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Stayin' Alive: Export Credit Guarantees and Export Survival

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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: Survival; Exports; Export credit guarantees

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

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1. Introduction

Firms that start to export rarely survive in the foreign market and this may negatively impact their future growth. The global financial crisis and the COVID-19 pandemic have illustrated the vulnerability of firms' exports to financial distress and heightened uncertainty. During both of these crises, governments increased capacity for offering export credit guarantees (OECD, 2020). We investigate for the first time firms' use of export credit guarantees and export survival, employing non- and semi-parametric survival models on rich Swedish register data on guarantees and trade. Our results indicate that guarantees positively impact export survival, particularly for smaller firms and contracts, as well as in trade with riskier markets.

Our study contributes to the growing literature on export survival. Most export flows have been found to cease within 2-3 years (Besedeš and Prusa, 2006; Esteve-Pérez *et al.*, 2013). However, export survival is at least as important as export entry. Small differences in survival rates can account for large differences in long-run export growth (Besedeš and Prusa, 2006, 2011).

We add to the limited evidence on factors that promote export duration by analysing the novel factor of export credit guarantees (e.g., Anwar *et al.*, 2019; Chen, 2012; Demir *et al.*, 2021). Such guarantees are prevalent in both developed and developing countries, with the value of new guarantees almost doubling since 2007 (Berne Union, 2018). Governments provide guarantees to firms for a fee to insure exports against default in trade. Despite the prevalence of countries offering guarantees, there are very few firm-level studies on export credit guarantees and firm performance, and none on export survival (e.g., Heiland and Yalcin, 2020).[1]

We expect guarantees to promote not only export entrance and expansion but also export survival, with the underlying mechanisms being a reduction in default risks and liquidity

[1] For a survey of the literature, which lacks evidence on export survival, see, e.g., Agarwal *et al.* (2018).

constraints that otherwise deter market-specific investments (Agarwal *et al.*, 2018). By reducing uncertainty in trade, we also expect small export contracts, which are associated with shorter trade relations, to be more likely to survive (Besedeš, 2008).

2. Data and Empirical Framework

We construct a data set for analysis by merging information from the Swedish Export Credit Agency (EKN) and Statistics Sweden (SCB), both which are independent government agencies. From the EKN, we have transaction-level information on the universe of loss on claim guarantees in the pre-period year 1999 and the study years 2000-2015. The guarantees insure export transactions against agents' default. We aggregate these data to the firm-country and firm-country-product level.[2]

Using unique firm identifiers, we merge the EKN data with SCB register data on firm characteristics in the period 2000-2015. We then construct a database at the firm-country level and another at the firm-country-product level. These data allow us to study the universe of all non-financial firms with at least one employee and their guarantees.

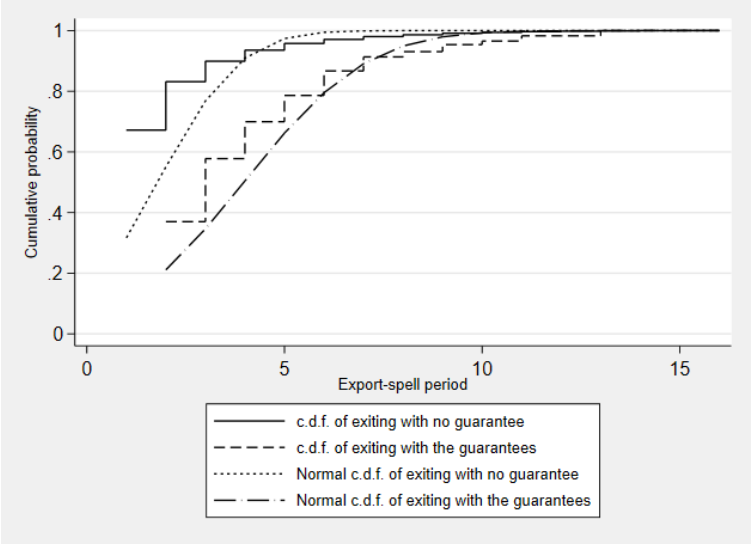
From these data, we create spells of firms' country and country-product export durations. Entry (exit) is defined as moving from no exports (exports) in $t-1$ to exports (no exports) in t. The maximum length of a completed spell in our sample is 16 years. Table A1 presents the duration of export spells for all firms and the subset of firms using guarantees. In the study period, there were 745,805 country and 5,351,873 country-product export spells, with a mean duration of 2 years.

