argentine firms. For each exporter, this index is defined as a weighted average of the money market interest rates of the foreign countries in which it borrowed at least once (hereafter referred to as "source countries"), and define relative weights as being dependent on the importance of each source country in the total amount of foreign financing obtained by the firm (for further details, see Section 4). In each of the five panels of Figure 1, the vertical line indicates the money market interest rate prevailing in Argentina over the corresponding year.

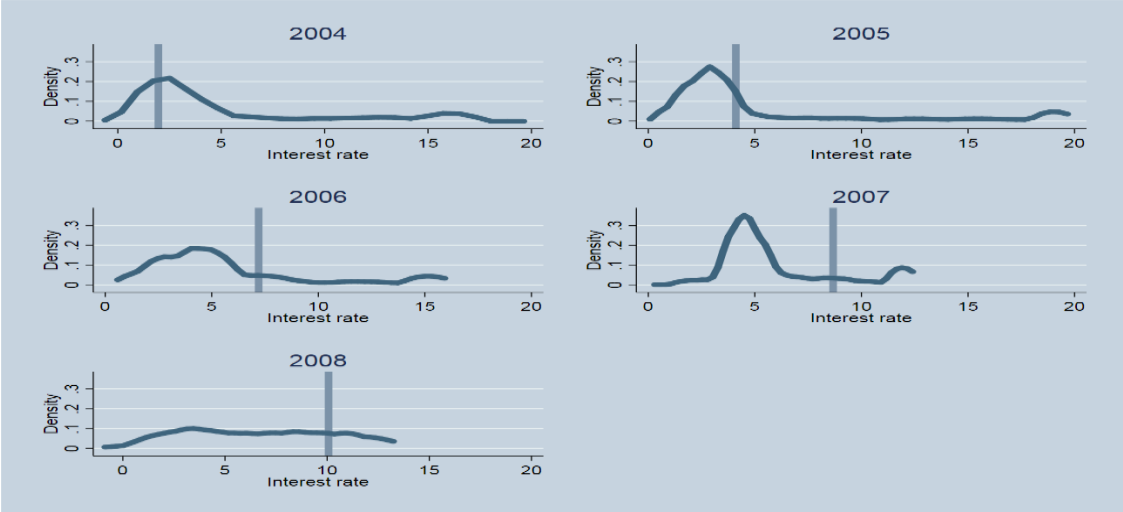
Two patterns emerge from Figure 1. In all panels, with the exception of the one referred to 2004, the greater mass of the distribution is located to the left of the vertical line. This indicates that exporters tended to borrow in countries in which the money market interest rate was smaller than in Argentina, possibly suggesting that there were easier liquidity conditions in these nations and lenders were more willing to lend. This is consistent with the idea that foreign financing gives the opportunity to pay smaller interests, i.e., it provides better financing conditions.

Furthermore, 2004 is the only year in which most firms seem to have borrowed, on average, in countries with higher interest rates than Argentina. While this may lead someone one to argue that interest rates are not that important in determining sources of foreign financing, Figure 2 argues against this hypothesis. This figure shows that it is precisely in 2004 when the private credit-to-GDP ratio was the lowest value over 1993-2012. That is, it is precisely in this year when the crisis of 2001 exerted the greatest impact, suggesting that it is also exactly in 2004 when domestic lenders may have been more unwilling to lend. In this context, firms may have used foreign financing to obtain otherwise unavailable external finance, regardless of interest rates.

Finally, 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 share of Argentine firms

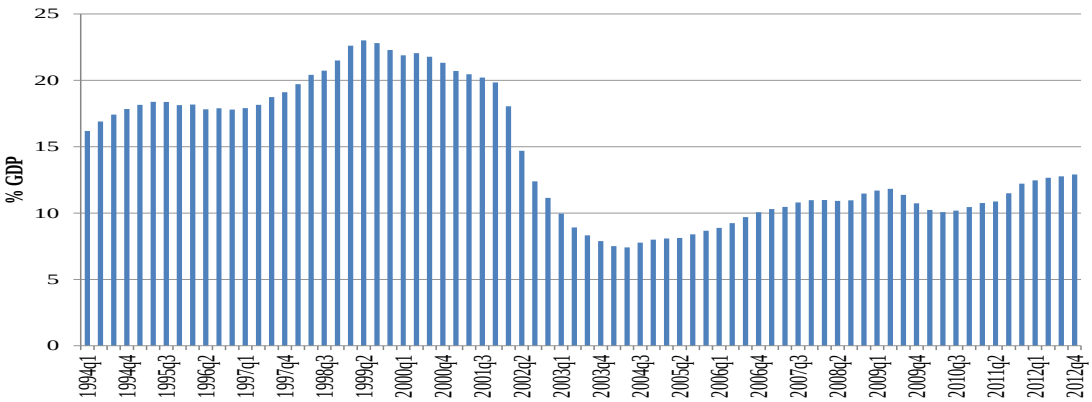
borrowed in Brazil, even though interest rates tended to be greater in this nation, i.e., the exception is 2008, when rates in both countries were closer to each other.[8]

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



Source: International Financial Statistics of the IMF; Central Bank of Argentine and own Author's calculation
Notes: distribution of firms according to the financial index, a weighted average of the money market interest rates where an exporter borrowed. The average uses constant weights by country of origin of the funds, with weights calculated across 2004 -2008. For each year, the lighter blue line depicts the money market interest rate in Argentina.

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



Sources: Central Bank of Argentina and INDEC, the Argentinian statistical office.

This suggests that there are (potentially unobservable) characteristics of firms that make them prone to borrow in a particular country and that, just as in the case of Brazil, these countries may have consistently different interest rates; i.e., cultural links may ease financial contracting by making it easier for some Argentine firms to overcome asymmetric information in Brazil. Although as noted below this poses a threat for our identification strategy, we will use intuition from the theory presented in the upcoming section to explicitly account for this fact in Section 5.

[8] 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.

2.3 Motivating Model

This subsection builds a simple model by borrowing from the static, partial equilibrium setup of Manova (2013). The main goal is not to develop a fully-fledged theory of foreign financing and export survival; instead, the goals are: (a) to show an additional channel through which better financing conditions increase export survival, complementing Subsection 2.1; and (b) to show the three theoretical results that identify threats for identification and provide intuition for the construction of the instrument in Section 5. An advantage is that the model is developed in two steps that are directly linked to our IV strategy.

2.3.1 Model Setup

Consider a continuum of firms from the same country and a representative period posterior to their entry into the 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., since all the action will occur in the representative period, we abstract from time subscripts.[9]

Exporters make two types of decisions. In the beginning, they decide whether to stay in the export market for an additional period. If an exporter stays, she must obtain external finance to overcome liquidity constraints by signing financial contracts with foreign investors.[10] Hence, export profitability depends on the costs of external finance and thus, when deciding whether to stay in the beginning of the period, exporters anticipate the contract terms they would obtain.

Conditional on staying, exporters face variable and fixed costs that are modelled as in Manova (2013). Because in the beginning of the period firms are already exporters, none of these costs relate to entry into the export market but, instead, must be interpreted as recurrent exporting costs. The variable part depends on two components. There are unitary costs denoted by a_i for firm i that follow a cumulative distribution $G(a_i)$ with support $[aL, aH]$, and there are iceberg trade costs, i.e., $\tau > 1$ units of a product must be shipped for 1 unit to arrive.[11] Fixed costs are denoted by fe, they must be borne upfront and involve the purchase of tangible assets.

[9] For simplicity, local producers are not considered. 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.
[10] The theory focused on foreign investors but, the empirical analysis also controls for domestic financing.
[11] 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.

The fact that exporters face liquidity constraints implies that they must cover a fraction d of fe with external finance.[12] In the process of obtaining it, we consider two investors from different countries and exporters can contract with one of them or with both. Just as in Manova (2013), there is an exogenous probability 1-λ that at the end period the firm defaults, the contract is not enforced and the collateral is seized. Anticipating this, in the beginning of the period 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 used as collateral.

