Stayin' Alive: Export Credit Guarantees and Export Survival*

Magnus Lodefalk† Aili Tang‡ Miaojie Yu§

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Abstract

We use survival analysis to analyse the impact of export credit guarantees on firms' export duration using granular Swedish panel data at the firm-country and firm-country-product levels. The estimation results show that firms' export survival substantially increases with guarantees, at both levels. The associations are particularly strong for smaller firms and contracts as well as in trade with riskier markets. The findings have implications for policies to promote long-run export growth.

Keywords: Exports; Survival; Export credit guarantees; Firms

JEL Codes: D22, F14, H81, C14, C41

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†Corresponding author: Magnus Lodefalk, Associate Professor. Address: Department of Economics, Örebro University, SE-70182 Örebro, Sweden, Telephone: +46 722 217340; Global Labor Organization, Essen, Germany; Ratio Institute, Stockholm, Sweden. E-mail: *magnus.lodefalk@oru.se*.

‡Örebro University, Sweden.

§Liaoning University, China

1. Introduction

Firms entering foreign markets often fail to sustain exports, with most flows ending within 2-3 years (Besedeš and Prusa, 2006; Esteve-Pérez *et al.*, 2013). Yet, export survival is as crucial as entry, as small survival rate differences can significantly impact long-term export growth (Besedeš and Prusa, 2006, 2011).

Governments encourage foreign trade by insuring exports against default via export credit guarantees. Widely used in developed and developing countries, these guarantees were notably expanded during the global financial crisis and COVID-19 pandemic to address firms' vulnerability to financial distress and uncertainty.

We are the first to investigate the role of export credit guarantees in export survival. Heterogeneous exporters use guarantees to mitigate foreign buyer default risks and liquidity constraints, which would otherwise reduce expected profits and deter market-specific investments (Agarwal *et al.*, 2023; Heiland and Yalcin, 2020).[1] We hypothesise that guarantees promote bilateral export entry, expansion, and survival. By reducing trade uncertainty, we also expect small export contracts, often associated with shorter trade relationships, to show higher survival rates (Besedeš, 2008).

Using survival models on detailed Swedish firm-country and firm-country-product data on guarantees and trade, we find that guarantees positively and heterogeneously affect bilateral export survival.

We contribute to the literature in two ways. First, we expand the limited evidence on factors influencing export duration by examining export credit guarantees (e.g., Anwar *et al.*, 2019; Chen, 2012; Demir *et al.*, 2021; Doan and Le, 2024). Second, our granular data enable a detailed analysis of the relationship between guarantees and export survival while controlling for confounders at firm, industry, and macro levels. Despite the prevalence

[1] Partial equilibrium models consider factors like export uncertainty, importer default risk, and liquidity constraints, building on Melitz (2003) and Manova (2013).

of guarantees, firm-level studies on their impact are scarce, with only one firm-country level study and none addressing export survival (e.g., Heiland and Yalcin, 2020; Jäkel, 2021).[2]

2. Data and Empirical Framework

We use data from the Swedish Export Credit Agency (EKN). The EKN insures export transactions against political and commercial risks, serving as a guarantor of last resort. It guarantees exports worth around 4–5 billion USD annually across over 130 countries, We use transaction-level data on all loss-on-claim guarantees, which insure export transactions against default, for the pre-period year 1999 and study years 2000-2015. We also add register data from Statistics Sweden (SCB) on the characteristics of non-financial firms with at least one employee. (For details, see the Online Appendix.)

We then create spells of firms' country and country-product export durations. Entry (exit) is defined as moving from no exports (exports) in $t-1$ to exports (no exports) in t. In the study period, there were 745,805 country and 5,351,873 country-product export spells, with a mean duration of 2 years (Table A1).

