Survival in export markets: Does foreign financing matter?*

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First draft: August , 2015

Abstract

Exporting is a finance intensive activity. However, exporters may be confronted with domestic credit constrains and/or high costs of funding in domestic financial markets. In this context, access to better financing conditions through the international markets provides exporters with alternative sources of financing and liquidity. In this paper, we explore whether access to foreign financing increases the probability of export survival for Argentina firms. For this purpose, we exploit a rich firm-level data set on financial variables and trade flows over the period 2004-2008, following the Argentinian financial crisis of 2001. Using an IV model, in which foreign financing is instrumented with the money market interest of the country where the funds originate, we are able to explicitly establish a positive causal relationship between foreign financing and export survival, accounting for non-stochastic unobserved heterogeneity. Our result remains robust to the use of more conventional survival analysis models as a probit random effects model and a clog-log duration model, indicating that export survival rates increase with foreign financing.

JEL Classification codes: F10, F13, G20, G28

Keywords: Credit constraints, bank credit, international trade

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1 Introduction

Exporting is a finance intensive activity. Exporters need large amounts of working capital to pay up-front costs in terms design, marketing and distribution, and face long time-lags between production and receipt sales revenue (Becker et al., 2012; Chor and Manova, 2010; Amiti and Weinstein, 2011).[1] Further, they frequently need financial insurance to face the additional transaction risks involved in international sales. By giving exporters the opportunity to fulfill these needs, access to external finance has the potential to improve their export performance.

The statement that finance is relevant for international trade is supported by a recent literature showing that financial development is a source of a comparative advantage in finance-intensive goods (see, for instance, Beck, 2002; Svaleryd and Vlachos, 2008 and Manova, 2011).[2] However, this literature has focused on the intensive and extensive margins of trade, overlooking the incidence of finance and access to better financing conditions on export survival rates. This fact is surprising given that export survival has recently been at the forefront of the debate on export performance and economic development (Besedes and Prusa, 2006 a. and b.; Besedes and Blyde, 2010; Eaton et al., 2011 and Albornoz et al. 2012). Further, it is surprising because a set of papers notes that finance reduces variable exporting costs, suggesting that access to better financing conditions may raise export survival rates (Feenstra, Li and Yu, 2013 and Kohn, 2014).

To the best of our knowledge, Besedes and Blyde (2010) and Jaud, et al. (2014) are the only papers that link finance to export survival.[3] Both studies find that financial development

[1] Amiti and Weinstein (2011) point out the relevance of the access to short-term dollar denominated credit (trade credit) for the export activity. They describe in great detail the crucial role of this type of international markets financing for trade. Chor and Manova (2010) highlight three motives why export activity is more finance intensive than domestic activities.

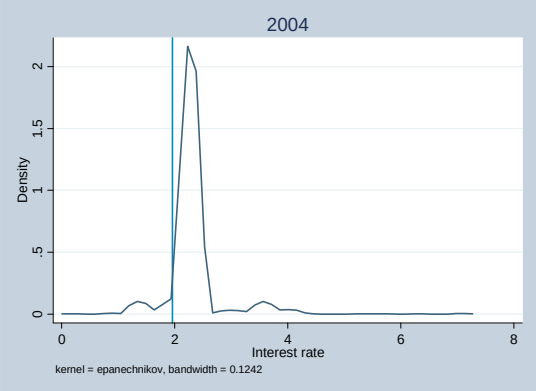
[2] This literature shows that financially developed countries have a comparative advantage in finance-intensive goods Beck (2002) uses a 30-year panel for 65 countries. Manova (2007) tests her predictions with a sample of 107 countries and 27 sectors for the period 1985-1995, and Svaleryd and Vlachos (2005) show that that financial conditions are more relevant to explain specialization patterns than differences in human and physical capital. See Chaney (2005) and Hur et al. (2006) for other works investigating the incidence of liquidity constraints and financial development on export performance.

[3] Besedes and Blyde (2010) find that financial development, proxied by the ratio of credit-to-GDP, increases survival rates. Along similar lines, Jaud, et al. (2014) show that finance matters for sustainable export performance, as goods with higher export-related financial needs disproportionately benefit from better financial development. Paravisini, Rapaport, Schnabl and Wolfenson (2015) study the incidence of finance on entry and exit in the exports market. However, they do not constrain their sample to new exporters, who mostly determine the consolidation of an exporting sector and for whom financing conditions may be more relevant, since they do not use standard

improves the prospects for survival; however, notwithstanding their great contribution, these papers present two flaws. First, they use financial data disaggregated at the country level and are thus unable to exploit heterogeneity across firms and different financing forms. Second, they constrain themselves to the use of standard survival techniques and cannot, as a result, establish causality in their results. In the present paper, we contribute to the young literature on finance and export survival by overcoming these flaws.

The present paper employs a novel firm-level data set on trade flows and financial characteristics, and is thus able to exploit heterogeneity across firms and financing forms. In particular, we focus on financing obtained through the international market for two reasons. First, foreign financing enables exporters to pay lower interest rates (see Ahn, 2011).[4] Second, it may also enable them to overcome domestic credit constrains. These two motives for foreign financing are supported by Figures 1-5, that show the distribution of average money market interest rates of all countries where the funds of a firm originate for each of the years comprised in our sample. Note that the average is lower than the Argentinean money market interest rate for most of the firms in every year, except for 2004. It is precisely in this year when foreign financing seems to have enabled Argentinean exporters to overcome domestic financial constrains, i.e. note in Figure 6 that the maximum effect of the 2001 financial crisis on the ratio of credit-to-GDP is observed in 2004.

Figure 1. Distribution of average money market interest rates



survival techniques. Further, they focus exclusively on financial resources intermediated by the domestic financial market and analyze the effects of a one-time shock, i.e. the most recent financial crisis.