The investors differ in two manners. First, the fraction of the collateralizable asset accepted to a firm depends on her nationality, i.e., γ_{i1} and γ_{i2} are the fractions accepted to firm i by investors from countries 1 and 2. This reflects that firms have different abilities to overcome the asymmetric information that characterize financial contracting; and, for a given firm, this ability varies with investors' nationality, e.g., some Argentine firms may deal better with Brazilian investors, as noted in Subsection 2.2. Second, investors face distinct opportunity costs, reflecting interest rates differences across countries. For simplicity, we assume that investors break even in expectation.[13]

Finally, we assume that the decision on whether to stay in the market depends on the profits an exporter obtains in the representative period. This simplifying assumption enables us to abstract from determinants of export survival other than finance.

2.3.2 Two-Step Optimization Process

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

$$min_{\phi_{i1},\phi_{i2}} F_i = F_{i1} + F_{i2} \quad (1)$$

subject to:

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

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

$$\phi_{i2} = 1 - \phi_{i1}\ ;\ 0 \leq \phi_{i1} \leq 1. \quad (1.3)$$

where ϕ_{i1} and ϕ_{i2} are the fractions of debt contracted with investors from countries 1 and 2; γ_{i1} and γ_{i2} are firm i's ability to deal with these investors; Equations (1.1) and (1.2) are their

[12] While it would be relatively easy to consider variable costs, this would not enrich much the model's mechanism.
[13] 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.

participation constraints; r_1 and r_2 are the interest rates in their countries and, to avoid collateral duplication, the collateralizable asset is 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 $j \in [1,2]$. In the right hand-side of (1.1) and (1.2), investors' outside options increase with the size of the loans; this is critical to preserve the model's tractability and can be easily justified, for instance, by making the realistic assumption that investors prefer diversified portfolios.

The solution to the optimization problem in Equations (1)-(1.3) is fully derived and shown in Appendix Section 1. Using the expression for the equilibrium value of ϕ_{i1} that results from this solution, we write the following propositions concerning γ_{ij} (for the proofs and a more formal definition of the propositions, see Appendix Section 1):

Proposition 1. Under the assumptions stated in Subsection 2.3.1, there is a cutoff ability to deal with the foreign 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.

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 $j \neq j'$), holding everything else constant, a greater ability to deal with the investor from j is associated with a greater fraction of debt contracted in this country.

Propositions 1 and 2 state that exporters tend to borrow in countries in which they find it easier to overcome asymmetric information constraints related to financial contracting. That is, just as it may be for Argentine firms in Brazil, these propositions state that, in the model, there are characteristics of firms that determine their sources of foreign financing. Hence, we will use these propositions to improve identification in our IV model. Moreover, Proposition 1 can be used to derive the following additional propositions (for formal definitions and proofs, see the Appendix)

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.

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.

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.

Using Propositions (3)-(5) note that a rise in r_j increases 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,

we argue that the rise in r_j increases the shadow price of foreign financing. Moreover, thus result is consistent with the evidence on money market interest rates presented in Subsection 2.2.

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., as long as $p_i(a_i)q_i(a_i) - q_i(a_i)\tau a_i - (1-d)fe \geq F_i^*$. 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 stays in the export market. For a given value of $\gamma_{ij'}$, the frontier of these combinations is shown in Figure 3 of the Appendix and written as follows

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

where Y is income in the export market. Figure 3 and Propositions (1)-(5) implicitly state that a rise in r_j increases financial costs, its shadow price of foreign financing and, therefore, diminishes its export survival probability. This result will be the cornerstone for constructing the financial index we will use as our instrument in Section 5.

In Figure 3, abilities to deal with foreign investors $(\gamma_{ij}, \gamma_{ij'})$ also affect financial costs and export survival. This illustrates that factors that are unobservable and are defined at the exporting firm-source country level can determine a firm's survival probability and the set countries in which it tends to borrow. Importantly, if these countries had consistently different interest rates (as it was the case for Brazil in Subsection 2.2), the unobservable characteristics would correlate with the index, biasing our results. Hence, in the empirical approach Section 5 we will explicitly account for this fact by introducing variables that are defined at the firm-source country level.

3. Data and Unconditional Means

3.1 Data Collection

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

The information on foreign financing has been retrieved from a survey that was first conducted

by the Central Bank of Argentina. In 2002, the Argentinian Government established an information-reporting regime called "Sistema de Relevamiento de Pasivos Externos y Emisiones de Títulos de los Sectores Financiero y Privado no Financiero," according to which regulated financial institutions would have to collect and report data on financial relationships linking financial and non-financial domestic firms with foreign creditors. Compliance with this regime generated a unique and valuable dataset containing information that is frequently not available in central banks, such as the origin country of the financial funds and the type of creditor involved in the relationships. In providing this information, the dataset classifies foreign creditors into three categories: financial institutions located abroad, related companies, and clients and suppliers.[14] Unfortunately, the rich dataset created by the new regime is only available for 2003-2008.

The information on domestic financing has been retrieved from a second survey, also conducted by the Central Bank of Argentina. This survey informs on all transactions involving at least one domestic financial institution. Thus, in this sense, and in contrast with the survey mentioned above, this one provides information that is frequently available in most central banks and financial regulatory agencies. Among all information provided, we focus on the financing granted to households and non-financial firms by domestic banks in the form of debt.

The information on exports has been retrieved from the records of the Argentinian Custom Office. For each export transaction, we identify the Argentine firm involved, the export product code at the 6-digit HS level, the country of the export destination, and the U.S. dollar export value. The paper also uses data on the number of employees by exporting firm that obtained from the Argentinian Tax Collection Agency that 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 nations for which the data were not available for every of the 5 years under consideration, we end up with a dataset containing 58 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

[14] The survey does not provide information on bond issuance in international markets. This form of financing has gained predominance in developing countries since the increase in global liquidity that took place after the Global Financial Crisis. Nonetheless, this phenomenon seems to have been relevant for the corporate sector of Latin American countries such as Mexico and Brazil,but not Argentina (Acharya, et al., 2015; Bastos, Kamil, and Sutton, 2015). Consistent with this, Table A2.1 in the Appendix 2 shows that the ratio of financial-to-commercial debt contracted by the Argentine non-financial private sector and of securities in foreign financial debt decreased towards 2007-2008.

the five years.[15] This leaves us with a sample of 6,577 manufacturing exporters, some of which obtained foreign financing over 2004-2008 and some of which did not. Second, following the literature on survival, we retain only the firms that are known as "starters", i.e., firms that began to export in the first year of the sample.[16] Thus, we exclude firms that exported in 2003, which gives us a sample of 3,265 firms that exported at least one year over 2004-2008.

The strategy of restricting the analysis to starters has been widely used in the survival literature to avoid bias arising from left censored samples (for details, see Besedeš and Prusa, 2006b). Because this paper focuses on survival, and one of its contributions is to complement the standard literature with an IV, we follow the same approach. In this regard, it is worth noting the difference with Paravisini, Rappoport, Schnabl and Wolfenson (2015). While they do not exclude starters and thus preserve a larger size sample, we believe our strategy is more consistent with the research question that we pose. This question refers to developing countries in which export relationships are particularly short-lived and, thus, starters are particularly important for export growth.

3.2 Unconditional Means

Summary statistics from our sample are consistent with those presented in other studies, and this gives external validity to our results. For instance, the fact that in our sample a large fraction of firms are starters (3,265/6,577) is consistent with the evidence on Argentine exporters presented for the same period by Albornoz, Pardo, Corcos and Ornelas (2012). Along these lines, for the sample of 3,265 starters, the average spell duration is 2.2 years and 46 percent of the firms exported for only a single year. That is, export relationships are on average short-lived, as noted by Besedeš and Prusa (2006b) for a sample that contains several developing countries.

Focusing hereafter on the sample of 3,265 starters, Table 1 shows, for each spell duration, the percentage of firms with domestic and foreign financing. This table shows that longer spells are in general associated with a larger proportion of firms that have any form of financing. Nonetheless, it also identifies a difference between the two forms: the increase in the proportion of firms with financing is monotonic and sharper for foreign than for domestic financing.

