6.4. Do firms' export status influence the likelihood of survival?

Mónica Borges Simões, Paulo M.M. Rodrigues

1. Motivation

The relation between borrowing constraints and firm dynamics, in particular survival, is an important topic in the context of the Portuguese economic growth. In general, the impact of financial variables on survival has been found to be significant and consistent across different empirical studies. In parallel, theoretical frameworks that incorporate financial variables have also been considered to explain the mechanisms through which borrowing constraints influence survival. Revenues, financial structure and the collateral of firms are variables frequently used in such models (see e.g. Albuquerque and Hopenhayn, 2004, Cabral and Mata, 2003, Farinha and Santos, 2006, Mata et al., 2010 and Mata and Freitas, 2012).

In addition to financial constraints also firm characteristics play a significant role in firm survival (Mata and Portugal, 1994, and Farinha and Santos, 2006). Companies that export are often seen as more resilient than firms that depend solely on the domestic demand, particularly during recessions. A number of papers have studied whether the likelihood of survival is differed between exporters and non-exporters (see Wagner, 2011, for a survey of the literature). A consistent conclusion across all studies is that exporters are more likely to survive than firms that do not export. However, only a very small number of papers have analyzed whether the likelihood of survival differs between exporters and non-exporters controlling for financial constraints. It is important to separate the two effects as in the literature, evidence has been found that financial constraints may be important when deciding whether to export (Bridges and Guariglia, 2008, and Görg and Spaliara 2014). Until present, none of the studies on the impact of export status on survival used Portuguese firms' data.

This Section is based on Simões (2017), and aims to study the impact of financial constraints on firm survival and to determine if the likelihood of survival differs between exporters and non-exporters,

or across exporting status - starters/switchers, continuous exporters, continuous non-exporters, and exiters from export markets - in Portugal. It also analyzes the impact of financial variables on survival for the different groups.

Empirical evidence shows that variables such as leverage, profitability and availability of assets that could be presented as collateral are relevant to the likelihood of exit of a firm. Firms with higher leverage, lower returns on assets and lower shares of assets that can be used as collateral have on average a higher probability of exit. However, relative to the main research question whether exporters were more likely to survive relative to firms that were only exposed to the domestic market, results show that, after controlling for financial variables, exporting firms have on average a higher probability of survival. Moreover, exporting firms also present healthier values for the financial indicators, which decreases even more the likelihood of exit. Exiters from export markets, which are firms that stopped exporting in the current period, constitute the group that has the lowest likelihood of survival. These firms present worst values for the financial variables when compared to continuous exporters and non-exporters and they are the most likely to exit when financial factors are controlled for. Exiters from export markets are also more reactive to variations in the financial variables relative to other firms. Nevertheless, firms that do not exit and become continuous exporters are expected to have lower hazard rates than firms that never decided to export, with and without the financial effects.

2. Data

The analysis uses the database *Informação Empresarial Simplificada* (IES) compiled by Banco de Portugal. The IES database includes balance sheet and firm information (such as starting year, district and sector of the economy) which is reported by each firm on a mandatory basis. However, for some firms there may be no data in a specific year (e.g. due to reporting delays). Hence, if a firm reported in period *t-1* and in period *t+1*, but no information for period *t* exists, the firm was considered to be alive and the simple average of the values of the variables in *t-1* and in *t+1* was used to compute the missing information for period *t*. If instead, a firm failed to report in period *t* and in period *t+1*, it was classified as "dead" in period *t-1*. Finally, a firm was classified as dead in period *t* if it had reported its intention to close business in period *t*. Consequently, only information for the period 2008-2012 is used, as the last two years are required to construct the variable "dead/exit".

Moreover, firms that had incomplete or inconsistent information for the variables of interest were excluded, as well as firms that reported values for the financial variables that were above the 99th percentile (as such extreme values were considered to be a result of reporting errors or extreme shocks). Additionally, only firms with positive values of business turnover and assets were used.

In 2010, a new set of accounting rules was implemented in Portugal, the new guidelines were designed to be consistent with international standards and a break in financial variables was observed. As a consequence, the definition of some of the variables varies before and after 2010. In order to accomplish a rigorous analysis, the sample was split into two subsamples: subsample I considers firms that reported before 2010 and subsample II includes information for the period between 2011 and 2012.