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

Figure 2. Distribution of average money market interest rates

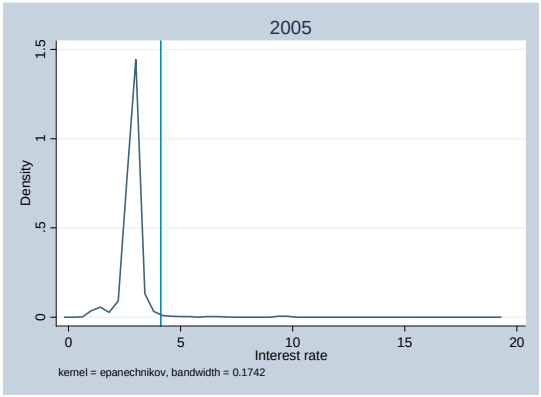


Figure 3. Distribution of average money market interest rate

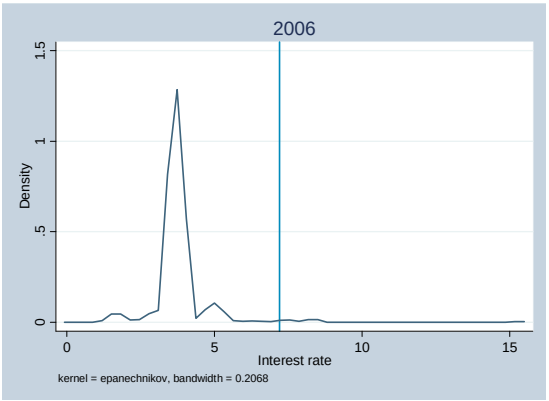


Figure 4. Distribution of average money market interest rate

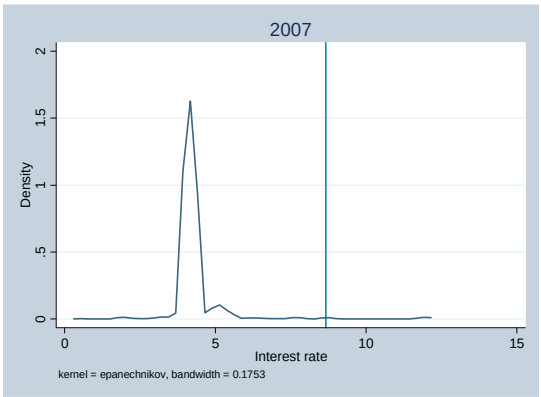


Figure 5. Distribution of average money market interest rate

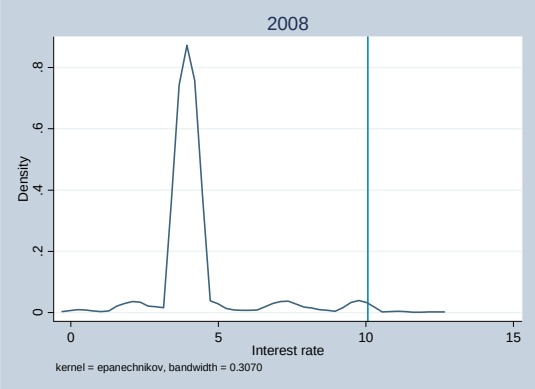
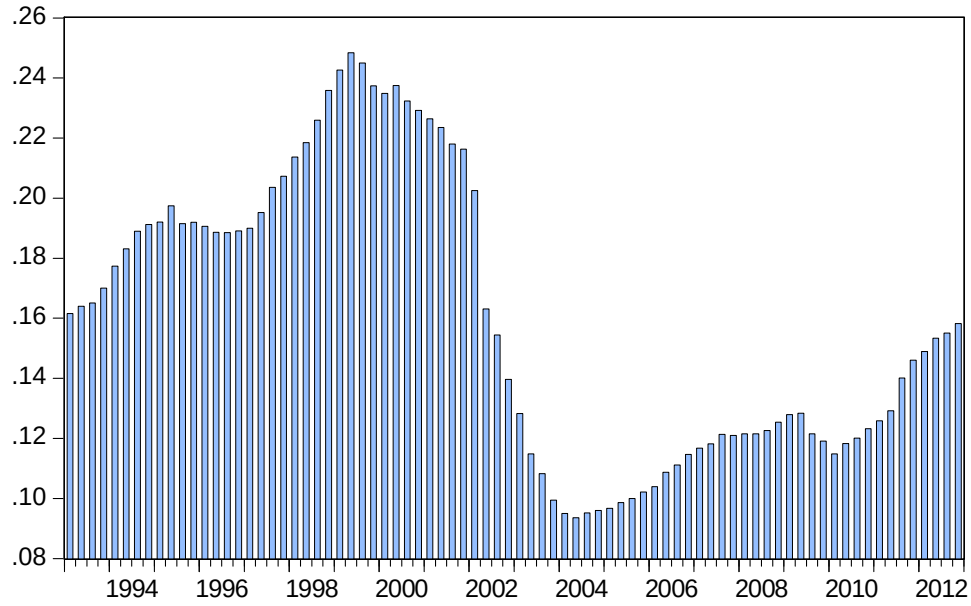


Figure 6. Ratio of Credit to GDP (%)



In order to overcome the second flaw of the young literature on finance and export survival, the paper complements the use of standard survival techniques with an instrumental variable probit model, which establishes causality between foreign financing and export survival. In particular, we consider two time discrete survival models: a clog-log with frailty and a probit random effects. In contrast with the continuous time Cox model, the clog-log and the probit

random effects can deal with potential bias stemming from the annual disaggregation of trade data and from stochastic unobserved heterogeneity (Hess and Persson, 2012 and Perez-Estevez, 2014). Further, the probit random effects avoids the restrictive proportionality assumption, according to which the effect of regressors on the hazard is constant over duration time.

In addition, the paper estimates an instrumental variable Probit model with the goal of establishing a casual relationship between foreign financing and export survival rates. In particular, the paper instruments foreign financing with the money market interest rate of the country where the funds originate. This variable captures time-variation stemming from changes in the credit supply conditions of the funds' origin countries, enabling us to account for potential bias arising from time-varing unobservable characteristics. To our knowledge, the first attempt to develop a systematic identification strategy using instrumental variables in the context of finance and export survival.

The paper relates closely to an emerging literature on export survival. A strand of this research investigates the role played by country and industry level variables, such as the degree of a product's differentiation or differences in GDP, on export survival (see Hess and Persson 2011; Besedes and Prusa 2007; Besedes 2008; Fugazza and Molina 2009; Nitsch 2009; Brenton et al. 2009a; Brenton et al. 2009b; Araujo, Mion and Ornelas 2012 and Cadot et al. (2013). A different strand of research examines the role of played by firm-level characteristics, considering variables as size (Fu and Wu 2014), the initial value of a firm's exports (Fugazza and McLaren 2014) and foreign capital participation (Esteve Perez et al., 2007; see Volpe and Carballo 2008; Tovar and Martinez 2011; Stribat 2012 and Jaud et al. 2014 for other references).

The paper also relates to the work by Albornoz et al. (2012). They use data on export values of manufacturing firms between 2002 and 2007 to show that the behavior of Argentine exporters follows a sequential pattern. In line with their results, we find that survival rates in Argentina are low.

The paper is organized as follows: in section 2 we describe the data set and provide some descriptive analysis to motivate our empirical exercise. In section 3 we describe our variables of interest and provide in section 4 a description of our methodological approach. The results of our empirical exercise are presented in section 5. Finally, section 6 concludes.

2 Channels Linking Foreign Financing and Export Surviving

2.1 Literature review

An important number of recent studies have provided theoretical and empirical support to the notion that the exporting activity is particularly dependent on outside capital. First, exporters face additional up front fixed and variable outlays that are specific to international trade: Learning about the profitability of export opportunities; making market-specific investments in capacity, product customization, regulatory compliance; the setting up and maintenance of foreign distribution networks, international shipping costs, duties and goods insurance (Manova, 2012; Chor and Manova, 2012; Del Prete and Federico, 2012; Berman and Héricourt, 2010; Becker, Chen and Greenberg, 2012; Chaney, 2005; Contessi and de Nicola, 2012). Second, international transactions take a long time to execute. So, firms engaged in international trade are likely to be quite working-capital intensive so as to cover the costs of goods that have been produced but not yet delivered (Amiti and Weinstein, 2013; Chor and Manova, 2012; Del Prete and Federico, 2012; Kohn et al., 2012; Manova, 2012; Ahn, 2011; Antràs and Foley, 2011; Foley, Johnson and Lane, 2010). Furthermore, some variable trade costs, such as shipping and duties, have to be incurred before export revenues are realized (Chor and Manova, 2012; Manova 2012). Third, because enforcing payments across country boundaries might be difficult, especially in distant countries with a different legal system, exporting involves additional risks than producing for the domestic market. Thus, exporters need credit insurance to cover the uncertainty involved in cross-border transactions (Amiti and Weinstein, 2013; Manova, 2012; Del Prete y Federico, 2012; Ahn, 2011; Foley, Johnson and Lane, 2010; Contessi and de Nicola, 2012).

If exporters are dependent on outside capital to finance variable and per period fixed costs and not just sunk entry costs, as it is shown in Manova (2012), Feenstra, Li and Yu (2013), Del Prete and Stefano (2012) and Paravisini et al. (2014), adverse financial conditions, by increasing the cost of external capital, can reduce exporters profits and thus, depending on their productivity, impact on their survival probability. A vast number of recent sudies has revealed the importance of the financial channel to explain the collapse of trade global induced by the financial crisis (Amiti and Weinstein, 2013; Manova, 2012; Del Prete y Federico, 2012; Ahn, 2011; Foley, Johnson and Lane, 2010; Contessi and de Nicola, 2012).

However, adverse financial conditions can be not just circumstantial for exporters, but rather a permanent part of the environement they have to deal with, taking into account that the costs

they afford are quite difficult to observe and the fact that they produce intangible assets with long gestation periods which are firm-specific. This is particularly true in developing countries, where the lack of depth of financial markets can limit the export activity in different manners, affecting the intensive and the extensive margins of trade and furthermore, the probability of exporters to survive.

While the effects of financial frictions on the intensive and extensive margins of trade and the importance of financial development and financial stability for trade have been the focus of the above mentioned studies, there are two aspects that remain uncovered by this literature. The first one is the relevance of access to financing for the survival of exporters, considering that the empirical evidence indicates that the exporting activity demands the use of external funds not just to finance firms' entrance in international markets but rather their variable and per period fixed costs. The second is the role that foreign financing can have in alleviating credit constraints for exporters, by widening their financing opportunities, particularly to those of developing countries, where domestic financing is usually either more expensive or scarce. Our aim in this paper is precisely to address this two issues empirically. In the next subsection we begin by motivating our empirical exercise with a simple model based in Manova (2012).

2.2 A motivating Model

In order to motivate the empirical analysis, this section develops a simple model that illustrates a specific channel through which foreign financing increases export survival rates (see 2.1 for other channels). Using some features from the static, partial equilibrium setup developed by Manova (2013), the model shows that: (i) foreign financing can result from domestic credit constraints in the event of a financial crisis and that (ii) under normal circumstances, domestic financing is preferred over foreign financing unless interest rates are sufficiently smaller abroad. In this context, foreign financing enables firms to survive in the export market by reducing the financial costs of circumventing liquidity constraints. Because the empirical analysis instruments with foreign interest rates, special attention is paid to the effect of these rates on export survival.

2.2.1 Model Setup

The model investigates whether domestic exporters (e.g. from Argentina) remain in or leave the export market in a given period. These exporters produce a continuum of differentiated goods, over which foreign consumers have preferences summarized by the following C.E.S. function:

$\left[\int_0^{\cap} q_f(w)^{\alpha} dw\right]^{\frac{1}{\alpha}}$, where $\cap$ is the set of varieties produced by domestic exporters, $\varepsilon = \frac{1}{1-\alpha}$ is the elasticity of substitution and P=$\left[\int_0^{\cap} p(w)^{1-\varepsilon} dw\right]^{\frac{1}{1-\varepsilon}}$ denotes the ideal price index[5].

Exporting costs are modeled just as in Manova (2013)[6]. Firms are distributed according to a cumulative distribution $G(a_i)$ with support $[aL, aH]$, $aH > aL > 0$, where is a_i the cost of manufacturing 1 unit of output for firm i. Exporters face a per-period fixed exporting cost f_e that must be borne up-front and also incur trade costs of the iceberg form, i.e., $\tau > 1$ units of a product must be shipped for 1 unit to arrive[7].

Exporters finance variable costs with cash flows from operations[8]. However, just as in Manova (2013), there is a fraction d of the per-period fixed exporting cost f_e that cannot be funded internally. To focus on the effect of these constraints on survival, it is assumed that liquidity is the only obstacle preventing a firm from staying in the export market.