In Figure 1, we display the cumulative distribution functions for firms' export exit. We conclude that export relations are short-lived. However, studying the 37.7% of all firm-country spells and 66.8% of all firm-country-product spells that were accompanied by

[2] Absent specific product information from EKN, we consider product-destination treatment as given, (D)$t-1$=1, if a firm starts to use guarantees for exports to a country while simultaneously starting to export a single 8-digit level product to the same country.

guarantees at entry, we find export spells to be longer. With guarantees, the distributions of duration are positively skewed both at the country and product level, with a median survival time of 5 and 2 years, respectively. We will test whether these stylised facts hold when using survival analysis.

(A) Firm-country level



(B) Firm-country-product level

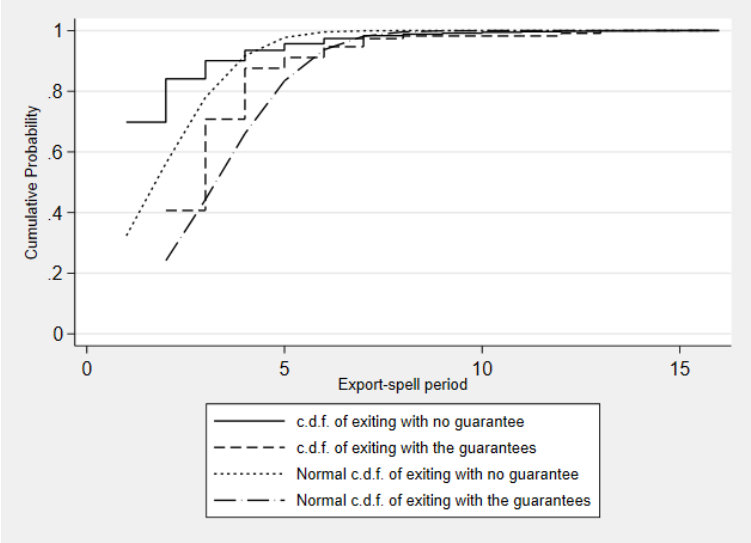


FIGURE 1
Notes: These figures display cumulative distribution plots (cdfs) of exits from export markets and by the usage of guarantees status in the previous year at the country level (A) and the country-product level (B) over 16 years from 2000 to 2015. The best fitting normal (Gaussian) models are also superimposed.

The nature of our data for survival analysis raises two issues. First, we may underestimate export duration because we cannot ascertain whether the initial (exiting) year of 2000 (2015) is the first (last) year of a spell. We address left-censoring by exploiting pre-period data for 1999, and right-censoring by using survival analyses (Hess and Persson, 2011). Second, our data are annual and therefore interval-censored, potentially biasing estimates (Hess and Persson, 2012). Therefore, we will use discrete-time survival methods.[3]

Turning to our estimation models, we employ both a non-parametric and a discrete-time duration model. In Equation 1, we have our non-parametric estimator, the Kaplan–Meier product limit estimator of the survival function S, which is the probability of survival for at least t periods for a trade spell i:

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

where m_i is the number of subjects (firm-country or firm-country-product spells) at risk of failing (exiting exports) in period t_i, and d_i denotes the number of observed failures at t_i. Thus, the function is estimated as the ratio between the number of subjects that survive and the number of subjects at risk.

To evaluate key factors affecting the export duration relation, we estimate a discrete-time duration model while controlling for unobserved heterogeneity. The discrete-time hazard rate h_{ik} of a particular trade relationship in a given time interval (t_k, t_{k+1}) conditional on its survival up to the beginning of the interval and given the explanatory variables, is defined as $h_{ik} = P(T_i < t_{k+1} | T_i \geq t_k, \mathbf{x}_{ik}) = F(\mathbf{x}'_{ik}\boldsymbol{\beta} + \gamma_k)$. Let T_i be a continuous, non-negative random variable measuring the survival time of a particular trade relation. $\mathbf{x}_{ik}$ is a vector with a large set of characteristics (firm, industry and macro characteristics) expected to

[3]The results are robust to excluding repeated entries/exits, see Table A5 of the Online Appendix.

explain differences in firm-country export survival and guarantee usage,[4] β is the vector of parameters to be estimated, and γ_k is the interval baseline hazard and summarises the pattern of duration dependence. The hazard rate is assumed to be of a logit form (Hess and Persson, 2012).