Table A2.3 in Appendix Section 2 also studies the link between export survival and financing by showing the mean spell duration associated with foreign and domestic financing, respectively. Just as Table 1 does, this table identifies a difference between them: while domestic financing is associated with an increase in the mean spell duration of seven months (0.6 year), foreign

[15] 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.
[16] Just as Besedes and Prusa (2006a) and Fu and Wu (2014) do, we represent firms in our sample by their first spell.

financing is associated with a higher increase of ten months (0.83 years).

Table1. Spell Duration and Different Forms of Financing

Spell	**1**	**2**	**3**	**4**	**5**
Foreign Financing	19.6	28.8	40.5	44.7	57.7
Domestic Financing	42.8	58.6	67.4	71.9	68.3

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

4. Estimation Methodology

4.1 Traditional Methods

The Cox model was the most-commonly used framework in export survival studies. However, Hess and Persson (2012) related it to three major flaws, leading to an end of its widespread use (see Esteve-Pérez, Mañez-Castillejo, Rochina Barrachina and Sanchis-Llopis, 2007). The authors argued that, even though the Cox model was a continuous-time specification, trade data was recorded in discrete time units and this generated "heavy ties," i.e., trade relationships of equal length and, thus, bias. Furthermore, they argued that this model could only incorporate the effects of unobserved heterogeneity by complicating the estimation procedure, or even making it computationally impossible. Finally, they argued that it ignored that the effects of the covariates on survival were non-linear, due to intrinsic non-linearities or to dependence on duration time.

In response to these flaws, later studies started to use discrete-time methods, such as the probit with random effects or the cloglog models (Fugazza and McLaren 2014; Stribat, Record and Nghardsaysone, 2013; Fu and Wu 2014). In contrast with the Cox model, these frameworks account for grouping of continuous time observations and 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. Thus, Section 5 uses a probit framework with random effects and a clog-log model as a robustness check.

The probit and the cloglog models base their analysis on hazard rates. In this paper, the hazard rate must be understood as the probability that a firm cease 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 the survival time of a firm

at a given spell i, 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. In our work, in which a single spell per-firm is considered, i.e., the first spell, the i index denotes not only a spell but also a given exporting firm. Moreover, the x_{ik} vector refers to characteristics defined at three levels: the levels of firms, industries and export destinations.

Using Equation (3), one can represent the log-likelihood for a given sample. Denoting the terminal time for firm i by k_i, we define a binary variable that equals 1 if the firm ceases exporting during the k^{th} time interval and 0 otherwise and write the log-likelihood as follows

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

To estimate the parameters, it suffices to use Equation (4) and a particular choice for $F(.)$. Thus, we assume that $F(.)$ is Normal in the probit and an extreme value in the clog-log model.

4.2 Linear Instrumental Variables Model

4.2.1 Constructing the Financial Index

The probit and the c-log-log models account for random unobserved heterogeneity by introducing random effects and a frailty term, respectively. However, neither of them accounts for the type of unobserved heterogeneity that is correlated with foreign financing or for reverse causality, even though these issues can affect our results. As noted above, not considering in the estimation a variable that is positively correlated with export survival and foreign financing, e.g., firm productivity, would lead to an upwards bias in coefficients obtained with standard techniques. Furthermore, within the set of firms that are exporters at a given moment in time, one would expect that survivors make higher profits than non-survivors and, therefore, that they are in less need of foreign financing. This tendency of survivors to obtain less foreign financing can generate reverse causality concerns and lead to a downwards bias in our result. Considering this, the present paper accounts for endogeneity and reverse causality by using a LIVM.

In constructing this model, the paper instruments for foreign financing by using the money market interest rates of the countries in which a firm borrows, i.e. the country sources of the financial funds. The advantage is that these interest rates help construct a valid instrument, that is, an instrument that is relevant and, at the same time, fulfills the exclusion restriction. They help construct a valid instrument because they capture relevant information on the monetary and liquidity conditions of foreign countries. Therefore, because these interest rates determine the financing costs faced by the firms, they are correlated with their foreign financing. For instance, smaller foreign interest rates reduce firm's costs of financing and, thus, should induce them to

increase their foreign financing, i.e. see the theory model of Subsection 2.3 and Figure 1 in 2.2.[17]

Moreover, money market interest rates help construct an instrument that fulfills the exclusion restriction. This is because they are features of foreign countries and, as such, exogenous to unobservable features of the firms and are not affected by the decisions they make, i.e., Argentine firms are price-takers in foreign financial markets. More formally, the use of foreign interest rates allows isolating time variation that arises only from the supply-side of foreign financial markets.

In this regard, the paper relates to other studies. For instance, Peek and Rosengren (2002) proxy for the financial health of Japanese banks with Moody's ratings and, using this proxy, show that firms that were more exposed to troubled banks reduced their foreign investments by a greater amount. Along these lines, Peek, Rosengren and Tootell (2003) employ CAMEL ratings to construct an index that captures exogenous time-variation in the financial conditions faced by firms and, using this index, show that credit supply conditions affect economic activity in the U.S.[18] In the manner of Peek, Rosengren and Tootell (2003), the present paper uses money market interest rates to construct an index that reflects financial conditions faced by firms.

At the time of constructing the index, we are confronted with two choices: (i) we must choose what the relevant interest rates for a firm at a given moment in time are, i.e., the relevant set of foreign countries; and (ii) when there is more than one relevant rate, we must choose how to combine the multiple rates in creating a single index. Thus, we make these choices by imposing two conditions ensuring that our index captures the "shadow price" of foreign financing.

The first condition is motivated by the theory model, particularly, Propositions 1 and 2. We assume that firms tend to borrow in a particular set of foreign countries. In terms of the theory, these countries can be thought of as those for which a firm's ability to overcome asymmetric information is sufficiently large ($\gamma_{ij} > \overline{\gamma_{ij}}$), i.e., for which there is some value of the interest rate at which the firm borrows in the referred country. Thus, when taking this concept to data, these countries will be associated with the nations in which the firm has borrowed at least once, i.e., source countries, over the sample period. The second condition relies on Propositions 3-5 of the theory model. Specifically, we ensure that a rise in a source country's interest rate raises the index of: (a) firms that were borrowing there at the time of the increase; and (b) firms that were not borrowing there but for which, nonetheless, the referred country is a source nation.

Under these conditions, a rise in the interest rate of a source country always rises a firm's index, regardless of whether it was borrowing there at the time of the increase; for this reason, we argue,

[17] To the extent that there is arbitrage, a smaller interest rate in the money market goes in hand with smaller interest rates in other markets within the same country and, therefore, reduce the financing costs faced by Argentine firms.
[18] CAMEL ratings are based on five categories: capital, assets, management, earnings, and liquidity.

the index captures changes in the "shadow price" of foreign financing and particularly not merely the financial costs faced by a firm. Considering this, we construct the time t financial index for a firm i that has borrowed abroad at least once (r_{it}^{B}) as follows

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

where:

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

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 financing obtained by the firm from this country at t; N_i refers to the firm's number of source countries; thus, FF_i and F_{ij} are the 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. The relative weight assigned to each foreign country w_{ij} varies across firm but, for a given exporter, do not vary over time.

Regarding the firms that did not borrow abroad, and that are thus not considered in Equations (5) and (6), we start from the observation that they did show a tendency to borrow in any particular set of countries. Thus, when constructing their index (r_{it}^{NB}), we ensure that it reflects global financial conditions, but always acknowledging that they are Argentine exporting firms, i.e., and that, for this reason, their experience in obtaining foreign financing may imply common challenges or be explained by common components. In particular, we capture these two features by constructing the index of firms that did not borrow abroad in the following manner

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

where:

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

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; and w_j, the relative weight of country j, is computed as an average of the weights corresponding to all exporters having borrowed abroad at least once. That is, just as in the case of (5) and (6), the index for firms that did not borrow abroad 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 Argentine exporters having borrowed abroad. Note that these features of r_{it}^{NB} ensure that it captures changes global financial conditions, at the time that it acknowledges that the exporters are Argentine firms.