Firms must contract with investors and pledge collateral to cover their financial needs, i.e., f_e. Financial contracting proceeds as follows. There is a domestic and a foreign investor. Firms can contract with one of them or both. Investors expect to be repaid with probability λ and, thus, with probability $1-\lambda$ the contract is not enforced, the firm defaults, and the collateral is seized. Firms bargain with the corresponding investor(s) on the size of the loan, the repayment and the collateral. For simplicity, we assume that exporters keep all quasi-rents and investors break even in expectation[9].

Foreign financing differs from domestic financing in two ways. First, investors accept different proportions of f_e as a collateral to different firms, i.e. γ_{id} and γ_{if} are the proportions accepted by the domestic and the foreign investors to firm i, respectively. This reflects that: (i) contracting with foreign investors generally involves further asymmetric information in different dimensions

[5] To focus on the link between foreign financing and export survival, the model abstracts from the existence of foreign producers. This assumption does not change the qualitative result.

[6] In contrast with Manova (2013), the per-period fixed exporting costs does not depend on a. Considering this case complicates the model but does not alter the qualitative results.

[7] In contrast with Manova (2013), the per-period fixed exporting costs does not depend on a. Considering this case complicates the model but does not alter the qualitative results.

[8] This oversimplification allows us to focus on liquidity. It implies, for instance, that in the absence of liquidity constraints, firms remain as exporters to reap present or future profits, or both. Consistent with this, Cebreros (2014) conceives exporting as a value option that pays off not only present but also in the future. Further, Albornoz et al. (2012) show that firms may remain as exporters in a given year to reap future profits.

[9] This assumption does not change the qualitative results. Assuming that firms keep a different proportion of the quasi-rents when contracting with the domestic investor, for instance, introduces an additional source of heterogeneity between domestic and foreign financing. Exploring this heterogeneity is out of this paper´s scope.

and, in particular, in terms of the collateral value (see Ahn, 2011); and that (ii) the ability to approach investors and partially overcome these issues differs not only across the residence of the investor but also, and most importantly, across firms. Second, interest rates differ across financial markets; thus, the domestic and the foreign investors have different outside option values i.e. r_d and r_f are the domestic and the foreign rates, respectively. This reflects that markets differ not only in terms of temporary conditions, but also in terms of more structural factors determining interest rates, e.g. rates tend to be higher in less deep or more concentrated financial markets.

Because only liquidity constraints prevent a firm from remaining in the export market, this firm remains as an exporter as long as the following condition is fulfilled:

$$p_i(a_i)\, q_i(a_i) - qi(a_i)\, \tau a_i - (1-d)\, f_e - F_i \geq 0^{10} \tag{1}$$

where

$$F_i = I_d F_{id} + I_f F_{if} \tag{2}$$

and $p_i(a_i)$ and $q_i(a_i)$ result from profit maximization by a firm with productivity level $\frac{1}{a_i}$, and I_d and I_f are indicator functions that take the value of 1 when the firm contracts with the domestic and the foreign investors, respectively, and F_{id} and F_{if} denote the payments made to these investors (defined below). Equations (1) and (2) reveal that firms must minimize their financial costs to maximize their survival probability. Exploiting this fact, we proceed in two steps. We first assume that a firm stays in the export market and, under this assumption, study the minimization of F. Then, we investigate whether, given this minimization, the firm remains in the export market.

2.2.2 Financial Decisions

When minimizing financial costs, firms choose the proportion of the liquidity that is financed by the foreign investor, i.e., ϕ_{if}. In particular, a firm solves the following problem

$$\min_{\phi_{if}} F_i = F_{id} + F_{if} \tag{3}$$

subject to:

[10] Note that F_i does not depend on a_i. This assumption does not alter the qualitative results.

$$\lambda F_{if} + (1-\lambda)\,\phi_{if} f_e \gamma_{if} = d\phi_{ie} f_e\,(1+r_f)\left(1+\phi_{if}\right) \tag{4}$$

$$\lambda F_{id} + (1-\lambda)\left(1-\phi_{if}\right) f_e \gamma_{id} = d\left(1-\phi_{if}\right) f_e\,(1+r_d)\left(1+1-\phi_{if}\right) \tag{5}$$

$$0 \leq \phi_{if} \leq 1 \tag{6}$$

where (4) and (5) are investors' participation constrains. Note that firms can pledge as collateral *at most* the fraction of f_e that it finances in a given market. This assumption ensures that the total amount of collateral is never greater than f_e (i.e., the collateral is not duplicated). Note also in (4) and (5) that investors' outside options increase with the size of the loan. This reflects that investors are likely to obtain higher returns in outside relationships by providing a greater amount of finance[11]. Using (3), we proceed by studying firms' financial choices in the event of a domestic financial crisis and under normal circumstances.

2.2.3 Domestic Financial Crises

Domestic financial crisis are characterized by the facts that national institutions are willing to neither lend nor, normally, to accept collaterals to alleviate these credit constraints. This is represented by assuming that $\gamma_{id} = 0$. Note in Equation (4) that, under these circumstances, F_{id} must increase to make the domestic investors break even. The optimization problem thus yields the following result:

Proposition 1. If $\gamma_{id} = 0$, then $\phi_{if} \geq \frac{1}{2}$ when $r_d < r_f + \overline{r}^e$, with $\overline{r}^e > 0$. In domestic financial crises, foreign financing is preferred over domestic financing even if the interest rate is higher abroad[12].

Proposition 1 is consistent with Figures 1 and 2, according to which exporters borrowed abroad in 2004, even though the interest rate was smaller in Argentina.

2.2.4 Normal Circumstances

Under normal circumstances, relationships that involve foreign investors are associated with further asymmetric information and a greater difficulty to overcome this asymmetry (see Ahn,

[11] The assumption is also motivated by the fact that investors may be reluctant to put more "skin in the game."

[12] Domestic constraints are not represented in the model by a direct rationing of credit. Instead, taking domestic credits is always feasible but at a sufficiently high costs that it tends to be not optimal.

2011). This is represented by assuming that exporters manage to make the domestic investor accept a greater fraction of f_e as a collateral, i.e., $\gamma_{id} > \gamma_{if}$. Under this assumption, the following results holds:

Proposition 2. If , $\gamma_{id} > \gamma_{if}$, then $\phi_{if} < \frac{1}{2}$when $r_d - \overline{r}^{ne} < r_f < r_d$ with $\overline{r}^{ne} > 0$. Under normal circumstances, domestic financing is preferred over foreign financing unless the foreign interest rate is sufficiently smaller than the domestic interest rate.

Proposition 2 is consistent with Figures 3-6, according to which exporters borrowed from countries with a lower interest rate than the Argentina one from 2005 to 2008. The following proposition shows which firms borrow abroad.

Proposition 3. There is a cut-off $\overline{\gamma_{if}}$ so that if $\gamma_{if} < \overline{\gamma_{if}}$, then firm i does not borrow abroad.

Proposition 3 states that not every firm borrows abroad: foreign financing is only profitable for firms with a sufficiently great ability to deal with foreign investors. The following proposition summarizes how the cut-off $\overline{\gamma_{if}}$ changes with r_f.

Proposition 4. The cut-off $\overline{\gamma_{if}}$ increases with the foreign interest rate: $\frac{\overline{\partial \gamma_{if}}(r_f)}{\partial r_f} > 0$

An increase in r_f makes foreign financing less profitable, pushing some of the exporters out of the international market. This has far reaching consequences for their financial costs.

Proposition 5. Define ε as some positive number and $\overline{r_{if}}(d, \lambda, r_d, \gamma_{id})$ as the minimum level of r_f under which firm i does not borrow abroad, i.e, $\gamma_{if} = \overline{\gamma_{if}}$. Then, $F_{if}(\overline{r_{if}} - \varepsilon) + F_{id}(\overline{r_{if}} - \varepsilon) < F_{id}(\overline{r_{if}})$: an increase in r_f that pushes the firm out of the international market raises its financial costs.

The exporters that leave the international market are not the only domestic firms harmed by the increase in r_f as noted below

Proposition 6. If , $\gamma_{if} > \overline{\gamma_{if}}$ then, $\frac{\partial F_i}{\partial r_f} > 0$: an increase in r_f raises the financial costs of firms that borrow abroad in spite of the increase in r_f.

Propositions 5 and 6 state that an increase in the foreign interest rate raises the financial costs of domestic firms through two channels: (i) by pushing firms out of the international financial market and (ii) by raising the financial costs of firms that borrow abroad. The next subsection shows that, through these channels, the increase in r_f also reduces export survival rates.

2.2.5 Survival Decisions

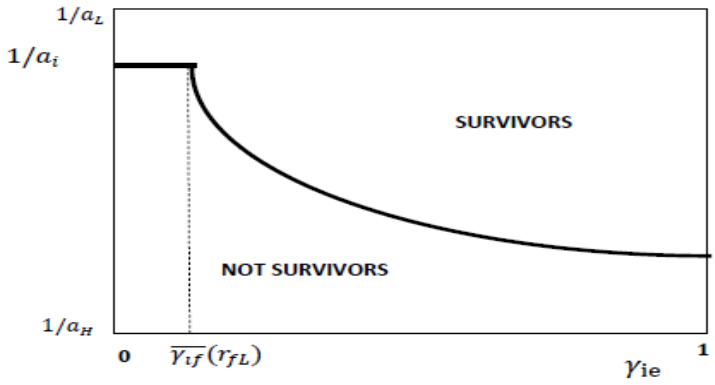
Using Equation (1) and Propositions 3-6 it is possible to derive all of the combinations of productivity levels $\frac{1}{\alpha}$ and ability γ_f to deal with foreign investors that enable a firm to remain in the export market for a given level of γ_d. The frontier of these combinations is given by

$$r_i(a_i) = \left(\frac{\tau a_i}{\alpha P}\right)^{1-\varepsilon} Y = (1-d) f_e + F_i\left(\gamma_{if}, r_f\right) \tag{7}$$

where Y denotes income in the export market, $r_i(a_i)$ is the net revenues of firm i, and F_i equals F_{id}, $F_{id} + F_{if}$, or F_{if} depending on the value of γ_{if}. Note that the left-hand-side of (7) is increasing in a_i and that the right hand-side of this equation is decreasing in γ_{if} for any $\gamma_{if} > \overline{\gamma_{if}}$ (by Propositions 5 and 6).