Ultimately, the final model to be estimated 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 presents a transformed version of the hazard probability (i.e., taking logarithms of the odds ratio). On the right side, **D** is a set of time indicator variables, **X** is a vector of possibly time-varying substantive covariates that are assumed to affect the hazard rate, α, β and γ are parameters to be estimated, and $\mu_\mathbf{i}$ is the error term. The set of terms $\mathbf{D}'\alpha$ includes multiple intercepts, one per period. As a group, they represent the baseline logit hazard function, i.e., the value of logit hazard when all the substantive predictors are zero. In addition, we include indicator variables for years and previous spell in **D**. The calendar year indicators control for latent factors common to all trading partners and products in a given year. The indicators for the number of previous spells are assumed to capture the factors that are related to any given trade relationship (Hess and Persson, 2011). The set of terms $\mathbf{X}'\beta$ represents the shift in the baseline logit hazard function corresponding to unit differences in the associated predictors. **W** represents indicators for frailty, that is, Gaussian random effects for every firm-country or firm-country-product combination, and γ contains the corresponding parameters.

[4]Conditional on the extensive set of observables, we assume that guarantees are as good as randomly allocated. In robustness checks, we consider remaining endogeneity concerns by adapting a quasi-natural experimental approach to survival analysis.

3. Results

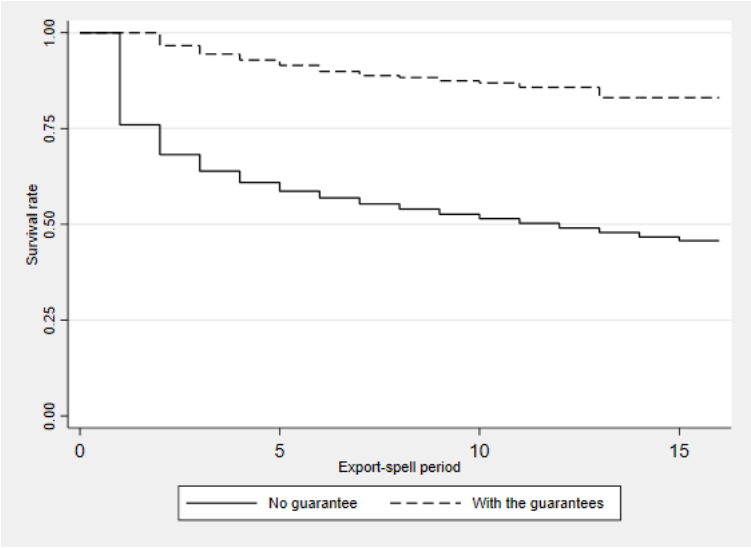
Our stylised facts in Figure 1 suggested that export flows with guarantees have a higher survival rate. We now investigate this by estimating Equation 1, and the results are presented in Figure 2. The initial hazard rates are high but rapidly decline, especially for users of guarantees. When using guarantees, the firm-country survival rate is above 75 percent throughout the time span of our study.

Next, in Table 1, we display the country-level duration estimates of Equation 2, while the product-level estimates are in Table A2. All estimates are in terms of hazard ratios, with a ratio < 1 indicating a decrease in hazard, i.e., a longer duration. We find that guarantees are linked to a substantial lowering of the hazard ratios, an average 50-65 percent decrease in the probability of exit in the next year. The association is the largest for micro and small firms, and especially at the product level.[5]

We expect heterogeneous effects of guarantees (e.g. Agarwal *et al.*, 2018; Badinger and Url, 2013; Besedeš, 2008; Demir *et al.*, 2021), and we analyse this in Table A3. We find a stronger association between guarantees and export duration for exports to riskier markets (Col. 1) and for smaller export contracts (Col. 2 vs. 3). Using guarantees during the financial crisis also more strongly promoted export duration (Table A4 in the Online Appendix). Overall, these patterns are suggestive of guarantees reducing uncertainty and associated default risks and liquidity constraints in foreign trade.