4.2.2 Threats for Identification in the LIVM

Variation in the financial indexes shown in Equations (5)-(8) comes from two sources. Time-variation arises from changes in foreign interest rates. As noted above, this variation is exogenous to unobservable characteristics, and thus, the omission of time-varying covariates at the level of firms should not lead to bias in the LIVM. Moreover, the fact that at a given moment survivors make higher profits than non-survivors and thus have more liquidity and are in less need of foreign financing, i.e., the reverse causality problem mentioned above, should be no longer a concern. This is because the index we use as our instrument relies, for both survivors and non-survivors, on interest rates rather on quantities of foreign financing.

The indexes shown in (5)-(8) can also vary across firms within a given moment in time. This variation results from the fact that the indexes use varying relative weights, reflecting firms' tendency to borrow in different countries. Nonetheless, unlike the case considered above, this second form of variation is a threat for identification in the LIVM. In particular, if it were the case that time-unvarying unobservable characteristics lead a firm to borrow in specific countries and it happened, at the same time, that these countries have consistently higher or lower interest rates, the unobservable characteristics would be correlated with the index we use as our instrument. Thus, if these characteristics were also correlated export survival, they would generate a bias in in our LIVM results, i.e., even though this is not sometimes explicitly mentioned, this is a common threat in the literature that link firm-level data with bank-level information.

Thus, to tackle this issue, the paper takes two strategies. The first strategy follows the theory of Section 2 in considering that the countries in which a firm borrows depends on idiosyncratic factors that are defined at the exporting firm-source level, such as cultural and historical factors. Considering this, and guided by the evidence on Brazil of Subsection 2.2, the IV analysis incorporates a variable to identify firms that borrowed in Latin America. In this regard, it is important to note that the introduction of variables defined at the exporting firm-source country level is not only consistent with the theory but also tackles the empirical concern noted above in a direct manner. This is because the actual threat for identification is not the existence of unobservable characteristics *per se* but, instead, the possibility that these characteristics lead firms to borrow in countries with consistently different interest rates, i.e., it is only in this case when the characteristics can be correlated with the index that we use as our instrument.

The second strategy relies on the inclusion of an additional variable defined at the exporting firm-source country level. In this case, rather than using the theory of Section 2, we take an agnostic approach and address the possibility that firms borrow in countries with consistently

different interest rates in an even more direct manner. Precisely, we introduce a dummy that directly identifies exporters that borrowed in countries with consistently different interest rates.

Finally, it is useful to go over a last threat for identification. This threat is relevant in those cases in which the source countries of a firm are also its export destinations. To illustrate this point, consider a firm that exports to and obtains foreign financing from the same country, and assume that a shock hits this economy, e.g., the crisis of 2008. To the extent that the shock affects the real and financial sides of the foreign economy, it may reduce survival in the products market and, at the same time, have an impact on financing conditions. That is, it may create a correlation between our instrument and survival that is not the subject of our study because it does not result from a causal impact of foreign financing on export survival rates. Even though export destinations are not necessarily the same as source countries, Section 5 addresses this point.

In particular, it proceeds in two manners. First, it includes in the estimation information on the GDP growth of the export destination countries. This accounts for the impact of macroeconomic shocks on the real side of the export destinations. Second, it also incorporates different variables to identify firms with a tendency to export to and borrow from the same countries.

5. Empirical Results

5.1 Random-effects Probit Estimation

Table 2 shows the results of the probit model with random effects. The dependent variable equals 1 in the event of exports ceasing and 0 otherwise; thus, a negative coefficient indicates a negative impact of the covariate on the hazard of export ceasing. To follow standard practices, we incorporate the variable Ln(Export year), the natural logarithm of firms' export year. Columns (1)-(6) sequentially introduce firm, industry and destination specific characteristics.

Before proceeding with Columns (1)-(6), note that Ln(Foreign financing), the natural logarithm of 1 plus the foreign financing obtained by a firm, has the expected sign and is significant at the 1% level. Column (2) incorporates two firm-specific variables: Ln(Size), the natural logarithm of a firm's number of employees, and Ln(Domestic financing), the natural logarithm of one plus the debt contracted with domestic banks. Incorporating Ln(Size) helps improve identification to the extent that it is likely to correlate with unobservable determinants of foreign financing and export survival (Forbes, 2007; Manova and Zhang, 2009; Manova, 2013 provide evidence that size correlates, for instance, with firm productivity). Along these lines, several of the unobservable determinants of foreign financing (and export survival) are also likely to affect domestic financing; thus, the introduction of Ln(Domestic financing) should also help identification.

Turning to the results, the effect of Ln(Size) on hazard is not statistically significant. This contrasts with the results of 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 Fu and Wu (2014) do not define firm size in a continuous space as we do may explain the difference. As for Ln(Domestic financing), it is significant at the 5% level and has the expected sign, but it loses statistical significance as more covariates are introduced in the model.

Column (3) incorporates a firm's exports value in its first year as an exporter. Among others, this is motivated by Rauch and Watson's (2003) model of search, according to which relationships with lower-cost suppliers (from less developed countries) feature both relatively large initial orders and long durations. Furthermore, several empirical studies support the importance of initial exports in trade duration (Besedeš and Prusa, 2006b; Brenton, Saborowski and Von Uexkull, 2010; Fugazza and Molina, 2009; Albornoz, Pardo, Corcos and Ornelas, 2012; Stribat, Record and Nghardsaysone, 2013). Albornoz, Pardo, Corcos and Ornelas (2012) also provide support by showing that a large value of initial exports signals a high ability to earn profits abroad, and Artopoulos, Friel and Hallak (2011) argue that this ability requires knowledge on local consumer preferences, business practices and institutional environments that may have been acquired through the formation of foreign networks and exporters' previous experiences.[19] Consistent with this, Table 2 shows that the effect of Ln(Initial exports) on survival is positive and significant at the 1% level in all specifications.

Column (4) incorporates two industry-specific dummies that equal 1 for high-tech and medium-tech intensive industries, respectively, and 0 otherwise. To classify industries, we adopt a criterion similar to the one used by Esteve-Pérez, Mañez-Castillejo, Rochina Barrachina and Sanchis-Llopis (2007). These authors argue that because 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 dummy variables are significant at the 1% (or 5%) level in all specifications.

Column (5) add the weighted GDP growth of exports' destinations. While the inclusion of this variable has been justified in the context of an IV model, the same reasoning holds true for the case of a probit model with random effects (for other studies with macroeconomic controls, see Besedeš and Blyde, 2010; Hess and Person, 2011; Fugazza and McLaren, 2014; Stribat, Record and Nghardsaysone, 2013; Fu and Wu, 2014). Indeed, Column (5) shows that the effect of the

[19] Artopoulos Friel and Hallak (2011) find that knowledge advantage is critical in understanding export pioneering.

GDP growth variable has the expected sign and is statistically significant at the 10% level.