Taking these considerations into account, Figure 7 shows the $\left(a, \gamma_f\right)$ combinations that enable a firm to remain in the export market for a given level of γ_d. Note in this figure the frontier is downward sloping for any $\gamma_{if} > \overline{\gamma_{if}}$: a higher level γ_{if} reduces financial costs F_i, allowing firms with a lower productivity level to remain as exporters.

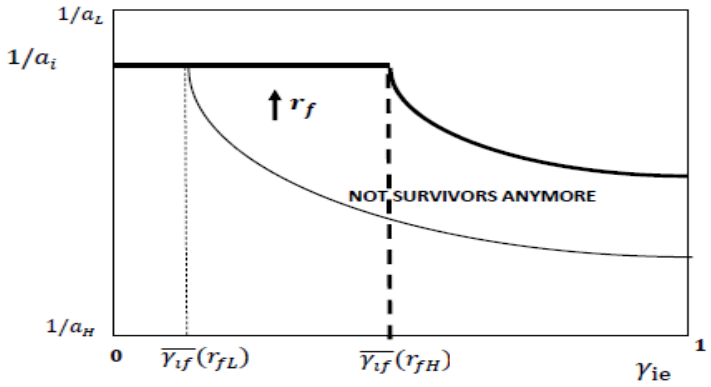
Figure 7: Frontier of Export Survival



Note: The level of γ_d remains unchanged.

Figure 8 shows the effect of an increase in the foreign interest rate. Note that this increase reduces the proportion of firms that borrow abroad, i.e., $\overline{\gamma_{if}}$ rises. This comes along with higher financial costs for both the firms that leave the international financial market and for the firms that stay. Hence, an increase in r_f raises F_i and, through this channel, diminishes the proportion of domestic survivors. This is the main channel we will be searching for in the data in the remaining of the paper.

Figure 8: Effect of an Increase in Foreign Interest Rate on Frontier of Export Survival



Notes: The level γ_d of remains unchanged.

3 Data and Unconditional Means

Our initial data set comprises information for Argentine manufacturing firms that exported over the period 2004-2008 coming from raw data of three different sources: The tax collection agency, the customs office and the Central Bank of Argentina. The data covers three dimensions of Argentinean exporters: (i) Export values by destination and product, (ii) size, measured by the number of employees and (iii) The amount and origin of foreign financing received by firms from financial institutions, related companies, clients and suppliers, and (iii) the amount of firms' debt with domestic banks.

We excluded from the sample firms that had on average fewer than five employees. Applying these criteria we ended up with a sample of 6,820 firms. Since our goal is to perform survival analysis, we focus on starters, i.e. we excluded from the sample firms that were already exporting in 2003. This strategy allows us to avoid the standard left censoring problem associated with survival techniques (see Besedes and Prusa, 2006b, for further details). Thus, our final sample is composed by 3,842 Argentinean firms exporting after 2003.

Confirming the findings by Albornoz et al (2012), the figures in Table 1 show that a large percentage of the firms in our data set started to export over the period 2004-2008, after the sharp depreciation of the currency in 2002.

Table 1. Percentage of New Exporters

Condition	Number of firms	%
Already exporters in 2003	2,978	43.7
Starters	3,842	56.3
Total	6,820	100

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

We treat spells as independent observations and represent firms by their longest spell, in line with Besedes and Prusa (2006) and Fu and Wu (2014). While the mean spell duration of the firms in the sample is quite low (2.2 year), 42% of the firms exported for just one year, confirming the evidence in Besedes and Prusa (2006a,b) on the predominance of short-lived exporting experiences.

With the focus from now on our final sample of 3,842 starters, Table 2 shows for each spell duration the percentage of firms in each category of financing. While In both cases the percentage of firms with access to either foreign or domestic financing increases with the spell length, it is notably sharper in the case of foreign financing. While only 20% of the firms in the 1 year duration spell have access to foreign financing, this percentage triples for firms with a duration spell of 5 years. On the contrary, the access to domestic financing seems to be not that different for firms depending on their duration spell.

Table 2. Access to financing and duration

Spell	1	2	3	4	5
Foreign Financing	20.6	30.8	41.6	46.9	57.0
Domestic Financing	45.9	59.0	67.3	73.6	68.7

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

Table 3 summarizes the previous results and calculates the mean spell duration for each category of financing. Whereas obtaining domestic financing is associated with an increase in the mean spell duration of six and a half months (193 days or 0.53 year), having access to foreign

financing is associated with a higher increase of nine months (270 days or 0.74 years). Both increases are statistically significant (as understood from the p-values in the right column of Table 3). This result provides a first insight into the relevance of foreign financing for survival in the exports market.

But the great challenge is to establish a causal relationship between these two variables and for this unconditional means are insufficient, mainly because the outcomes in Table 3 may be driven by the likely fact that both survival and access to foreign financing are driven by firms' unobservable characteristics. If successful firms are intrinsically different from those that fail and these characteristics allow them to obtain foreign financing, standard techniques yield biased estimates

Table 3. Access to financing and spell length

Type of Financing	**Mean of spell**	**p-value**
Without Foreign Financing	1.97	0.000
With Foreign Financing	2.71	
Without Domestic Financing	1.91	0.000
With Domestic Financing	2.44	

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

Table 4 has precisely the aim of illustrating that firms that remain longer in export markets have intrinsically different characteristics, by looking at the size of the firms, measured by the number of employees. Size is in fact frequently used in the literature as a proxy of unobservable characteristic of firms such as productivity. Clearly, the figures show that the average size of firms increases with duration

Table 4. Mean of Employees

Spell	**1**	**2**	**3**	**4**	**5**
Employees	31.0	30.5	35.8	38.1	41.2

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

Overall, this first approximation to the data suggest, that foreign financing can play a role in increasing firms' survival probability. Thus, we need an identification strategy to properly

assess the effect of foreign financial on export survival rates. As we make clear in the following two sections we address the identification problem through the inclusion of variables that help us in different ways to account for these unobservable characteristics and also through an explicit identification strategy.

4 Explanatory Variables

The set of explanatory variables we include in our empirical models can be classified into three groups: (i) firm-specific variables; (ii) destination-specific covariates and (iii) industry characteristics. The motivation for introducing these variables is two-fold. First, the recent literature has shown these variables are relevant in explaining export survival. Thus, taking these covariates into consideration gives external validity to the present study. Second, as more thoroughly explained below, these variables partially address potential bias in the Clog-log and Probit random effects estimations. We consider the following list of explanatory variables:

(1) *FIRM-SPECIFIC VARIABLES*

- *Foreign Financing.* This is our main variable of interest. It is constructed as the natural logarithm of the financing in dollar terms obtained by a firm from financial institutions, related companies, clients and suppliers residing outside Argentinean soil. For exporters that have not borrowed abroad, we assign to foreign financing the value of 0.[13]

- *Domestic Financing.* This variable equals the natural logarithm of the debt in dollar terms contracted by firms with domestic banks. The sole paper in the literature linking export survival to domestic financial conditions is Besedes and Blyde (2010).[14] Note that many determinants of domestic financing should also determine a firm's access to financing in the international market, e.g. productivity. Thus, domestic financing in the present study is likely to capture some of the effects of the unobserved determinants of both foreign

[13] This implies the variable foreign financing is censored on the left. We do not explicitly tackle this issue in the present paper. However, note that, if anything, the left-censoring of foreign financing should bias our estimates downward rather than upward. Thus, given the result we report in Section 5, it is fair to say that foreign financing is shown to be significant, even though the variable is left-censored.

[14] As noted in the introduction, our paper differs from theirs in that we use data on foreign financing disaggregated at the country-level.

financing and export survival (see discussion on the intrinsic characteristics of the firms in Section 2).

- *Size.* This variable is constructed as the natural logarithm of a firm's number of employees. Fu and Wu (2004) note that, by selling their products abroad, large firms may be able to exploit scale economies. This fact, along with potentially better access to capital and skilled labor markets, leads Fu and Wu (2004) to claim that large firms should remain longer in the export markets. Besides being relevant in explaining export survival, size should correlate with some unobserved determinants of foreign financing (large firms should have greater collateral assets). Thus, size may partially address potential bias arising from unobserved characteristics as well.