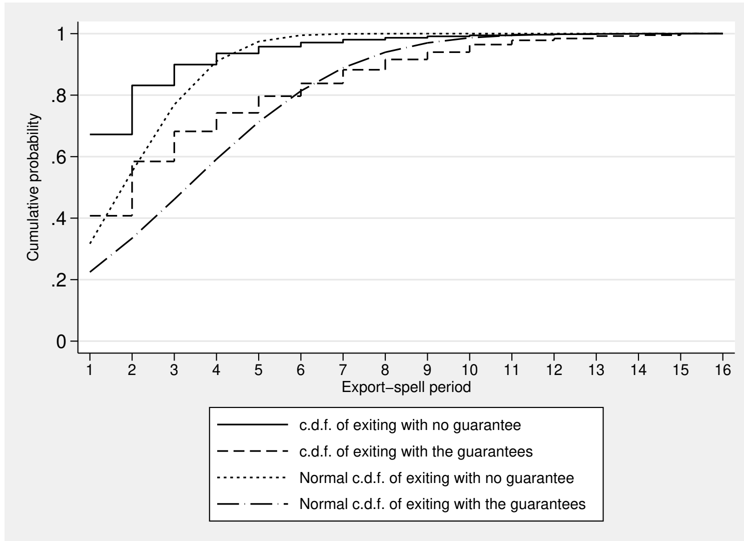
Figure 1 presents cumulative distribution functions for firms' export exit. With guarantees, export durations are positively skewed at both the country and product levels, with median survival times of 5 and 2 years, respectively. We will test these patterns using survival analysis.

We may underestimate export duration because it is unclear whether 2000 (2015) represents the first (last) year of a spell. To address left-censoring, we use pre-period data from 1999, and for right-censoring, we apply survival analyses (Hess and Persson, 2011). Additionally, the use of annual, interval-censored data could bias estimates (Hess and Persson, 2012), so we employ discrete-time survival methods.[3]

[2] For a literature survey on guarantees, see, e.g., Agarwal *et al.* (2023).

[3] Results are robust to excluding repeated entries/exits (Online Appendix Table A5).

(A) Firm-country level



(B) Firm-country-product level

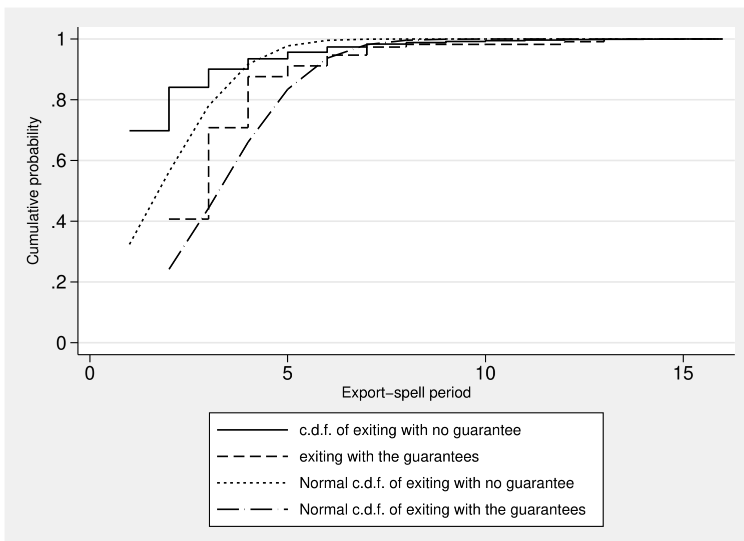


FIGURE 1
Notes: These figures show cumulative distribution plots (cdfs) of export market exits by guarantee usage status in the previous year at the country level (A) and country-product level (B) from 2000 to 2015. Best-fitting normal (Gaussian) models are superimposed.

Estimation employs both non-parametric and discrete-time duration models. Equation 1 presents the Kaplan–Meier product-limit estimator of the survival function S, representing the probability that a trade spell i survives at least t periods:

$$\hat{S}(n) = \prod_{i:t_i \leq t} \frac{m_i - d_i}{m_i} \tag{1}$$

where m_i is the number of subjects (firm-country or firm-country-product spells) at risk of exiting exports in period t_i, and d_i is the number of observed exits at t_i. The survival function is thus estimated as the ratio of surviving subjects to those at risk.