To create the final database, financial ratios were calculated for each firm for every year. The ratio of debt to total assets was taken as a measure of leverage. Profits were defined as return on assets, i.e. the ratio between earnings before interests and taxes over total assets. IES does not have a direct measure of collateral, therefore fixed assets were used as a proxy and for each firm in each year, the ratio between fixed assets to total assets was computed.

Export indicator variables were also calculated for each of the firms. *Exporter* is an indicator variable which is equal to 1 if exports are positive, and zero otherwise. After 2010, the number of firms with missing information on exports was similar to the number recorded before 2010. Therefore, missing values were considered to be zero for this particular variable. An additional variable, measuring the link between survival and export behavior, was computed for each firm. The *Export* status is a categorical variable with four possible classifications: continuous exporter, continuous non-exporter, exiter from export markets and starter/switcher. A firm was classified as continuous exporter if it exported in period *t*, *t-1* and in period *t-2*. If a firm did not have positive exports for period *t*, *t-1* and *t-2* the firm was classified as continuous non-exporter. Moreover, in the case a firm exported in period *t-1* but had no positive exports in period *t*, it was considered an exiter from export markets. Finally, if a firm had no positive exports in period *t-1* but had positive exports in period *t* the firm was classified as a starter/ switcher.

The control variables for individual characteristics of the firms, age and size, were computed as the logarithm of age and the logarithm of real sales to account for non-linearities. In the cases where this specification was considered not sufficient, the logarithm squared was used as well. In the literature, different measures for size are used

	2008	2009	2010	2011	2012
Non-exporter	8.5	6.8	6.6	7.4	7.6
Exporter	4.8	4.1	3.5	4.1	3.9
Exiter from export markets	9.6	10.3	8.8	8.1	9.0
Continuous exporter	4.6	4.0	3.3	3.9	3.8
Continuous non-exporter	8.4	6.7	6.5	7.3	7.5
Starter/switcher	5.4	4.6	4.0	4.5	4.3

Table 14: Evolution of death rates of firms by export status
Sources: IES and author's calculations.

(e.g. number of employees, real sales or assets). In this analysis, sales were used to approximate the classification used by the European Commission for firm dimension. Control variables for the market (the industry dummies) were also used (see Simões, 2017 for details).

To reduce endogeneity, all financial and size variables were used with one lag. Moreover, in order to measure the impact of the financial variables on survival, only firms that had positive values for the financial variables for at least one of the sample years were included in the analysis. Additionally, sectors that did not have at least one firm with positive values of exports in each year were excluded.

Table 14 shows the evolution of death rates across the years for exporting and non-exporting firms. There is clear evidence that the rate is higher in the case of non-exporters. Relative to export status, exiters from export markets have the highest death rate and continuous exporters have the lowest.

Table 15 presents the sample means of the firm's variables by exporting status. On average, exporting firms are larger and older, have larger profits and have lower collateral and leverage. Finally, on average, profits are the highest for continuously exporting firms and continuous non-exporters have the largest value of debt.

3. Empirical model

To achieve our purpose it is essential to estimate the exit probability of firms. Several important features condition the analysis and should be taken into consideration before choosing a suitable model. First, looking at the information available for firms in 2012, it is impossible to know when most of the firms in the sample will die, i.e., the data is right censored. Second, in 2008 all firms were included regardless

	Non--Exporters	Exporter	Exiter Export Market	Continous Exporter	Continous Non--Exporter	Starter/ switcher
Age (S1)	2.409 (0.774)	2.629 (0.759)	2.533 (0.695)	2.687 (0.740)	2.397 (0.780)	2.431 (0.790)
Age (S2)	2.431 (0.761)	2.600 (0.756)	2.518 (0.705)	2.650 (0.744)	2.423 (0.765)	2.432 (0.771)
Size (S1)	12.27 (1.690)	13.76 (1.675)	12.90 (1.428)	14.01 (1.577)	12.22 (1.701)	12.89 (1.709)
Size (S2)	11.97 (1.657)	13.43 (1.760)	12.55 (1.476)	13.70 (1.658)	11.91 (1.663)	12.55 (1.804)
Collateral (S1)	65.69 (50.61)	63.32 (46.23)	61.33 (46.28)	64.41 (46.69)	66.12 (50.99)	59.62 (44.44)
Collateral (S2)	31.16 (28.39)	25.26 (21.91)	25.66 (23.98)	24.94 (21.32)	31.70 (28.73)	26.32 (23.75)
Profits (S1)	0.805 (14.54)	3.112 (10.53)	1.463 (12.75)	3.451 (9.906)	0.741 (14.70)	1.960 (12.35)
Profits (S2)	−1.786 (19.92)	1.659 (14.10)	−1.127 (17.60)	2.213 (13.07)	−1.850 (20.13)	−0.199 (16.98)
Leverage (S1)	23.17 (22.16)	21.14 (17.07)	21.38 (18.59)	21.30 (16.70)	23.34 (22.47)	20.63 (18.25)
Leverage (S2)	39.60 (34.48)	30.99 (24.44)	34.16 (29.26)	30.18 (23.20)	40.13 (34.90)	33.71 (28.03)
Observations	213627	58588	18781	45272	194846	13316