- *Initial Exports.* This variable equals the natural logarithm of a firm's exports in its first year as an exporter. Rauch and Watson's model of search (2003) derives a positive link between initial exports and trade duration. Their setup shows that relationships with lower-cost suppliers (from less developed countries) are characterized by large buyers´ initial orders and long durations. Similarly, Albornoz et al. (2012) demonstrates that a large value of initial exports signals high ability to earn profits abroad. This ability requires knowledge on local consumer preferences, business practices and institutional environments and may have been acquired through the formation of foreign networks or exporters' previous experiences (see Artopoulos et al., 2011).[15] Several studies have provided empirical support for the models developed by Rauch-Watson and Albornoz et al. (see, for instance, Besedes and Prusa, 2006b, Brenton et al, 2010, Fugazza and Molina, 2009, Albornoz et al., 2012, Stribat et al., 2013 and Cadot et al., 2013). In the sense that initial exports captures a firm's ability to perform in foreign markets, due for instance to the formation of foreign networks or previous experiences, it will help our empirical identification. To be precise, initial exports should capture some of the unobserved abilities that are required to obtain foreign financing (and not domestic financing) and correlate with export survival.

(2) *DESTINATION-SPECIFIC VARIABLES*

- *GDP Growth.* This variable is constructed as a weighted average of the GDP growth rates in the export destination countries. For a year t, the growth rate of a destination

[15] Artopoulos et al. (2011) find that knowledge advantage is critical in understanding the experience of export pioneers.

country is weighted by its share in the total exports of the firm. A number of papers have introduced macroeconomic conditions in export survival equations (see, for instance, Besedes and Blyde, 2010; Fu and Wu (2014); Stribat, 2013; Hess and Person, 2011b and Fugazza and McLaren, 2013). In the present study, *GDP Growth* helps identify the link between foreign financing and export survival. To see this, imagine a firm that exports to and obtains foreign financing from the same country and assume a shock hits this country on both the real and financial sides.[16,17] This shock is likely to affect both the firm's access to foreign financing and its prospects for export survival, thereby biasing our estimate results. To tackle this issue, we control for the real economic conditions in the exports destination countries by introducing *GDP Growth*.

- *Mercosur*. This dummy variable takes the value of 1 if more than 50% of firm's export value goes to Mercosur and zero otherwise. The introduction of this variable is justified by the idea that, for several reasons, Argentinean exporters may find it easier to survive in Mercosur countries. Among these reasons, one should consider that tariffs are lower within Mercosur and the facts that Argentina and its neighboring countries have relatively similar levels of GDP capita and potentially similar tastes (see Fugazza and McLaren, 2013; Hallak, 2010 and Esteve-Perez et al., 2007).[18] Since surviving in Mercosur markets may be easier for Argentinean firms, it is likely that those mainly exporting to Mercosur have distinctive characteristics (e.g. lower productivity levels). Thus, *Mercosur* can also partially accounts for potential bias arising from unobservable characteristics that determine both export survival and *foreign financing*.

- *Dummy export_foreign financing.* This dummy aims at controlling the potential identification problem created by the fact that some of the firms that borrow abroad, could receive most of the foreign funds from the country which is their main export destination. In this case, it is possible that a credit supply shock in this market can have real macroeconomic effects in the economy , thus affecting, not only the supply of funds to the exporting firm, but also the demand for its products in this particular market. Then we will not be able to

[16] Note that this argument holds only when a firm exports to and obtains financing from the same country.

[17] It could be easily argued this was the case of the 2008 financial crisis.

[18] Fugazza and McLaren (2013) deal with the effect of market access in Mercosur on export survival. Hallak, (2010) explores the Linder hypothesis on trade volumes and Esteve-Perez et al. (2007) study export survival in "closer markets"

correctly identify the impact of the credit supply shock on the survival probability of the firm. This dummy takes the value of 1 if the main country of origin of the funds coincides with the main export destination of the firm. We use four different criteria to determine what we consider as a coincidence of main origin of funds and main destination. In our core estimation we calculate the exports' and foreign financing's weights within the whole firms' export experience determining the principal export destination and funds' origin countries. *Dummy export-foreign financing* takes value 1 if those countries coincide. As robustness check we rank export destination and te countries of origin of the funds according to within year volumes. I this case, *Dummy export-foreign financing 2* takes value 1 if the first export destination country coincides with the first or second funds' origin country. We calculate the exports' and foreign financing's weights within each year of firms' export experience. *Dummy export-foreign financing 3* (4) takes value 1 if the same country concentrate 80% (90%) of the corresponding volumes.

(3) *INDUSTRY-SPECIFIC VARIABLES*

- *High and Medium.* These dummies variables take the value of 1 for high-tech and medium-tech intensive industries, respectively, and zero otherwise. In order to classify industries according to their tech-intensiveness, we adopt a similar classification to that used by Esteve-Perez et al. (2007).[19] In the referred paper, they argue that tech-intensive industries exert greater innovation efforts and supply more vertically-differentiated products. Since R&D activities enhance competitive advantages and vertical differentiation yields larger price-cost margins, tech-intensive firms tend to survive longer in export markets. For the purpose of the present study, note that tech-intensive firms may not only have higher export survival rates but also larger access to foreign financing. Hence, High and Medium can control for the effects of some of the unobserved characteristics that affect both trade duration and foreign financing.

Having established that all of the covariates are helpful in dealing with potential bias arising unobserved characteristic and exogenous shock, it is important to note that our best strategy to deal with these econometric issues is the estimation of an instrumental variables model. With this aim we construct a measure of financial conditions on the country of origin of the foreign

[19] See Appendix I for a description of the industries included in each category.

financing received by the firms, which we use as an instrument to identify the effects of financing on firms' survival probability.

The index is constructed using the money market rates in each of the countries of origin of the funds, which aims at reflecting the relevant credit supply conditions faced by firms. Since firms foreign financing can come from multiple origins, the index is as weighted average of the money market interest rate in the different countries of origin of the funds received by the firm. In the case of those firms that received foreign the weights are constant, ie., given by the relative importance of funds from each origin *across all* the exporting years in which the firm received financing from this same origin. So, for firms receiving foreign financing, the index is then calculated as follows:

The relevant money market interest rate r_{it} for firm i at time t is constructed as a weighted mean of the money market rates in the j countries from which firm i receives financing at time t according to

$$r_{it} = \sum_{j=1}^{N} w_{ij} r_{jt}$$

were $j = 1, ..., N$ are the countries from which firm i receives financing in year t, r_{jt} is the money market rate in country j at time t and w_{ij} is the weight of financing from country j in total financing received by firm across its exporting years calculated as follows:

First, we calculate for each firm i the total amount of financing received from country j across all its total exporting years

$$FF_{ij} = \sum_{t=1}^{T} FF_{ijt}$$

Were FF_{ijt} is the natural logarithm of the financing in dollar terms obtained by firm i in country j, in year t.

Second, we calculate total financing received by firm i, summing FF_{ijt} across countries providing financing to firm i according to:

$$FF_i = \sum_{t=1}^{T} \sum_{j=1}^{N} FF_{ijt} \tag{8}$$

Were FF_i is total financing received by firm i across all its exporting years.

Finally, the weights are constructed according to

$$w_{ij} = \frac{FF_{ij}}{FF_i}$$

and used to calculate r_{it} according to (8) The use of constant weights across time helps us to properly identify the credit supply shock, since firms can substitute creditors across origins in the event of a shock in any specific market.

Regarding those firms that did not borrow abroad, we decided to assign them an index reflecting the potential credit supply conditions these firms faced in each of the years of our sample. Thus, for each t in the sample we calculate the following index

$$r_t^M = \sum_{j=1}^{N} w_j r_{jt} \tag{9}$$

Were r_t^M the weighted average money market interest rate across all countries that provided financing to any of the i firms in the sample in period t and w_{jt} is the the weight of country j in total foreign financing in period t, calculated as follows:

First, total financing FF_{Sample} to the $i = 1, ..., S$ firms in the sample across all years is calculated according to

$$FF_{Sample} = \sum_{t=1}^{T}\sum_{j=1}^{N}\sum_{i=1}^{S} FF_{ijt}$$

And then weights for each country j are calculated as

$$w_j = \frac{FF_j}{FF_{Sample}}$$

where FF_j is total financing from country j in year t

Finally, the weights w_j are used to obtain r^M according to (9)

5 Methodology

Our identification strategy is based on the estimation of an IV linear probability model and a random effects probit model. On the one hand, the IV estimation explicitly addresses the potential correlation of both, survival and the access to foreign with firms' unobservable characteristics through the use of the money market rate in the mean weighted average country of origin of the funds received by the firms from abroad as an instrument for foreign financing, which was calculated as described in section 4. This index aims at capturing time-variation related to changes in the credit supply conditions of the origin countries, i.e. those countries from which a firm obtains funding from, which is supposed to be unrelated to any intrinsic characteristic of the firm. The

use of constant weights across time helps us to properly identify the credit supply shock, since firms can substitute creditors across origins in the event of a shock in any specific market.

On the other hand, the use of the random effects probit model allows us to deal with the potential non-proportionality of regressors with respect to the hazard and is also a way of incorporating the recent developments in the trade literature on survival, which has acknowledged several shortcomings in applying the standard time continuous Cox model to estimate export survival rates.[20]

Also, as a robustness check, we consider the estimation of a clog-log model with frailty as well a set of additional estimations of the IV model considering alternative forms of calculating the dummy variables controlling for the fact that the main country of origin of the funds could coincide with the main destination of firm´s exports, what in turn could unable us to correctly identify the effects of credit supply shocks in the country of origin of the funds on exporters' survival probability.