To evaluate key factors influencing export duration, we estimate a discrete-time model while controlling for unobserved heterogeneity. The discrete-time hazard rate h_{ik} of a trade relationship in a given interval (t_k, t_{k+1}), conditional on its survival up to the interval start and given explanatory variables, is defined as $h_{ik} = P(T_i < t_{k+1} | T_i \geq t_k, \mathbf{x}_{ik}) = F(\mathbf{x}'_{ik}\boldsymbol{\beta} + \gamma_k)$. Here, T_i is a continuous, non-negative random variable measuring the survival time of a trade relation, $\mathbf{x}_{ik}$ is a vector of characteristics (firm, industry, macro) explaining differences in export survival and guarantee usage, $\boldsymbol{\beta}$ is the parameter vector, and γ_k is the interval baseline hazard summarising duration dependence.[4] The hazard rate follows a logit form (Hess and Persson, 2012).

Ultimately, the final model to estimate can be expressed as:

$$logit\, h_{ik} = \mathbf{D}'\boldsymbol{\alpha} + \mathbf{X}'\boldsymbol{\beta} + \mathbf{W}'\boldsymbol{\gamma} + \mu_i \tag{2}$$

where the left side represents the logarithm of the odds ratio (a transformed hazard probability). On the right side, $\mathbf{D}$ is a set of time indicators, $\mathbf{X}$ a vector of possibly time-varying covariates affecting the hazard rate, α, β and γ are parameters to estimate, and $\mu_{\mathbf{i}}$ is the error term.

The terms $\mathbf{D}'\alpha$ include multiple intercepts, one per period, representing the baseline logit hazard function–i.e., the logit hazard value when all predictors are zero. Additionally, we

[4] Conditional on the extensive set of observables, we assume guarantees are as good as randomly allocated. Robustness checks include a quasi-natural experimental approach.

year and previous spell indicators in $\mathbf{D}$.

The calendar year indicators control for latent factors common to all trading partners and products in a given year. Indicators for the number of previous spells capture factors related to specific trade relationships (Hess and Persson, 2011). The terms $\mathbf{X}'\beta$ represent shifts in the baseline logit hazard function per unit change in predictors. $\mathbf{W}$ includes frailty indicators (Gaussian random effects for firm-country or firm-country-product combinations), and γ contains their parameters.

3. Results

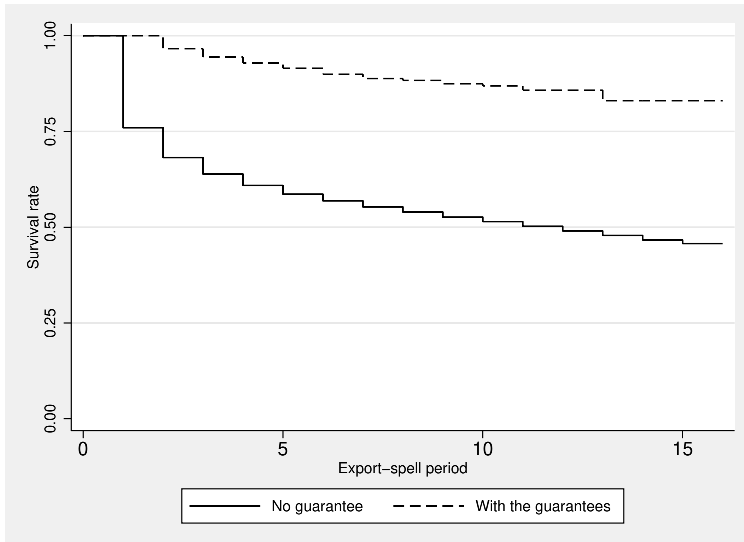
Figure 1 indicated that export flows with guarantees exhibit higher survival rates. To explore this, we estimate Equation 1, with results shown in Figure 2. Initial hazard rates are high but decline rapidly, particularly for guarantee users. With guarantees, firm-country survival remains above 75 percent throughout the study period.