[5]The results are robust to alternative assumptions, estimators, and specifications, see the Online Appendix. The presence of a statistically significant positive effect is robust to remaining endogeneity concerns using a Fuzzy Regression Discontinuity Design (FRDD) survival estimator that exploits a Swedish quasi-natural experiment that is described in Agarwal *et al.* (2018). The small magnitudes of the FRDD estimates on export duration are expected since the experiment started near the end of the study period (2012-), and the mean export-spell duration in our data is two years, thus, substantially truncating the potential impact on export survival when using the FRDD estimator.

(A) Firm-country level



(B) Firm-country-product level

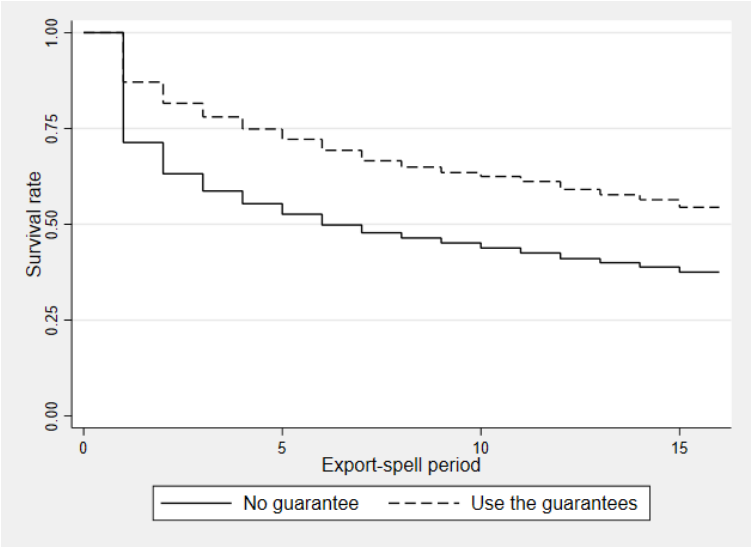


FIGURE 2
Notes: These figures display the Kaplan–Meier survival estimates by the usage of guarantees status in the previous year at the firm-country (A) and firm-country-product levels (B) over 16 years from 2000 to 2015.

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 displays our baseline discrete-time hazard estimates at the firm-country level and by firm size. Response is measured as logit hazard. Baseline indicator, year and spell number dummies are also included (omitted for brevity). The results with all confounders included are displayed in Online Appendix Table A1. Standard errors are clustered at the firm-country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4. Concluding remarks

Export flows are short-lived, but yet little is known about factors promoting export survival. We employ survival analysis to investigate the role of export credit guarantees for export survival. We find a robust, substantial and statistically significant positive association between guarantees and firm-country and firm-country-product export survival, particularly for smaller firms and contracts, as well as for riskier markets. The results suggest that governments may employ export credit guarantees to promote firms' sustained export participation and long-run export growth.

References

Agarwal, N. and Lodefalk, M. and Tang, A. and Tano, S. and Wang, Z. (2018). 'Mitigating Information Frictions in Trade: Evidence from Export Credit Guarantees', *Örebro University Working Paper*, No. 12/2018.

Anwar, S. and Hu, B. and Jin, Y. and Wang, K. (2019) 'China's export tax rebate and the duration of firm export spells', *Review of Development Economics*, vol. 23(1), pp. 376–394.

Badinger, H. and Url, T. (2013). 'Export credit guarantees and export performance: Evidence from Austrian firm-level data', *World Economy*, vol. 36(9), pp. 1115–30.

Berne Union (2018). 'Berne Union Yearbook 2017', TXF Publishing.

Besedeš, T. and Prusa, T.J. (2006). 'Ins, outs, and the duration of trade', *Canadian Journal of Economics/Revue canadienne d'économique*, vol. 39(1), pp. 266–295.

Besedeš, T. (2008). 'A search cost perspective on formation and duration of trade', *Review of International Economics*, vol. 16(5), pp. 835–849.