As mentioned above, the trade literature on survival has shifted to the use of discrete time models, which can deal with unobserved heterogeneity and non-proportionality. In this regard the discrete time clog-log model with frailty and the random-effects probit seem to be the best suited for the trade survival literature that has to deal with unobserved heterogeneity, grouping of continuous time observations and non-proportionality of regressors (Estevez-Pérez et al, 2007and 2013, Brenton et al. (2010), Hess Persson (2012), and Fu and Wu, 2014). While the clog-log model, with frailty can deal with the potential problem of spurious duration dependence created by unobserved heterogeneity, the non-proportional nature of the random effects probit model makes it a good complement of the clog-log model.

The survival time of a particular trade relationship can be defined as a continuous, non-negative random variable T_i. In a discrete-time framework, the core of the duration analysis is

[20] Earlier trade studies on exports survival were based on the estimation of continuous semi-parametric Cox models (Besedes and Prusa 2006b, Brenton et al 2009, Fugazza and Molina 2009). Estevez-Pérez et al (2007) and more recently Hess and Persson (2012) have pointed out important weakness of continuous time models of the Cox type: (i) They are at odds with the way in which trade data are usually considered because, although trade takes place continuously, the observations are usually grouped annually and this leads to a large number of tied survival time (ii) they cannot deal with heavy ties, what could lead to biased coefficients and standard errors, (iii) they are not well suited to properly control for unobserved heterogeneity, what can lead to spurious duration dependence and (iv) they assume proportionally in the effects of covariates on the hazard, what could be implausible either because the effects of the explanatory variables on the hazard are intrinsically non-linear or because their effects depend on the duration time.

the hazard rate, defined as the probability that a trade relationship terminates in a given interval $[t_k, t_{k+1})$, with $k = 1, 2, \ldots, k_{max}$, and $t_1 = 0$, conditional on its survival up to the beginning of the interval and given the explanatory variables included in the model and can be written as

$$h_{ik} = P\left(T_i < t_{k+1} / T_i \geq t_k, x_{ik}\right) = F\left(x'_{ik}\beta + \gamma_k\right)$$

where x_{ik} is a vector of possible time varying regressors, γ_k a function of the interval time that allows the hazard to vary across periods and $F(.)$ an appropriate distribution function ensuring that $0 \leq h_{ik} \leq 1$ for all i, k.The subscript i, with $i = 1, ..., n$ denotes in our case the representative spell for each firm.

For each firm or representative spell, the last year in which a positive exporting value is observed, can be recorded. Denoting the terminal time for each firm i by k_i; a binary variable y_{ik} can be defined, taking the value one if firm i is observed to cease exporting during the k^{th} time interval and zero otherwise. The log-likelihood for the observed data is given by

$$\ln L = \sum_{i=1}^{n} \sum_{k=1}^{k_i} \left[y_{ik} \ \ln\left(h_{ik}\right) + \left(1 - y_{ik}\ \right) \ln\left(1 - h_{ik}\right)\right]$$

As pointed out by Hess and Persson, this expression is structurally isomorphic to a standard log-likelihood function for a binary panel regression model with dependent variable y_{ik} . A functional form for the hazard rate needs to be specified as to be able to estimate the model parameters. The most commonly functional specifications are the normal, logistic, and extreme-value minimum distribution, that lead to a probit, logit and clog-log model, respectively. To account for unobserved heterogeneity, random effects can be included into this binary choice framework.

The clog-log and the random-effects estimations include the same three groups of explanatory variables: (1) Firm-specific, (2) Destination-specific and (3) industry-specific described in section 4, while the IV model includes the index of financial conditions in the main origin of the funds receivied by firms, described in detail in Section 4 It is important to stress that according to our knowledge, this is the first paper that explicitly develops a strategy to address the identification problem within this strand of literature on exporter's survival.

6 Empirical results

The results of the IV linear probability model estimation are presented in Table 5. The dependent variable takes the value of one in the event of failure; thus, a negative coefficient indicates that

the covariate reduces the probability of exiting the export market. Further, the larger absolute value of the coefficient, the greater the effect of the covariate on the failure probability is.

In proceeding with this estimation, we pool the data and ignore the panel structure of our data set. This strategy offers two advantages with respect to the panel alternative, i.e. estimating an IV panel with random effect. First, pooling the data allows us to test the endogeneity and weakness of our instruments as well as to check the underidentification properties of the model in a simple manner. Second, whereas we lose the ability to account for random effects, we are able to cluster errors at the firm-level.

Table 5: IV model estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(Foreign financing)	-0.162***	-0.155***	-0.139***	-0.142***	-0.144***	-0.140***	-0.139***	-0.205**
	[0.0436]	[0.0416]	[0.0430]	[0.0469]	[0.0482]	[0.0483]	[0.0484]	[0.0862]
GDP growth		-0.00908***	-0.0103***	-0.0103***	-0.0102***	-0.00920***	-0.00658**	-0.00621**
		[0.00258]	[0.00246]	[0.00248]	[0.00249]	[0.00252]	[0.00259]	[0.00287]
Ln(Initial exports)			-0.0247***	-0.0246***	-0.0251***	-0.0269***	-0.0281***	-0.0225**
			[0.00664]	[0.00675]	[0.00671]	[0.00676]	[0.00681]	[0.0102]
Ln(Domestic financing)				0.00205	0.000941	0.000820	0.00112	0.00395
				[0.00384]	[0.00371]	[0.00372]	[0.00371]	[0.00532]
Ln(Size)					0.00820	0.00590	0.00618	0.0136
					[0.00765]	[0.00775]	[0.00772]	[0.0110]
Medium technology						-0.0715***	-0.0657***	-0.0682***
						[0.0192]	[0.0192]	[0.0218]
High technology						-0.0327**	-0.0299**	-0.0275
						[0.0153]	[0.0153]	[0.0186]
Mercosur							-0.0472***	-0.0474***
							[0.0126]	[0.0143]
Dummy export-foreign financing								0.180**
								[0.0835]
Constant	0.287***	0.329***	0.400***	0.398***	0.377***	0.400***	0.418***	0.378***
	[0.0131]	[0.0199]	[0.0192]	[0.0200]	[0.0288]	[0.0306]	[0.0313]	[0.0474]
Observations	8,491	8,491	8,491	8,491	8,491	8,491	8,491	8,491
Centered R^2	-0.367	-0.331	-0.255	-0.267	-0.275	-0.254	-0.248	-0.565
Underidentification test (Kleibergen-Paap rk LM statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0018
Weak identification test (Kleibergen-Paap rk Wald F statistic)	22.68	23.45	21.51	18.73	17.87	17.20	17.19	9.394
Funds' origen dummies	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in brackets
*** Significant at 1%, ** at 5%, * at 10%.

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

Note first that the instrument is significant at the 1% level in all of the specifications. Further, the sign of the coefficient is also the correct one (negative).

In Table 5 Columns (1) to (8) sequentially incorporate all the firm, industry and destination specific characteristics of the variables described in Section 4. Notably, in all of the cases foreign financing is significant and has the expected sign and, from Column (1) to (7) it is significant at the 1% level, suggesting that access to the international financial market significantly improves the prospects for export survival. To be precise, conditional on being alive in t and the other covariates, an increase in the amount of foreign financing reduces the probability of exiting the

export markets in $t+1$. As will be shown later, this result is robust to all of the specifications in the three empirical models we consider, but the advantage of the IV model it that it allows for a casual interpretation of the results: More access to foreign financing causes higher export survival rates.

Column (2) adds to foreign financing the dummy controlling for macroeconomic condition in the main export destination country (*GDP_ Growth*), which remains significant at the 1-5% level across the different specifications. The same happens with initial exports, incorporated in Column (3), what reflects that firms that start larger in the export markets tend to remain longer as exporters. The intuition for this result can be found in the models of Rauch-Watson (2003) and Albornoz et al. (2012) mentioned in Section 4. A larger value of initial exports denote more confidence of the buyer in the supplier or a higher ability of the latter to earn profits abroad, and therefore increases survival rates. Further, the fact that initial exports is significant in all of the specifications makes our results consistent with Fugazza and Molina (2009), Besedes and Prusa, (2006b), Brenton et al, (2010), Albornoz et al. (2012), Stribat et al. (2013) and Cadot et al. (2013), among others.

Columns (4) and (5) add sequentially domestic financing and the size of the firm. Neither domestic financing nor the size affect firm's probability of survival as exporter, i.e. they are not significant at the 10% level. The outcome regarding the size of the firm contrasts with Fu and Wu's results (2014). They argue that large firms have higher export survival rates because, among other reasons, they have better access to capital. However, in our regressions this potential better access to capital is explicitly captured by foreign financing and domestic financing. This, and the fact that they do not define size in continuous space as we do, partially reconciles our outcomes with their results.

Columns (5) and (6) incorporate the two industry-specific dummies. Both high and medium are significant at the 1% level, indicating that tech-intensive firms survive longer in the export market. As noted by Esteve-Perez et al., these firm perform R&D activities allowing them to enhance comparative advantages and to have grate price-cost margins. Note also that high has a smaller coefficient than medium in all the specifications (although marginally), which suggests that the positive link between tech-intensiveness and export survival is monotonic.