Table 2. Probit model with random effects *

	(1)	(2)	(3)	(4)	(5)	(6)
Ln(Foreign financing)	-0.0837***	-0.0806***	-0.0852***	-0.0793***	-0.0779***	-0.0769***
	[0.0174]	[0.0169]	[0.0191]	[0.0183]	[0.0177]	[0.0171]
Ln(Export year)	-0.529***	-0.474***	-0.0930	-0.140	-0.173	-0.197
	[0.150]	[0.154]	[0.174]	[0.168]	[0.159]	[0.149]
Ln(Size)		-0.0365	-0.00561	-0.0167	-0.0175	-0.0159
		[0.0256]	[0.0346]	[0.0335]	[0.0326]	[0.0318]
Ln(Domestic financing)		-0.0293**	-0.0312**	-0.0304**	-0.0294**	-0.0279*
		[0.0121]	[0.0155]	[0.0150]	[0.0146]	[0.0143]
Ln(Initial exports)			-0.260***	-0.253***	-0.245***	-0.241***
			[0.0419]	[0.0403]	[0.0382]	[0.0357]
Medium technology				-0.277***	-0.261**	-0.232**
				[0.106]	[0.103]	[0.0999]
High technology				-0.196***	-0.180***	-0.163**
				[0.0692]	[0.0670]	[0.0648]
GDP growth					-2.113*	-1.302
					[1.124]	[1.127]
Mercosur						-0.164***
						[0.0561]
Constant	-0.408***	-0.287***	0.0939	0.212*	0.306**	0.356***
	[0.0574]	[0.0751]	[0.109]	[0.115]	[0.126]	[0.126]
Observations	7,120	7,120	7,120	7,120	7,120	7,120
Number of firms	3,265	3,265	3,265	3,265	3,265	3,265
rho	0.21	0.256	0.568	0.534	0.51	0.488
rho s.d.	0.2	0.185	0.107	0.113	0.113	0.111
Log likelihood	-3,595	-3,589	-3,472	-3,465	-3,463	-3,459
Likelihood-ratio test of rho = 0	0.172	0.100	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 equals 1 if the firm ceases exporting and 0 otherwise; Ln(Foreign financing) is the natural logarithm of 1 plus the dollar amount of foreign financing obtained by a firm; Ln(Export year) is the natural logarithm of a firm's export year; Ln(Size) is the natural logarithm of its number of employees; Ln(Domestic financing) is the natural logarithm of 1 plus the dollar amount of domestic banks' debt; Ln(Initial exports) is the natural logarithm of a firm's exports in its first year as an exporter; High and Medium technology a equal to 1 for high-tech and medium-tech intensive industries, respectively, and 0 otherwise. GDP Growth is the weighted average (by share in the total exports in each year) of GDP growth rates in export destination countries; and Mercosur is a dummy variable equal to 1 if more than 50% of firm's export value goes to Mercosur and 0 otherwise.

Nonetheless, this result is overturned in Column (6) as one incorporates the variable Mercosur, which takes the value of 1 if more than 50% of a firm's export value goes to this destination and 0 otherwise. The fact that Argentine exporters may find it easier to survive in Mercosur can imply that firms that mainly sell in this region are 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 1% level and turns GDP growth insignificant. Possibly, this is because Mercosur countries grew at relatively higher rates over the sample.

Finally, focusing on the effect of foreign financing, note that Ln(Foreign financing) has the expected sign and is significant at the 1% level in all specifications. Regarding its quantitative impact, Besedeš (2012) notes that neither the estimated coefficients nor the marginal effects of a probit model informs on the true impact of the covariates on the hazard rate, i.e., the probability that a firm cease exporting in a given year, conditional on its survival up to the beginning of this year. Thus, we follow his approach and calculate hazard rates for firms with different foreign financing, i.e., a firm with no foreign financing and a firm with a level of foreign financing that is at the 75th percentile of the distribution, both with mean values for the remaining covariates. Figures A3.1 and A3.2 state that the difference in the hazard rates of these firms goes from 2.7% in the first year to 2.1% in the firth one.

5.2 Linear Instrumental Variable Model (LIVM)

This subsection uses a LIVM to account for endogeneity and reverse causality concerns, addressing at the same time potential correlation between unobserved heterogeneity, foreign financing and export survival. In this context, and given the analysis of Subsection 5.1, one could argue that the natural following step would be to tackle both random and systematic unobserved heterogeneity simultaneously. Nonetheless, in following this strategy, we take an additional step. In particular, we acknowledge that there are not yet widely accepted tests on weakness of instruments for those cases in which the error terms are not independent and identically distributed (i.i.d.). Thus, we begin by assuming that the error terms in the LIVM fulfill this condition and test for weakness. We break this assumption in 5.3.

In both cases we incorporate the variables mentioned in Subsection 4.2. That is, we incorporate variables defined at the exporting firm-source country level to identify exporters that borrowed in Latin America, exporters that borrowed in countries with consistently different interest rates and, to account for the potential impact of macroeconomic shocks, both the GDP variable considered in Subsection 5.1 and a variable that identifies firms for which its source countries are also export destinations.[20] As noted above, considering variables defined at the firm-source country level is consistent with the theory and the most direct manner to tackle a potential correlation between uncovered heterogeneity and the financial index. This is reassuring because the facts that by definition we have an unbalanced panel and that the average duration is relatively

[20] See notes to Table 3 for formal definitions of these dummy variables.

short implies that we do not have enough degrees of freedom to incorporate firm fixed effects.

Considering this, the model is estimated in two stages: the first stage regresses Ln(Foreign Financing) against the index we use as an instrument and other controls, and the second stage regresses the dependent variable of the previous subsection against the instrument and other controls. In this regard, it is important to note that, among the covariates considered in the probit model, this subsection considers only the variable on GDP growth. Given that most covariates in Subsection 5.1 are correlated with the instrument or the additional variables we incorporate in the LIVM, this ensures that we have sufficient variation. Even more importantly, most of the covariates considered in Subsection 5.1 are endogenous and therefore introducing them in the LIVM model would require that, to preserve an equal number of instruments and endogenous variables, we should include more instruments in the regression. However, this strategy would not add much to our analysis because our variable of interest is Ln(Foreign financing). Moreover, we feel comfortable with the ability of our one-instrument based strategy and, therefore, choose not to threaten our empirical strategy by incorporating more endogenous covariates.

Table 3 presents the results of the first stage. Column (1) shows that, when foreign financing is regressed only against the index, it is significant at the 1% level but does not have the expected sign. Interestingly, however, this result is overturned as we introduce the variable identifying firms that borrowed in Latin America: in Columns (2)-(6), the coefficient on the index is statistically significant at the 1% level and has the expected sign. This is consistent with the hypothesis that not controlling for the variable LATAM foreign financing may create identification problems and that there are determinants other than interest rates affecting a firm's sources of foreign financing. As for LATAM foreign financing, it is also significant at the 1% level and has a sign that is consistent with the interpretation that yields the theory of Section 2.

Using the same specifications as in Table 3, Table 4 shows the results of the second stage. In Column (1), the coefficient of Ln(Foreign financing) is significant at the 5% level; however, the economic interpretation of the coefficient in this column is complicated by the fact that the index does not have the expected sign in the first stage. Starting in Column (2) then, we observe that the coefficient is negative, as expected, and significant at the 1% level. This result is robust to the introduction of the variable above mean interest rate in Column (3) and, interestingly, it is precisely since then that the value of the foreign financing coefficient remains relatively stable. Furthermore, the coefficient of *above mean interest rate* is significant at the 1% and has a negative sign, as speculated above. Indeed, this variable has been included to account for unobservable characteristics of the firms that could lead them to borrow in countries with consistently different

interest rates and not to borrow abroad. Hence, the facts that the coefficient of foreign financing begins to be relatively stable when this variable is included at that the coefficient of this latter variable has the expected sign is reassuring in terms of the empirical strategy we have chosen.

More generally, the outcome that the coefficient associated with foreign financing is significant remains robust to the introduction of all variables in all specifications of Table 4. Hence, we conclude that the foreign financing exerts a positive impact on export survival probabilities, potentially because it provides firms with otherwise unavailable external finance to pay recurrent exporting costs or because it enables them to reduce their costs of financing as speculated above.

Table 3. Linear instrumental variable model: First stage

	(1)	(2)	(3)	(4)	(5)	(6)
Interest rate	10.57***	-4.513***	-4.585***	-4.301***	-4.532***	-4.260***
	[0.857]	[0.804]	[0.806]	[0.804]	[0.804]	[0.803]
Dummy LATAM foreign financing		2.423***	2.408***	2.211***	2.408***	2.218***
		[0.0496]	[0.0511]	[0.0585]	[0.0510]	[0.0584]
Dummy above mean interest rate			0.0594	0.0905*	0.0975**	0.126***
			[0.0480]	[0.0480]	[0.0483]	[0.0484]
Dummy export-foreign financing				0.455***		0.439***
				[0.0668]		[0.0668]
GDP growth					-5.472***	-5.197***
					[0.949]	[0.947]
Constant	0.522***	0.600***	0.565***	0.516***	0.801***	0.741***
	[0.0494]	[0.0428]	[0.0512]	[0.0516]	[0.0655]	[0.0659]
Observations	7,120	7,120	7,120	7,120	7,120	7,120
R-squared	0.021	0.267	0.267	0.271	0.270	0.275

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 the natural logarithm of 1 plus the dollar amount of foreign financing obtained by a firm; *Interest rate* is the index defined in Equations (5)-(8); LATAM foreign financing equals 1 if at least 1 fund supplier is in LATAM and 0 otherwise; above mean interest rate equals 1 if the firm receives funds from at least 1 country whose time dimension collapsed money market interest rate mean is above the cross-section (time dimension collapsed) sample mean or did not receive foreign financing and 0 otherwise; and export-foreign financing equals 1 if the firm's main origin country coincides with its main export destination and 0 otherwise; GDP Growth is the weighted average (by share in the total exports in each year) of GDP growth rates in export destinations.