Table 15: Sample means of the firms' variables by exporting status

Note: (S1) - sample from 2008-2010; (S2) - sample from 2011 -2012; Standard errors are reported in parenthesis; Variables are expressed in logs.
Sources: IES and author's calculations.

of their age, which means that the data is left truncated. Third, the data used is of annual periodicity, and therefore it is not possible to determine the exact time of death of the firm. It is only possible to acknowledge that the firm died after the beginning of the period and before it ended, thus interval censoring is also present. Finally, it is also important to incorporate firm heterogeneity in the models as it is relevant to explain survival. For instance, the discrete survival model used to analyse the relationship between survival and exporter status was:

$$\log h_i(t, \Pi|\nu) = \delta(t) + \beta Y_{it} + \alpha X_{it} + \eta W_{it} + \gamma +$$
$$X_{it} * W_{it} + \omega Z_{it} + \theta_i \qquad (20)$$

where the hazard depends on the baseline hazard that characterises each firm, $\nu(\theta_i = f(\nu))$, (t) and Y_{it} correspond to a firms age and size, X_{it} is a vector of financial variables, W_{it} are export status indicators, Z_{it} are market indicators, and β, α, η and ω are vectors of regression coefficients.[42]

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42 Note that the interaction term is $\gamma X_{it} * W_{it} = \gamma_1 \text{Levarage}_{it}$ Export status$_{it} + \gamma_2$ Profits$_{it}$ Export status$_{it} + \gamma_3$ Collateral$_{it}$ Export status$_{it}$. Π includes Y_{it}, X_{it}, W_{it} and Z_{it}.

4. Results

The impact of financial variables - leverage, profits and collateral - is relevant (statistically significant) for the exit decision of firms. The results show that firms with more leverage have on average a higher likelihood of exit, which is consistent with the results found in the literature (e.g. Fotopolis and Louri, 2000, Bridges and Guariglia, 2008, Görg and Spaliara, 2014), including previous results that used Portuguese data (Farinha and Santos, 2006, Mata et al., 2010, and Mata and Freitas, 2012).

The results also indicate that firms with higher ROA (profits) have on average a lower probability of exit. This is in line with previous studies on survival (Mata and Freitas, 2012, Fotopolis and Louri, 2000, Bridges and Guariglia, 2008). Moreover, collateral is also an important factor of survival. The higher its value, the lower is, on average, the probability of exit. In the literature, several variables have been used as proxy for collateral, e.g. fixed assets (Fotopolis and Louri, 2000); and tangibles assets, which include not only fixed assets but also inventories (Farinha and Santos, 2006, and Bridges and Guariglia, 2008). The empirical results show that the probability of survival depends on the financial strength of firms, as companies with less leverage and more profits and collateral have a lower probability of exit, which is also consistent with the existent empirical literature.

The empirical results also show that exporting firms have, on average, a lower probability of exit than non-exporting firms, controlling for the financial factors that also influence the business. There are several empirical studies that analyze the link between firm survival and exports, and found that (on average) exporting firms have a lower likelihood to exit or the link is insignificant. However, only Bridges and Guariglia (2008) analyzed this effect controlling for the financial health of the firm. Their conclusion was that exporting firms had a higher probability of survival.