In Column (7) the *Mercosur* dummy is incorporated. Note that it remains significant at the 1% level and has a negative sign: Exporting to neighboring countries reduces the probability of exiting foreign markets for Argentinean firms. Note also that once Mercosur is introduced in the

regression, *GDP growth* loses its significance. This result could be explained by the fact that our sample covers the period of *golden Latin American years*, in which the Mercosur countries grew at relatively higher rates.[21]

Finally, Column (8) incorporates the dummy *export_financing* with a very precise purpose: The use of the money market interest rate to instrument foreign financing ensures that time-varying unobservable characteristic of firms will prevent form a bias in our results. However, there is an additional (potentially less relevant) source of bias. that refers to the occurrence of exogenous shocks that simultaneously affect the real and financial sides of an economy. As carefully explained in Section 4, this sort of shock would bias our estimate of interest only for cases in which a great proportion of the sample export mainly to and obtain financing mainly from the same country. However, we tackle this issue incorporating in our IV regression an additional dummy *export_financing* that aims at capturing this coincident concentration of exports destination and origin of the funds. This strategy ensures that our instruments exclusively captures changes in financial and not in real economy conditions. In Table 5 *Expo_Fin* is calculated using fixed weights, as explained in Section 4. As a robustness check. we also estimate the IV model using alternative forms of calculating this dummy variable in Subsection 6.1.1.

The lower part in Table 5 shows the results of tests that evaluate potential weaknesses of the IV probit model, as the presence of (i) an underidentification problem, (ii) weak instruments. The tests we run are: the Kleibergen-Paap rk LM test and the weak identification Kleibergen-Paaprk Wald test, respectively. The models pass these two tests: we reject the null hypothesis of weakness of our instrument and the null hypothesis of under identification.

Table 6 presents the results of the random-effects probit estimation. The dependent variable takes the value of one in the event of failure; thus, the interpretation of the sign and magnitude of the coefficient is similar to that explained for the probit random effect (however, the interpretation of the quantitative effects differs).

As in Table 5, we sequentially introduces the firm, industry and destination specific characteristics. Note the estimation of the random effects model incorporates the variable *Ln(export year)* to control for duration dependence. The most salient result in Table 6 refers to foreign financing: Notably, this variable remains significant at the 1% level from Columns (1) to (5).

[21] See http://www.brookings.edu/research/opinions/2013/11/07-latin-america-growth-rate-talvi-munyo for a reference to the golden years.

Note also that size remains non-significant, while the level of initial exports is again significant in all of the specifications, similarly to Table 5. Contrary to the IV estimation, domestic financing is significant in all of the specifications and has the expected sign, i.e, it contributes to increase the survival probability. Further, the industry specific variables are also significant, with a similar (negative) effect on the probability of failure.

With regard to the destination-specific variables, *GDP Growth* remains significant at the 1% level in Column (4) and Mercosur is significant also at the 1% level in Column (5). Note that again, that when the *Mercosur* dummy is added, *GDP_ Growth* looses significance.

Table 6. PROBIT RANDOM EFFECTS model estimation results*

	(1)	(2)	(3)	(4)	(5)
Ln(Foreign financing)	-0.0727***	-0.0721***	-0.0641***	-0.0635***	-0.0620***
	[0.0138]	[0.0157]	[0.0148]	[0.0143]	[0.0137]
Ln(Size)	-0.0349	-0.000529	-0.0184	-0.0205	-0.0188
	[0.0233]	[0.0304]	[0.0292]	[0.0282]	[0.0273]
Ln(Export year)	-0.373***	-0.0640	-0.115	-0.153	-0.181
	[0.127]	[0.153]	[0.145]	[0.135]	[0.125]
Ln(Domestic financing)	-0.0281***	-0.0285**	-0.0287**	-0.0271**	-0.0253**
	[0.0107]	[0.0134]	[0.0128]	[0.0124]	[0.0121]
Ln(Initial exports)		-0.270***	-0.264***	-0.255***	-0.250***
		[0.0419]	[0.0399]	[0.0373]	[0.0346]
Medium technology			-0.347***	-0.327***	-0.294***
			[0.0971]	[0.0930]	[0.0891]
High technology			-0.333***	-0.305***	-0.284***
			[0.0698]	[0.0660]	[0.0624]
GDP growth				-0.0314***	-0.0214**
				[0.0102]	[0.0102]
Mercosur					-0.177***
					[0.0497]
Constant	-0.472***	-0.0289	0.168	0.316***	0.368***
	[0.0789]	[0.0983]	[0.106]	[0.117]	[0.117]
Observations	8,491	8,491	8,491	8,491	8,491
Number of firms	3,842	3,842	3,842	3,842	3,842
rho	0.252	0.528	0.482	0.449	0.420
rho s.d.	0.159	0.106	0.111	0.112	0.108
Log likelihood	-4045	-3941	-3921	-3916	-3909
Likelihood-ratio test of rho=0	0.0726	3.09e-06	2.22e-05	6.27e-05	8.84e-05

Standard errors in brackets
*** Significant at 1%, ** at 5%, * at 10%.

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

6.1 Robustness checks

6.1.1 Clog-log estimation

The estimation of the Clog-log model helps us to corroborate the robustness of our results under an alternative estimation methodology which, although not as powerful as the IV model to explicitly addresses the potential correlation of both, is well suited to deal with unobserved heterogeneity and the grouping of continuous time.

In the Clog-log specification the heterogeneity term is assumed to be normally distributed. The results of the estimation are presented in Table 7. The sign of the coefficients reported in this table show the direction of the effect of the covariates on the hazard rate, i.e. a positive coefficient indicates the covariate reduces the probability of exiting the export market. Further,

the smaller the coefficient, the larger the extent of the effect on the hazard rate is.[22]

All columns incorporate the variable *ln(Export year)*, to control for duration dependence, as usual in the Clog-log model specification. The most notable result in Table 7 is that in all of the model specifications the access to foreign financing significantly contributes to reduce the probability of exiting from export markets (it remains significant at the 1% level across all columns). Similarly to the random effect probit estimation and differently to the IV linear probability model estimation, domestic financing remains significant once other regressors are considered. On the contrary the result that size is not significant conditional on both foreign and domestic financing, seems to be robust to all the different estimation methodologies we apply here.

Table 7. CLOG-LOG with frailty model estimation results*

	(1)	(2)	(3)	(4)	(5)
			e (b)		
Ln(Foreign financing)	0.903***	0.916***	0.924***	0.923***	0.924***
	[0.0149]	[0.0169]	[0.0160]	[0.0157]	[0.0155]
Ln(Size)	0.957	1.004	0.984	0.981	0.983
	[0.0284]	[0.0356]	[0.0331]	[0.0324]	[0.0320]
Ln(Export year)	0.466***	0.630**	0.581***	0.568***	0.558***
	[0.0714]	[0.115]	[0.0929]	[0.0856]	[0.0794]
Ln(Domestic financing)	0.962***	0.965**	0.965**	0.966**	0.967**
	[0.0136]	[0.0156]	[0.0149]	[0.0147]	[0.0146]
Ln(Initial exports)		0.729***	0.735***	0.738***	0.739***
		[0.0293]	[0.0263]	[0.0252]	[0.0242]
Medium technology			0.672***	0.685***	0.710***
			[0.0722]	[0.0723]	[0.0737]
High technology			0.678***	0.695***	0.708***
			[0.0494]	[0.0494]	[0.0490]
GDP growth				0.962***	0.976*
				[0.0121]	[0.0123]
Mercosur					0.796***
					[0.0477]
Constant	0.408***	0.660***	0.844	1.026	1.092
	[0.0490]	[0.0743]	[0.0930]	[0.128]	[0.136]
Observations	8,491	8,491	8,491	8,491	8,491
Number of firms	3,842	3,842	3,842	3,842	3,842
rho	0.0814	0.337	0.257	0.234	0.215
rho s.d.	0.175	0.131	0.128	0.125	0.120
Log likelihood	-4050	-3945	-3923	-3918	-3911
Likelihood-ratio test of rho=0	0.332	0.00566	0.0211	0.0288	0.0351

Standard errors in brackets
*** Significant at 1%, ** at 5%, * at 10%.

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

[22] The impact of the explanatory variables on the hazard rate is measured in terms of $exp\left(X'_{it}\beta\right)$.