Besedeš, T. and Prusa, T.J. (2011). 'The role of extensive and intensive margins and export growth', *Journal of Development Economics*, vol. 96(2), pp. 371–379.

Chen, W.C. (2012). 'Innovation and duration of exports', *Economics Letters*, vol. 115(2), pp. 305–308.

Demir, B. and Crozet, M. and Javorcik, B. (2021). 'International trade and letters of credit: A double- edged sword in times of crises', *CEPR Discussion Paper Series*, No. 16630.

Esteve-Pérez, S. and Requena-Silvente, F. and Pallardó-Lopez, V.J. (2013). 'The duration of firm-destination export relationships: Evidence from Spain, 1997–2006', *Economic Inquiry*, vol. 51(1), pp. 159–180.

Heiland, I. and Yalcin, E. (2020). 'Export market risk and the role of state credit guarantees', *International Economics and Economic Policy*, vol. 18(1), pp. 25–72.

Hess, W. and Persson, M. (2011). 'Exploring the duration of EU imports', *Review of World Economics*, vol. 147, pp. 665–692.

Hess, W. and Persson, M. (2012). 'The duration of trade revisited', *Empirical Economics*, vol. 43(3), pp. 1083–1107.

OECD (2020). 'Summary of the Responses to the Survey on Export Credits and the Coronavirus (COVID-19) Pandemic', *Organisation for Economic Co-operation and Development*, TAD/ECG(2020)10.

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

Odds ratio	(1) All	(2) Micro and small	(3) Medium	(4) Large
Guarantees(D)$_{t-1}$	0.526***	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)
Import intensity$_{t-1}$	1.007***	1.016***	1.013***	1.014***
	(0.000)	(0.000)	(0.000)	(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 displays the baseline discrete-time hazard estimates at the firm-product-country level and by firm size. Response is measured as logit hazard. Baseline indicator, year and spell number dummies are also included (omitted for brevity). The results with all confounders included are displayed in Online Appendix Table A2. Standard errors are clustered at the firm-country-product level. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A3

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.

Online Appendix

Stayin' Alive: Export Credit Guarantees and Export Survival

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A. Table and Figure Appendix

Table A1

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)
log(firm age)$_{t-1}$	0.994***	0.998***	0.995***	1.001
	(0.000)	(0.001)	(0.001)	(0.001)
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)
Multinational status(D)$_{t-1}$	0.756***	0.851***	0.812***	0.804***
	(0.005)	(0.007)	(0.012)	(0.022)
Foreign ownership(D)$_{t-1}$	0.972***	1.088***	1.013	1.046**
	(0.007)	(0.011)	(0.013)	(0.019)
log(physical capital)$_{t-1}$	1.009***	1.006***	1.007*	1.017***
	(0.001)	(0.002)	(0.004)	(0.006)
log(value added)$_{t-1}$	0.976***	0.971***	0.990***	0.992**
	(0.001)	(0.002)	(0.003)	(0.004)
log(wage bill)$_{t-1}$	0.983***	0.968***	0.980***	1.005
	(0.002)	(0.004)	(0.005)	(0.011)
log(cost of raw materials)$_{t-1}$	1.000	1.000	1.004***	1.002***
	(0.000)	(0.000)	(0.001)	(0.001)
log(cost of intermediate goods)$_{t-1}$	1.004***	1.000	1.002***	1.000
	(0.000)	(0.000)	(0.001)	(0.001)
log(cost of intermediate services)$_{t-1}$	1.005***	1.002	0.994***	0.968***
	(0.001)	(0.002)	(0.002)	(0.003)
Export intensity$_{t-1}$	0.955***	0.895***	0.874***	0.906***
	(0.001)	(0.001)	(0.002)	(0.003)
Import intensity$_{t-1}$	0.990***	0.983***	0.974***	0.979***
	(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(GDP)	0.978***	0.975***	0.958***	0.945***
	(0.002)	(0.003)	(0.005)	(0.006)

Notes: The table displays our baseline discrete-time hazard estimates at the firm-country level and by firm size. Response is measured as logit hazard. Baseline indicator, year and spell number dummies are also included. Standard errors are clustered at the firm-country level. * p < 0.10, ** p < 0.05, *** p < 0.01.