Next, Table 1 presents country-level duration estimates of Equation 2, while product-country level estimates are in Table 2. Guarantees significantly reduce hazard ratios, decreasing exit probabilities by 50-65 percent on average. The association is the strongest for micro and small firms, especially at the product-country level.[5]

We anticipate heterogeneous effects of guarantees (e.g. Agarwal *et al.*, 2023; Badinger and Url, 2013; Besedeš, 2008; Demir *et al.*, 2021). This is analysed in Table A2. The association between guarantees and export duration is stronger for riskier markets (Col. 1) and smaller export contracts (Col. 2 vs. 3). Guarantees also had a greater impact during the financial crisis (Table A4, Online Appendix). These findings suggest that guarantees help reduce uncertainty and associated default risks, and liquidity constraints in foreign

[5] Results are robust to alternative assumptions, estimators, and specifications (see Online Appendix). The statistically significant effect remains under endogeneity controls using a Fuzzy Regression Discontinuity Design (FRDD) survival estimator, exploiting a Swedish quasi-natural experiment described in Agarwal *et al.* (2023). Smaller FRDD estimates are expected due to the experiment starting late in the study period (2012-), and the short mean export-spell duration, truncating potential impacts when using the FRDD estimator.

(A) Firm-country level



(B) Firm-country-product level

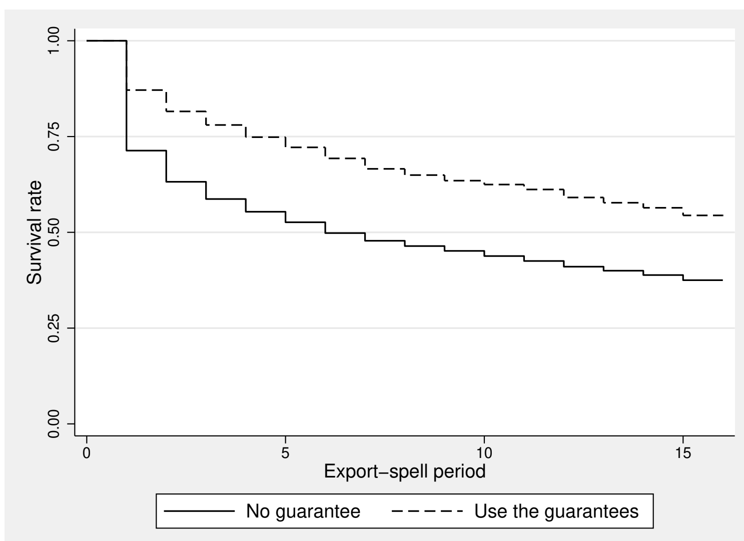


Figure 2

Notes: These figures show Kaplan-Meier survival estimates by guarantee usage status in the previous year at the firm-country (A) and firm-country-product (B) levels from 2000 to 2015.

Table 1

Estimates of the discrete-time hazard model, firm-country level

Odds ratio	(1) All	(2) Micro and small	(3) Medium	(4) Large
Guarantees(D)$_{t-1}$	0.443***	0.348***	0.500***	0.491***
	(0.045)	(0.064)	(0.132)	(0.084)
log(employment)$_{t-1}$	1.013***	1.012***	1.042***	0.975**
	(0.002)	(0.003)	(0.007)	(0.010)
Share post Sec.Educ. $_{t-1}$	0.682***	0.815***	0.638***	0.375***
	(0.008)	(0.012)	(0.023)	(0.019)
log(turnover)$_{t-1}$	1.033***	0.967***	1.014**	0.989**
	(0.002)	(0.004)	(0.005)	(0.005)
Export intensity$_{t-1}$	0.955***	0.895***	0.874***	0.906***
	(0.001)	(0.001)	(0.002)	(0.003)
log(distance)	1.061***	1.065***	1.123***	1.125***
	(0.005)	(0.007)	(0.012)	(0.017)
Log likelihood	-453,626.9	-258,861.7	-86,100.8	-42,781.3
Rho	0.0202	0.0104	0.0403	0.0299
Observations	865,214	489,328	184,879	97,760

Notes: The table shows baseline discrete-time hazard estimates at the firm-country level by firm size. The response is the logit hazard. Baseline indicators, year, and spell number dummies are included (omitted for brevity). Results with all confounders are in Online Appendix Table A1. Standard errors are clustered at the firm-country level. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 2