*Unobserved heterogeneity is assumed to follow a Normal distribution

6.1.2 Adding alternative controls to the IV estimation

In Table 8 we present the results of using within year weights to construct the index of financial conditions, which we use as an instrument for foreign financing and alternative definition of the dummy variable export_financing, that refine the one presented in Table 5. Note in the first column that changing to variable weights does not alter the results in Table 5 in terms of the significance and sign of foreign financing. Also foreign financing continues to be significant, although now at the 10% level, once we incorporate alternative definitions of the *Export-foreign financing* dummy

Table 8: IV model estimates results using different definitions of export-financing

	Within year weights	1st country or 2nd country	80%	90%
Ln(Foreign financing)	-0.135***	-0.394*	-0.336*	-0.328*
	[0.0420]	[0.226]	[0.175]	[0.168]
GDP growth	-0.00653**	-0.00348	-0.00508	-0.00612*
	[0.00256]	[0.00384]	[0.00349]	[0.00352]
Ln(Initial exports)	-0.0286***	-0.0106	-0.0103	-0.0112
	[0.00625]	[0.0205]	[0.0187]	[0.0180]
Ln(Domestic financing)	0.000937	0.0110	0.00973	0.0102
	[0.00351]	[0.0110]	[0.00932]	[0.00934]
Ln(Size)	0.00587	0.0353	0.0253	0.0240
	[0.00744]	[0.0253]	[0.0187]	[0.0179]
Medium technology	-0.0657***	-0.0677**	-0.0752***	-0.0708***
	[0.0190]	[0.0303]	[0.0279]	[0.0271]
High technology	-0.0305**	-0.0141	-0.0116	-0.00891
	[0.0148]	[0.0314]	[0.0290]	[0.0293]
Mercosur	-0.0472***	-0.0492**	-0.0494***	-0.0496***
	[0.0125]	[0.0196]	[0.0181]	[0.0179]
Dummy export-foreign financing 2		0.937*		
		[0.523]		
Dummy export-foreign financing 3			0.804**	
			[0.403]	
Dummy export-foreign financing 4				0.803**
				[0.391]
Constant	0.419***	0.278**	0.306***	0.315***
	[0.0302]	[0.115]	[0.0905]	[0.0846]
Observations	8,491	8,491	8,491	8,491
Centered R^2	-0.232	-1.757	-1.366	-1.318
Underidentification test (Kleibergen-Paap rk LM statistic)	0.0000	0.0507	0.0286	0.0255
Weak identification test (Kleibergen-Paap rk Wald F statistic)	22.69	3.751	4.643	4.832
Funds' origen dummies	YES	YES	YES	YES

Robust standard errors in brackets
*** Significant at 1%, ** at 5%, * at 10%.

7 Conclusions

We use a rich data set that contains valuable information on Argentine new exporters domestic and their domestic and foreign debt to we evaluate the importance of the access foreign financing

as an alternative source of financing for their survival in the presence of financial distress or high costs of funding in the domestic market.

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

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

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

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Appendix

Proof of Propositions 1-4

Using the participation constraints shown in () and (), that can be written as

$$F_{if} = \frac{f_e}{\lambda\left(d\phi_{if}\left(1+r_f\right)\left(1+\phi_{if}\right)-\left(1-\lambda\right)\phi_{if}\gamma_{if}\right)} \tag{A1}$$

$$F_{id} = \frac{f_e}{\lambda\left(d\left(1-\phi_{if}\right)\left(1+r_d\right)\left(1+1-\phi_{if}\right)-\left(1-\lambda\right)\left(1-\phi_{if}\right)\gamma_{id}\right)} \tag{A2}$$

And ignoring the constraint shown in (6), the solution to the optimization problem shown in (3) yields:

$$\phi_{if} = \frac{d\left(2+3r_d-r_f\right)-\left(1-\lambda\right)\left(\gamma_{id}-\gamma_{if}\right)}{2d\left(2+r_d+r_e\right)} \tag{A3}$$

Plugging , $\gamma_{id}=0$ we get:

$$\phi_{if} = \frac{d\left(2+3r_d-r_f\right)-\left(1-\lambda\right)\gamma_{if}}{2d\left(2+r_d+r_e\right)}$$

In this case, $\phi_{if} \geq \frac{1}{2}$ as long as

$$r_f < r_d + \frac{\left(1-\lambda\right)\gamma_{if}}{2d}$$

Let's define $\overline{r^e} = \frac{\left(1-\lambda\right)\gamma_{if}}{2d} > 0$; this proves Proposition 1.

To prove Proposition 2, now take the definition of given in ϕ_{if} in (A3) and consider the case in which $\gamma_{id} > \gamma_{if}$. In this case $\phi_{if} < \frac{1}{2}$, unless

$$r_f < r_d - \frac{\left(1-\lambda\right)\left(\gamma_{id}-\gamma_{if}\right)}{2d}$$

Let's define $\overline{r^{ne}} = \frac{\left(1-\lambda\right)\gamma_{ie}}{2d} > 0$; this proves Proposition 2.

To prove Propositions 3 and 4, consider again the definition of ϕ_{if} given in (A3) and the case in which $\gamma_{id} > \gamma_{if}$. Using this definition, we know that $\phi_{if} \geq 0$ when

$$\gamma_{if} > \overline{\gamma_{if}}\left(r_f\right) = \gamma_{id} - \frac{d\left(2+3r_d-r_f\right)}{1-\lambda} \tag{A4}$$

Note also that

$$\frac{\partial\overline{\gamma_{if}}\left(r_f\right)}{\partial r_f} = \frac{d}{1-\lambda} > 0 \tag{A5}$$

(A4) and (A5) show Proposition 3.

Proposition 3. If $\gamma_{ie>}\overline{\gamma_{if}}(r_{if})$, then , $\phi_{if}=0$ with $\dfrac{\partial\overline{\gamma_{if}}(r_f)}{\partial r_f}>0$ There is a cutoff $\overline{\gamma_{if}}(r_{if})$, below which firms with a smaller ability to deal with foreign investors do not borrow abroad. The cutoff $\overline{\gamma_{if}}$ increases with the foreign interest rate r_f.

Proof of Proposition 5 and 6

To prove Proposition 5, consider the definition of $\overline{r_{if}}(d,\lambda,r_d,\gamma_{id})$ given in Proposition 5 and consider the following inequality:

$$\begin{aligned} & F_{if}\left(\phi_{if}\left(\lambda,\gamma_{if},\gamma_{id},d,r_d,\overline{r_{if}}-\varepsilon\right),f_E,\lambda,\gamma_{if},d,\overline{r_{if}}-\varepsilon\right) \\ & +F_{id}\left(\phi_{if}\left(\lambda,\gamma_{if},\gamma_{id},d,r_d,\overline{r_{if}}-\varepsilon\right),f_E,\lambda,\gamma_{id},d,r_d\right) \\ < \quad & F_{if} \end{aligned} \tag{A6}$$

This inequality follows from the facts that: (i) by the definition of $\overline{r_{if}}(d,\lambda,r_d,\gamma_{id})$, the optimal level of ϕ_{if} at $\overline{r_{if}}-\varepsilon$ is greater than 0; (ii) thus, by the principle of minimization. Consider the following equality:

$$\begin{aligned} & F_{if}\left(0,F_{E,}\lambda,\gamma_{if},d,\overline{r_{if}}-\varepsilon\right)+F_{id}\left(0,f_E,\lambda,\gamma_{id},d,r_d\right) \\ = \quad & F_{id}\left(0,f_{E,}\lambda,\gamma_{id},d,r_d\right)=F_{id}\left(\phi_{if}\left(\lambda,\gamma_{if},\gamma_{id},d,r_d,\overline{r_{if}}\right),f_E,\lambda,\gamma_{id},d,r_d\right) \end{aligned} \tag{A7}$$

The equality follows from the fact that $F_i\left(0,f_{E,}\lambda,\gamma_{id},d,r_d\right)=F_{id}\left(0,f_{E,}\lambda,\gamma_{id},d,r_d\right)$ and that, in this case, an increase r_f in does not affect financial costs. From the (A6) and (A7), we have:

$$\begin{aligned} & F_{if}\left(\phi_{if}\left(\lambda,\gamma_{if},\gamma_{id},d,r_d,\overline{r_{if}}-\varepsilon\right),f_E,\lambda,\gamma_{if},d,\overline{r_{if}}-\varepsilon\right) \\ & +F_{id}\left(\phi_{if}\left(\lambda,\gamma_{if},\gamma_{id},d,r_d,\overline{r_{if}}-\varepsilon\right),f_E,\lambda,\gamma_{id},d,r_d\right) \\ < \quad & F_{id}\left(\phi_{if}\left(\lambda,\gamma_{if},\gamma_{id},d,r_d,\overline{r_{if}}\right),f_E,\lambda,\gamma_{id},d,r_d\right) \end{aligned} \tag{A8}$$

This proves Proposition 5.

To prove Proposition 6, replace the definition of ϕ_{if} given in (A3) in (4) and (5) and write:

$$
\begin{aligned}
F_i &= F_{if} + F_{id} = \\
&\frac{f_e(12d^2 - d^2r_d^2 - d^2r_f^2 + 2dr_d\left(6d + 7dr_f + \gamma_{id} - \lambda\gamma_{id} + 3\left(-1+\lambda\right)\gamma_{if}\right)}{4d\lambda\left(2 + r_d + r_f\right)} \\
&\frac{+2dr_f\left(6d + 3\left(-1+\lambda\right)\gamma_{id} + \gamma_{if} - \lambda\gamma_{if}\right)}{4d\lambda\left(2 + r_d + r_f\right)} \\
&\frac{+\left(-1+\lambda\right)\left(\gamma_{id}\left(4d + \gamma_{id} - \lambda\gamma_{id}\right) + 2\left(2d + \left(-1+\lambda\right)\gamma_{id}\right)\gamma_{if} - \left(-1+\lambda\right)\gamma_{if}^2\right))}{4d\lambda\left(2 + r_d + r_f\right)}
\end{aligned}
$$

Now take the following derivative

$$
\frac{\partial F_i}{\partial r_f} = \frac{f_e\left(2d + 3r_d - dr_f + \left(-1+\lambda\right)\gamma_{id} + \gamma_{if} - \lambda\gamma_{if}\right)\left(6d + 5dr_d + dr_f + \left(-1+\lambda\right)\gamma_{id} + \gamma_{if} + \lambda\gamma_{if}\right)}{4d\lambda\left(2 + r_d + r_f\right)^2}
$$

If ,$\gamma_{if} > \overline{\gamma_{if}}$ the expression shown above is positive. This proves Proposition 6.