A more detailed analysis of the effect of exporting was done considering exiters of export markets, continuous exporters, continuous non-exporters and starters. After controlling for financial factors (on average) exiters from export markets have the highest probability of closing their business. Starters/switchers have the lowest probability of exit, which suggests that the decision to start exporting and exit are not taken in the same year. Continuous exporters show a lower probability of exit when compared to continuous non-exporters, this difference is particularly relevant in the last period (2011-2012). However, Table 15 shows that firms with different exporting status present different sample means for the financial variables. This fact suggests

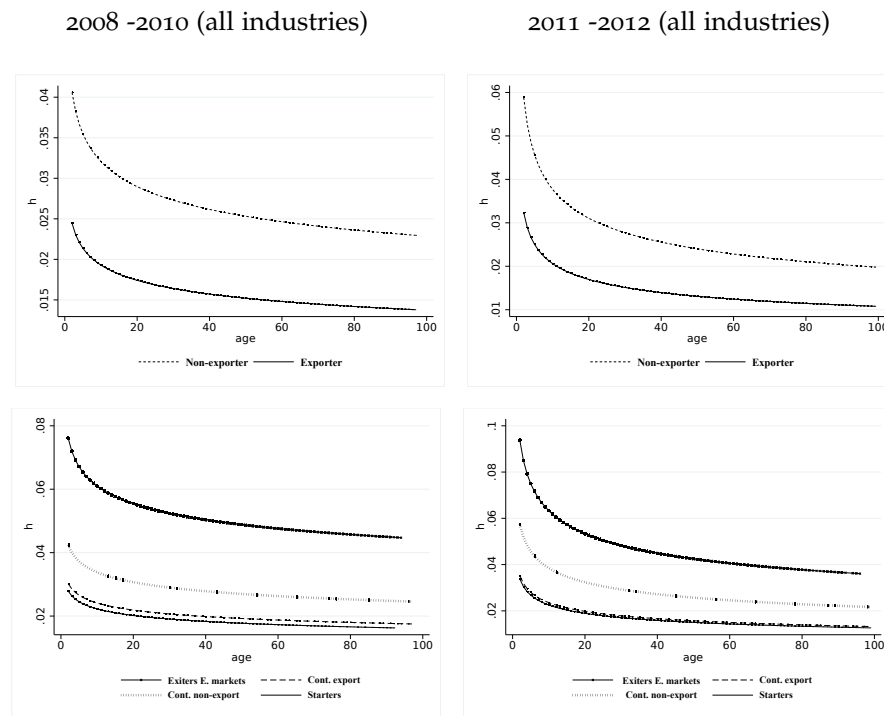2008 -2010 (all industries)   2011 -2012 (all industries)

Figure 50: Hazard rates

that the impact of export status on survival happens through two channels - the financial and the non-financial.

Figure 50 shows the hazard rate (probability of death at each age) using the coefficients that were estimated in the regression, the mean of the financial variables for each status, and the effect of the status. The graphs confirm the previous conclusions that exiters from export markets have higher hazard rates, and starters/switcher have the lowest rates. Continuous exporters have a lower likelihood of exit relative to continuous non-exporters.

The exporting status of a firm seems relevant to explain survival even when the financial effect is controlled for in the model. The results also show that the decision to export comes with risks as exiters from export markets had the highest values for the hazard rate. A possible explanation is that a large investment is required prior to the start of the exporting activity, with a large share being a sunk cost. Not succeeding may therefore compromise the firm's ability to honor their commitments with the financial institutions or reduce the internal resources of the firm to unsustainable levels.

The results on the individual characteristics of the firms are also consistent with the literature, as older and larger firms have a lower probability to exit. In addition, the results show that the interac-

tions between the financial variables and export status are particularly relevant when the estimation uses all industries, with most of the coefficients being statistically significant. The empirical results suggest that the increase in the probability of exit after a decrease of collateral or profits will be higher for exiters from export markets relative to starters and continuous non-exporters, however the impact on survival after an increase in leverage is expected to be lower for exiters. It should be noted that even in the presence of interactions, the indicators of export status remain statistically significant, with the same sign and ordering.

5. Concluding remarks

As expected, the results indicate that firms with less leverage, higher profits and higher collateral are more likely to survive than their counterparts. The empirical analysis also shows that after controlling for financial effects, firms' characteristics such as age and size, sector characteristics, macro and random firm effects, exporters were more likely to survive than non-exporting firms. In addition, after exiting the export market firms had a lower probability of surviving when compared to continuous and non-continuous exporters, and starters/switchers.

Firms that export are more robust, they have lower death rates, lower leverage and higher returns. This may be relevant for policy decisions. Therefore, removing barriers to internationalization is important to strengthen the economy. However, the decision to export has risks. Firms that stop exporting have the highest hazard rates.

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