The lower part in Table 4 shows the results of different tests concerning endogeneity and weakness of the instrument in the context of IV estimation. Note first that the test of endogeneity of endogenous regressors confirms the need of instrumenting foreign financing in order to obtain a consistent estimator of its effect on firms' survival.

Regarding weakness of instruments, we implement two tests. As a first glance, we use Staiger and Stock's rule of thumb (Staiger and Stock, 1997), according to which the hypothesis that the instrument is weak can be rejected when the F-statistic of the first stage is greater than 10. Because

for the regression shown in Column (6) of Table 3 (our preferred specification) the F-statistic is 15.296, the rule of thumb rejects the weakness hypothesis. However, this rule has been criticized leading to the use of other tests that focus on the bias that one would obtain if instruments were weak relative to the bias that one would obtain with an OLS, i.e., due to endogeneity (Stock and Yogo, 2005). One of them is the Cragg-Donald test reported in Table 4, according to which we can rejects the hypothesis that our bias is more than 10% greater than the bias of an OLS with a 0% risk of making an error of type I, i.e., the 10% and 5% are common values in the literature. Precisely, the value for the Wald statistic in Table 4 is 28.17 and greater than 16.38, the one required for rejecting the hypothesis.

Table 4. Linear instrumental variable model: Second stage

	(1)	(2)	(3)	(4)	(5)	(6)
Ln(Foreign financing)	-0.0409**	-0.164***	-0.283***	-0.297***	-0.284***	-0.298***
	[0.0170]	[0.0512]	[0.0617]	[0.0679]	[0.0626]	[0.0687]
Dummy LATAM foreign financing		0.209*	0.608***	0.597***	0.611***	0.600***
		[0.119]	[0.143]	[0.144]	[0.145]	[0.147]
Dummy above mean interest rate			-0.442***	-0.434***	-0.437***	-0.429***
			[0.0170]	[0.0181]	[0.0177]	[0.0191]
Dummy export-foreign financing				0.105***		0.104***
				[0.0403]		[0.0397]
GDP growth					-0.650	-0.663
					[0.482]	[0.499]
Constant	0.274***	0.345***	0.677***	0.673***	0.706***	0.703***
	[0.0186]	[0.0218]	[0.0270]	[0.0270]	[0.0436]	[0.0442]
Observations	7,120	7,120	7,120	7,120	7,120	7,120
Centered R^2	0.003	-0.406	-1.094	-1.229	-1.106	-1.24
Underidentification test (Kleibergen-Paap rk LM statistic)	0.000	0.000	0.000	0.000	0.000	0.000
Weak identification test (Cragg-Donald Wald F statistic)	152.2	31.53	32.38	28.59	31.78	28.17
Hansen J statistic (overidentification test of all instruments)	0.000	0.000	0.000	0.000	0.000	0.000
Endogeneity test of endogenous regressors	0.259	0.000	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 1 if the firm ceases exporting and 0 otherwise; Ln(Foreign financing) is the natural logarithm of 1 plus the foreign financing obtained by a firm; LATAM foreign financing equals 1 if at least 1 fund supplier is in LATAM and 0 otherwise; above mean interest rate equals 1 if the firm receives funds from at least 1 country whose time dimension collapsed money market interest rate mean is above the cross-section (time dimension collapsed) sample mean or did not receive foreign financing and 0 otherwise; and export-foreign financing equals 1 if the firm's main origin country coincides with its main export destination and 0 otherwise; GDP Growth is the weighted average (by share in the total exports in each year) of GDP growth rates in export destinations.

As for the comparison between the LIVM and the probit model, in both cases the coefficient is statistically significant and has the expected sign. Regarding the quantitative results obtained with each model, it is worth noting that they are not directly comparable. Nonetheless, caveats aside, one could explore if at first glance they are at least of the same order of magnitude. It stands out that the difference between the survival probability for a firm with no foreign financing and for a

firm that has a level of foreign financing that is at the 75th level of the distribution is equal to 32% in the LIVM model. This number is relatively large, suggesting again that not accounting for endogeneity and reverse causality may generate a downward bias in our results.

We can further investigate this hypothesis by comparing the results of the LIVM with those of other models that do not account explicitly for endogeneity and reverse causality. To this end, we begin by estimating specifications of Tables 3 and 4 but with an OLS estimation. Note in Table 4.b of the appendix that in the OLS model the coefficient of foreign financing is not statistically significant at any of the commonly accepted levels, i.e., 10%, 5%, or 1%. This reinforces the idea that not accounting for endogeneity or reverse causality generates a downward bias in our results.

5.3 Robustness checks

This subsection conducts three robustness checks. The first one complements the probit model by estimating a framework that has also been widely used in the literature, a clog-log model. Considering the same dependent variable and covariates as in the probit setup of Subsection 5.1, Table 5 in Appendix Section 3 shows the results. In this table, the coefficient associated with foreign financing is significant at the 1% level in all specifications and has the same sign as in Subsection 5.1. Thus, we argue that our probit results are robust to the use of a clog-log model.

In the second robustness check, we break the assumption that the error terms in the LIVM are i.i.d. In doing so, we opt for not considering a LIVM with random effects; instead, we consider a LIVM in which we cluster errors at the level of firms. The strategy acknowledges that multiple observations may pertain to the same exporting firm. Moreover, since in this case the error terms are not i.i.d. and thus their variances are not conditionally homoscedastic, neither Staiger and Stock's rule of thumb nor the Cragg-Donald remains valid. Hence, we rely on the Olea and Pflueger test (2013) because it remains valid even in the presence of heteroskedasticity, autocorrelation and clustering errors. The results of the two stages are shown in Tables 5 and 6 of the appendix. Note in Table 6 that 28.17 is above 23.109 (the number reported in Table 6 and the critical value, respectively), implying that the hypothesis that our bias is 10% greater than the bias we would obtain with an OLS estimation with a 5% type I error.

Finally, the third robustness check uses an alternative definition for export-foreign financing so that this variable is equal to 1 a higher number of times, i.e., we are more severe in controlling for firms for which the source countries tend to be export destination s. In particular, Tables 7 and 8 in the appendix considers cases in which this variable is equal to 1 when the fund supplier coincides with either the first or the second most export destination of the firm and when it coincides with its first, second or third main export destination, respectively. Indeed, by

comparing these tables to Tables 3 and 4, it is possible to note that the use of an alternative definition for export-foreign financing does not change qualitatively the results.

6. Conclusions

This paper uses a rich dataset on Argentine exporters' financial information to assess the impact of foreign financing on export survival rates. Preliminary evidence based on this information is consistent with the fact that Argentine exporters used foreign financing to obtain external finance that would be otherwise unavailable in the domestic market, as well as to obtain it at smaller financial costs. Along these lines, econometric methods traditionally used in the literature, such as the probit model with random effects and the clog-log, show that foreign financing is significantly and positively associated with higher export survival rates.

Considering that these methods are unable to account for endogeneity and reverse causality concerns, we tackle this issue by complementing them with a linear instrumental variable model, which we theoretically found and guide with the theory we have developed in Section 2. Enabling us to establish a causal relationship between finance and survival, this model suggests that foreign financing raises survival in the export market. Moreover, the impacts estimated with this model are of a larger order of magnitude than the impacts estimated with the probit and clog-log setups. This, along with the fact that in an OLS estimation this impact is not significantly different from zero, suggests that not accounting for endogeneity and reverse causality generates downward bias.