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

Odds ratio	(1) All	(2) Micro and small	(3) Medium	(4) Large
WTO(D)	0.936***	0.861***	0.809***	0.874***
	(0.018)	(0.024)	(0.032)	(0.040)
FTA(D)	0.880***	0.906***	0.951**	0.929**
	(0.009)	(0.013)	(0.022)	(0.028)
log(asset tangibility)	0.950***	0.966***	0.963***	0.944***
	(0.001)	(0.001)	(0.003)	(0.005)
log(Ext. financial dependence)	1.006***	1.003***	1.007***	1.011***
	(0.000)	(0.000)	(0.001)	(0.001)
Ownership of banks	1.004***	1.006***	1.003	0.997
	(0.001)	(0.002)	(0.003)	(0.004)
Private sector credit	0.998	0.996*	0.993*	0.979***
	(0.002)	(0.002)	(0.004)	(0.005)
Interest rate of bank	1.000	1.004	0.991	0.982**
	(0.004)	(0.005)	(0.008)	(0.009)
Country risk	1.012***	1.031***	1.015***	1.008
	(0.002)	(0.003)	(0.005)	(0.006)
Δ Export demand	0.993***	0.979***	0.977***	0.983***
	(0.000)	(0.001)	(0.001)	(0.001)
Δ Import demand	0.988***	0.990***	0.989***	0.989***
	(0.000)	(0.000)	(0.001)	(0.001)
Δ Export intensity	1.006***	1.026***	1.028***	1.013***
	(0.001)	(0.001)	(0.002)	(0.004)
Δ Import intensity	0.985***	0.993***	0.994**	0.987***
	(0.001)	(0.001)	(0.002)	(0.004)
Δ Tot. export intensity	1.004***	1.001	0.988***	0.983**
	(0.001)	(0.001)	(0.004)	(0.007)
Δ Tot. import intensity	0.995***	0.994***	0.992**	0.989
	(0.001)	(0.001)	(0.004)	(0.007)
Δ log(employment)	0.986***	0.995**	0.977***	0.992
	(0.002)	(0.002)	(0.004)	(0.007)
Δ log(turnover)	0.981***	0.995	1.001	1.005
	(0.002)	(0.004)	(0.006)	(0.009)
Δ log(value added)	0.999	1.000	0.992***	0.996
	(0.001)	(0.002)	(0.003)	(0.004)
Δ Share of post-sec. educ.	1.049**	1.081***	1.113	2.005***
	(0.024)	(0.030)	(0.122)	(0.288)
Δ log(wage bill)	1.004*	0.989***	1.009**	0.998
	(0.002)	(0.003)	(0.004)	(0.009)
Δ log(physical capital)	0.993***	0.993***	0.973***	0.984*
	(0.002)	(0.002)	(0.005)	(0.010)
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 displays our baseline discrete-time hazard estimates at the firm-country level and by firm size. Response is measured as logit hazard. Baseline indicator, year and spell number dummies are also included. Standard errors are clustered at the firm-country level. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A2