Estimates of the discrete-time hazard model, firm-country-product level

Odds ratio	(1) All	(2) Micro and small	(3) Medium	(4) Large
Guarantees(D)$_{t-1}$	0.426***	0.205***	0.329***	0.437***
	(0.067)	(0.068)	(0.108)	(0.116)
log(employment)$_{t-1}$	1.001	1.004***	1.011***	1.048***
	(0.000)	(0.001)	(0.002)	(0.003)
Share post Sec. Educ.$_{t-1}$	1.097***	0.930***	1.239***	1.690***
	(0.005)	(0.006)	(0.014)	(0.021)
log(turnover)$_{t-1}$	0.998**	0.902***	1.006***	0.960***
	(0.001)	(0.002)	(0.002)	(0.002)
Export intensity$_{t-1}$	0.979***	0.932***	0.924***	0.925***
	(0.000)	(0.001)	(0.001)	(0.001)
log(distance)	1.044***	0.974***	1.043***	1.053***
	(0.002)	(0.003)	(0.003)	(0.003)
Log likelihood	-4,874,001.5	-1,911,532.4	-1,176,328.7	-1,381,316.6
Rho	0.0332	0.0580	0.0247	0.0831
Observations	8,354,765	3,229,687	2,075,877	2,487,235

Notes: The table shows baseline discrete-time hazard estimates at the firm-country-product level by firm size. The response is the logit hazard. Baseline indicators, year, and spell number dummies are included (omitted for brevity). Results with all confounders are in Online Appendix Table A2. Standard errors are clustered at the firm-country level. * p < 0.10, ** p < 0.05, *** p < 0.01.

trade.

4. Concluding remarks

Export flows are short-lived, with factors promoting their survival still underexplored. Using survival analysis, we find a robust, substantial, and statistically significant positive link between export credit guarantees and survival, especially for smaller firms, contracts, and riskier markets. These findings indicate that governments can leverage export credit guarantees to foster sustained export participation and long-term growth.

5. Disclosure of interest

No potential conflict of interest was reported by the author(s).

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Appendix

Table A1
Exporting Duration

	Obs.	Mean	Median	Std. Dev.	Min.	Max.
(A) All Exporting Spells						
Firm-country						
Export-Spell Duration	745,803	2.3	1.0	2.5	1.0	16.0
Firm-country-product						
Export-Spell Duration	5,351,873	2.1	1.0	2.2	1.0	16.0
(B) Spells with any guarantees used						
Firm-country						
Export-Spell duration	1,210	6.7	5.0	4.6	1.0	16.0
Firm-country-product						
Export-Spell duration	47,060	3.6	2.0	3.5	1.0	16.0

Notes: The table displays the exporting spells of all Swedish firms (domestic and exporting) starting anytime during the period 2000 - 2015 and during which any guarantees were used. If a firm enters a destination market in year t, but is no longer present in that market in year t+1, the duration of the exporting spell is set as = 1. That is, a duration equal to 1 means that the firm was continuously exporting to this destination country during only one single year, thus entering and exiting in the same year.

Table A2

Estimates across types of use, firm-country level

Odds ratio	(1) Risk category 4	(2) Contract value (< 50% quantile)	(3) Contract value (> 50% quantile)
Guarantees(D)$_{t-1}$	0.332***	0.186***	0.332***
	(0.073)	(0.045)	(0.080)
Log likelihood	-21.388.5	-453,633.3	-453,652.3
Rho	0.027	0.020	0.020
Observations	36,789	865,214	865,214

Notes: The table displays the results at the firm-country level. Column (1) shows the results of the guarantees used in the destinations with highest risk category. The country risk categories are on a scale of $0-7$. The lower the number, the better the country's creditworthiness. Risk category 1 $\in$ [0, 2); Risk category 2 $\in$ [2, 4); Risk category 3 $\in$ [4, 6); Risk category 4 $\in$ [6, 7]. The results by 2 quantiles of export contract value are presented in Column (2) and Column (3). Baseline indicator, year and spell number dummies are included. Standard errors clustered at firm-country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.