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Appendix 1

Formal Definition of Propositions 1-5

Proposition 1. Under the assumptions stated in Subsection 2.3.1, there is a cutoff ability to deal with the foreign 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 $j \neq j'$), holding everything else constant, a greater ability to deal with the investor from j is associated with a greater fraction of debt contracted in this country. Formally, we write: let us call two 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 and $\gamma''_{ij} > \overline{\gamma_{ij}}$ 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 optimization problem in (1)-(1.3) when γ_{ij} equal γ'_{ij} and γ''_{ij}, respectively.

Propositions 1 and 2 state that exporters tend to borrow in countries in which they find it easier to overcome asymmetric information constraints related to financial contracting. That is, in the model there are characteristics of firms determining its optimal debt portfolio. As for Proposition 1, it can be used to derive the following propositions (for the proofs, see the Appendix)

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 $F_{ij}(\overline{r_{ij}} - \varepsilon) + F_{ij'}(\overline{r_{ij}} - \varepsilon) < F_{ij'}(\overline{r_{ij}})$.

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 0. 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:

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

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

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

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

(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:

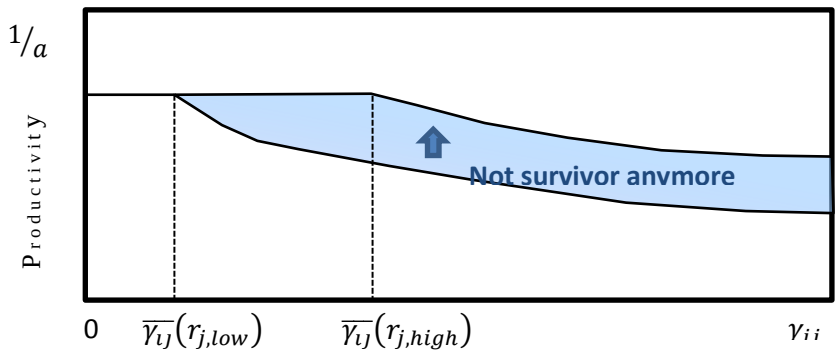
$$F_i = F_{if} + F_{id} = \frac{f_e(12d^2 - d^2 r_{j\prime}^2 - d^2 r_j^2 + 2dr_{j\prime}\left(6d + 7dr_j + \gamma_{ij\prime} - \lambda\gamma_{ij\prime} - 3(1-\lambda)\gamma_{ij}\right) + 2dr_j\left(6d - 3(1-\lambda)\gamma_{ij\prime} + \gamma_{ij} - \lambda\gamma_{ij}\right) - (1-\lambda)(\gamma_{ij\prime}\left(4d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

Now take the following derivative

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

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

Figure 3. Frontier of Export Survival



Appendix 2: Tables mentioned in Section 3

Table A2.1. Foreign debt of the Non-financial private sector (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: Central Bank of Argentina, Report on external debt, loans and deposits.

Table A2.2. Percentage of New Exporters

Condition	**Number of firms**	**%**
Already exporters in 2003	3,312	50.4
Starters	3,265	49.6
Total	6,577	100

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

Table A2.3. Financing and spell length

Type of Financing	**Mean of spell**	**p-value**
Without Foreign Financing	1.93	0.000
With Foreign Financing	2.75	
Without Domestic Financing	1.85	0.000
With Domestic Financing	2.45	

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

Appendix 3: Tables and Figures mentioned in Section 4

Table 5. Clog-log with frailty model

	(1)	(2)	(3)	(4)	(5)	(6)
			$e^{(\beta)}$			
Ln(Foreign financing)	0.895***	0.900***	0.901***	0.907***	0.908***	0.908***
	[0.0167]	[0.0165]	[0.0214]	[0.0202]	[0.0196]	[0.0191]
Ln(Export year)	0.381***	0.402***	0.682	0.638**	0.616**	0.602***
	[0.0692]	[0.0718]	[0.166]	[0.143]	[0.128]	[0.117]
Ln(Size)		0.958	0.995	0.982	0.980	0.982
		[0.0295]	[0.0416]	[0.0395]	[0.0387]	[0.0381]
Ln(Domestic financing)		0.963**	0.963*	0.964**	0.965**	0.966*
		[0.0146]	[0.0187]	[0.0181]	[0.0177]	[0.0175]
Ln(Initial exports)			0.737***	0.744***	0.750***	0.753***
			[0.0373]	[0.0344]	[0.0323]	[0.0304]
Medium technology				0.727**	0.740**	0.767**
				[0.0920]	[0.0913]	[0.0929]
High technology				0.790***	0.804***	0.820**
				[0.0642]	[0.0637]	[0.0635]
GDP growth					0.0684*	0.224
					[0.0966]	[0.316]
Mercosur						0.809***
						[0.0560]
Constant	0.437***	0.504***	0.710***	0.824	0.935	0.996
	[0.0455]	[0.0562]	[0.0877]	[0.104]	[0.132]	[0.141]
Observations	7,120	7,120	7,120	7,120	7,120	7,120
Number of firms	3,265	3,265	3,265	3,265	3,265	3,265
rho	0.043	0.075	0.462	0.415	0.392	0.374
rho s.d.	0.209	0.188	0.138	0.138	0.133	0.127
Log likelihood	-3,601	-3,594	-3,478	-3,472	-3,470	-3,465
Likelihood-ratio test of rho = 0	0.421	0.350	0.000	0.000	0.000	0.001

Standard errors in brackets

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

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

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

Notes: The dependent variable equals 1 if the firm ceases exporting and 0 otherwise; Ln(Foreign financing) is the natural logarithm of 1 plus the dollar amount of foreign financing obtained by a firm; Ln(Size) is the natural logarithm of its number of employees; Ln(Export year) is the natural logarithm of a firm's export year; Ln(Domestic financing) is the natural logarithm of 1 plus the dollar amount of domestic banks' debt; Ln(Initial exports) is the natural logarithm of a firm's exports in its first year as an exporter; High and Medium technology a equal to 1 for high-tech and medium-tech intensive industries, respectively, and 0 otherwise. GDP Growth is the weighted average (by share in the total exports in each year) of GDP growth rates in export destination countries; and Mercosur is a dummy variable equal to 1 if more than 50% of firm's export value goes to Mercosur and 0 otherwise. Unobserved heterogeneity is assumed to follow a Normal distribution.

Table 6. Linear instrumental variable model with clustered errors: 1st stage

	(1)	(2)	(3)	(4)	(5)	(6)
Interest rate	10.57***	-4.513***	-4.585***	-4.301***	-4.532***	-4.260***
	[1.550]	[1.486]	[1.491]	[1.517]	[1.487]	[1.514]
Dummy LATAM foreign financing		2.423***	2.408***	2.211***	2.408***	2.218***
		[0.0955]	[0.0961]	[0.128]	[0.0960]	[0.128]
Dummy above mean interest rate			0.0594	0.0905	0.0975*	0.126**
			[0.0587]	[0.0568]	[0.0589]	[0.0576]
Dummy export-foreign financing				0.455***		0.439***
				[0.164]		[0.162]
GDP growth					-5.472***	-5.197***
					[1.184]	[1.142]
Constant	0.522***	0.600***	0.565***	0.516***	0.801***	0.741***
	[0.0858]	[0.0774]	[0.0809]	[0.0791]	[0.102]	[0.0968]
Observations	7,120	7,120	7,120	7,120	7,120	7,120
R-squared	0.021	0.267	0.267	0.271	0.270	0.275

Robust 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 the natural logarithm of 1 plus the dollar amount of foreign financing obtained by a firm; *Interest rate* is the index defined in Equations (5)-(8); above mean interest rate equals 1 if the firm receives funds from at least 1 country whose time dimension collapsed money market interest rate mean is above the cross-section (time dimension collapsed) sample mean or did not receive foreign financing and 0 otherwise; ATAM foreign financing equals 1 if at least 1 fund supplier is in LATAM and 0 otherwise; GDP Growth is the weighted average (by share in the total exports in each year) of GDP growth rates in export destinations; e*xport-foreign financing 2* equals 1 if a firm's first or the second main financial fund supplier of a firm coincides with its main export destination and zero otherwise; *export-foreign financing 3* equals 1 if a firm's first, second or third main financial fund supplier coincides with its main export destination and zero otherwise.

Table 7. Linear instrumental variable model with clustered errors: 2nd stage

	(1)	(2)	(3)	(4)	(5)	(6)
Ln(Foreign financing)	-0.0409**	-0.164**	-0.283***	-0.297**	-0.284***	-0.298**
	[0.0186]	[0.0710]	[0.103]	[0.116]	[0.105]	[0.117]
Dummy LATAM foreign financing		0.209	0.608**	0.597**	0.611**	0.600**
		[0.166]	[0.240]	[0.247]	[0.244]	[0.251]
Dummy above mean interest rate			-0.442***	-0.434***	-0.437***	-0.429***
			[0.0214]	[0.0233]	[0.0228]	[0.0255]
Dummy export-foreign financing				0.105		0.104
				[0.0745]		[0.0736]
GDP growth					-0.650	-0.663
					[0.691]	[0.730]
Constant	0.274***	0.345***	0.677***	0.673***	0.706***	0.703***
	[0.0206]	[0.0295]	[0.0408]	[0.0410]	[0.0676]	[0.0694]
Observations	7,120	7,120	7,120	7,120	7,120	7,120
Centered R^2	0.003	-0.406	-1.094	-1.229	-1.106	-1.24
Underidentification test (Kleibergen-Paap rk LM statistic)	0.000	0.003	0.003	0.005	0.003	0.006
Montiel-Pflueger robust weak instrument test	152.2	31.53	32.38	28.59	31.78	28.17
Hansen J statistic (overidentification test of all instruments)	0.000	0.000	0.000	0.000	0.000	0.000
Endogeneity test of endogenous regressors	0.302	0.000	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.

Notes: The dependent variable is 1 if the firm ceases exporting and 0 otherwise; Ln(Foreign financing) is the natural logarithm of 1

plus the foreign financing obtained by a firm; LATAM foreign financing equals 1 if at least 1 fund supplier is in LATAM and 0 otherwise; above mean interest rate equals 1 if the firm receives funds from at least 1 country whose time dimension collapsed money market interest rate mean is above the cross-section (time dimension collapsed) sample mean or did not receive foreign financing and 0 otherwise; e*xport-foreign financing 2* equals 1 if a firm's first or the second main financial fund supplier of a firm coincides with its main export destination and zero otherwise; and *export-foreign financing 3* equals 1 if a firm's first, second or third main financial fund supplier coincides with its main export destination and zero otherwise

Table 8. Linear instrumental variable model with alternative controls: 1st stage

	1st or 2nd country	1st, 2nd or 3rd country
Interest rate	-2.892***	-2.456***
	[0.740]	[0.733]
Dummy above mean interest rate	0.213***	0.217***
	[0.0445]	[0.0440]
Dummy LATAM foreign financing	1.565***	1.482***
	[0.0522]	[0.0521]
GDP growth	-3.586***	-3.273***
	[0.873]	[0.865]
Dummy export-foreign financing 2	2.376***	
	[0.0653]	
Dummy export-foreign financing 3		2.481***
		[0.0640]
Constant	0.494***	0.453***
	[0.0607]	[0.0602]
Observations	7,120	7,120
R-squared	0.385	0.397

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 the natural logarithm of 1 plus the dollar amount of foreign financing obtained by a firm; *Interest rate* is the index defined in Equations (5)-(8); above mean interest rate equals 1 if the firm receives funds from at least 1 country whose time dimension collapsed money market interest rate mean is above the cross-section (time dimension collapsed) sample mean or did not receive foreign financing and 0 otherwise; LATAM foreign financing equals 1 if at least 1 fund supplier is in LATAM and 0 otherwise; GDP Growth is the weighted average (by share in the total exports in each year) of GDP growth rates in export destinations; e*xport-foreign financing 2* equals 1 if a firm's first or the second main financial fund supplier of a firm coincides with its main export destination and zero otherwise; and *export-foreign financing 3* equals 1 if a firm's first, second or third main financial fund supplier coincides with its main export destination and zero otherwise.

Table 9. Linear instrumental variable model with alternative controls: 2nd stage

	1st or 2nd country	1st, 2nd or 3rd country
Ln(Foreign financing)	-0.444***	-0.523***
	[0.128]	[0.170]
Dummy above mean interest rate	-0.371***	-0.352***
	[0.0340]	[0.0434]
Dummy LATAM foreign financing	0.624***	0.703***
	[0.192]	[0.244]
GDP growth	-0.692	-0.811
	[0.634]	[0.748]
Dummy export-foreign financing 2	1.048***	
	[0.307]	
Dummy export-foreign financing 3		1.295***
		[0.427]
Constant	0.698***	0.715***
	[0.0547]	[0.0670]
Observations	7,120	7,120
Centered R^2	-2.552	-3.568
Underidentification test (Kleibergen-Paap rk LM statistic)	0.000	0.001
Weak identification test (Cragg-Donald Wald F statistic)	15.30	11.24
Hansen J statistic (overidentification test of all instruments)	0.000	0.000
Endogeneity test of endogenous regressors	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 1 if the firm ceases exporting and 0 otherwise; Ln(Foreign financing) is the natural logarithm of 1 plus the foreign financing obtained by a firm; LATAM foreign financing equals 1 if at least 1 fund supplier is in LATAM and 0 otherwise; above mean interest rate equals 1 if the firm receives funds from at least 1 country whose time dimension collapsed money market interest rate mean is above the cross-section (time dimension collapsed) sample mean or did not receive foreign financing and 0 otherwise; e*xport-foreign financing 2* equals 1 if a firm's first or the second main financial fund supplier of a firm coincides with its main export destination and zero otherwise; and *export-foreign financing 3* equals 1 if a firm's first, second or third main financial fund supplier coincides with its main export destination and zero otherwise.

Figure A3.1 Hazard Rate of Export Ceasing- Probit model- Effect of foreign financing-

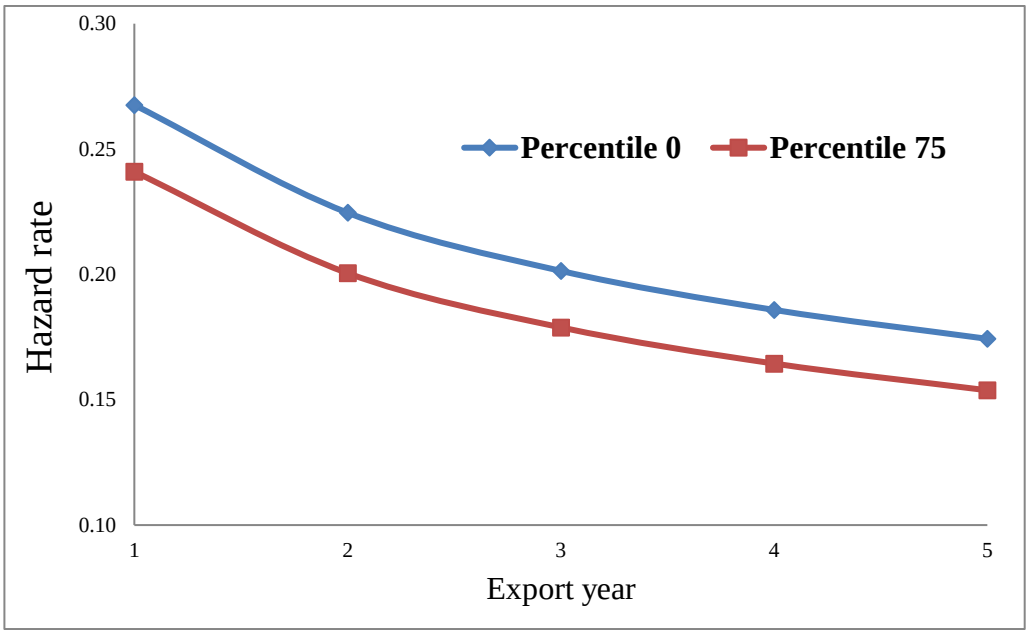


Figure A3.2 Hazard Rate of Export Ceasing- clog-log model - Effect of foreign financing.-