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)$_{t-1}$	0.526***	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)
Firm age$_{t-1}$	1.003***	1.001***	1.007***	1.011***
	(0.000)	(0.000)	(0.000)	(0.000)
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)
Multinational status(D)$_{t-1}$	0.735***	0.845***	0.858***	0.862***
	(0.002)	(0.003)	(0.004)	(0.006)
Foreign ownership(D)$_{t-1}$	0.997	1.073***	1.071***	1.048***
	(0.002)	(0.004)	(0.004)	(0.004)
log(physical capital)$_{t-1}$	0.966***	1.004***	0.971***	0.914***
	(0.000)	(0.001)	(0.001)	(0.001)
log(value added)$_{t-1}$	0.980***	0.975***	0.993***	0.978***
	(0.000)	(0.001)	(0.001)	(0.001)
log(wage bill)$_{t-1}$	1.017***	1.006***	1.012***	1.025***
	(0.001)	(0.002)	(0.002)	(0.003)
log(cost of raw materials)$_{t-1}$	1.003***	1.002***	1.005***	1.007***
	(0.000)	(0.000)	(0.000)	(0.000)
log(cost of intermediate goods)$_{t-1}$	0.994***	0.997***	0.995***	0.993***
	(0.000)	(0.000)	(0.000)	(0.000)
log(cost of intermediate services)$_{t-1}$	1.013***	0.999	1.002***	1.008***
	(0.000)	(0.001)	(0.001)	(0.001)
Export intensity$_{t-1}$	0.979***	0.932***	0.924***	0.925***
	(0.000)	(0.001)	(0.001)	(0.001)
Import intensity$_{t-1}$	1.007***	1.016***	1.013***	1.014***
	(0.000)	(0.000)	(0.000)	(0.001)
log(distance)	1.044***	0.974***	1.043***	1.053***
	(0.002)	(0.003)	(0.003)	(0.003)
log(GDP)	0.988***	0.981***	0.999	0.998
	(0.001)	(0.001)	(0.002)	(0.002)
WTO(D)	1.100***	1.159***	1.031**	1.016
	(0.007)	(0.015)	(0.016)	(0.010)
FTA(D)	0.755***	0.610***	0.716***	0.813***
	(0.003)	(0.004)	(0.006)	(0.005)
log(asset tangibility)	0.989***	0.974***	0.982***	1.025***
	(0.000)	(0.001)	(0.001)	(0.001)
log(Ext. financial dependence)	1.008***	1.005***	1.008***	1.011***
	(0.000)	(0.000)	(0.000)	(0.000)

Notes: The table displays our baseline discrete-time hazard estimates at the firm-product-country level and by firm size. Response is measured as logit hazard. Baseline indicator, year and spell number dummies are also included. Standard errors are clustered at the firm-country-product level. * p < 0.10, ** p < 0.05, *** p < 0.01.

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

Odds ratio	(1) All	(2) Micro and small	(3) Medium	(4) Large
Ownership of banks	0.998***	1.006***	1.003***	0.994***
	(0.000)	(0.001)	(0.001)	(0.001)
Private sector credit	1.013***	1.028***	1.015***	1.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Interest rate of bank	0.953***	0.916***	0.930***	0.992***
	(0.001)	(0.002)	(0.002)	(0.002)
Country risk	1.011***	1.026***	1.016***	1.005***
	(0.001)	(0.002)	(0.002)	(0.001)
Δ Export demand	0.987***	0.973***	0.959***	0.960***
	(0.000)	(0.000)	(0.000)	(0.001)
Δ Import demand	0.995***	0.998***	0.997***	0.996***
	(0.000)	(0.000)	(0.000)	(0.000)
Δ Export intensity	0.992***	1.002***	0.984***	0.996***
	(0.000)	(0.001)	(0.001)	(0.001)
Δ Import intensity	0.990***	0.990***	0.994***	0.989***
	(0.000)	(0.000)	(0.001)	(0.001)
Δ Tot. export intensity	1.009***	1.002**	1.000	1.000
	(0.001)	(0.001)	(0.002)	(0.002)
Δ Tot. import intensity	1.000	1.000	0.995***	1.019***
	(0.000)	(0.001)	(0.001)	(0.002)
Δ log(employment)	0.995***	1.002*	0.993***	0.995***
	(0.000)	(0.001)	(0.001)	(0.001)
Δ log(turn over)	0.995***	1.007***	1.005**	1.014***
	(0.001)	(0.002)	(0.002)	(0.003)
Δ log(value added)	1.001***	1.005***	0.993***	1.002***
	(0.000)	(0.001)	(0.001)	(0.001)
Δ Share post Sec. educ.	0.952***	1.022*	0.990	1.019
	(0.009)	(0.013)	(0.028)	(0.029)
Δ log(wage bill)	0.990***	0.985***	0.998	0.979***
	(0.001)	(0.001)	(0.001)	(0.002)
Δ log(physical capital)	0.996***	0.987***	0.997**	0.983***
	(0.001)	(0.001)	(0.001)	(0.003)

Notes: The table displays our baseline discrete-time hazard estimates at the firm-product-country level and by firm size. Response is measured as logit hazard. Standard errors are clustered at the firm-country-product level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

TABLE A3

ROBUSTNESS ANALYSIS - FUZZY REGRESSION DISCONTINUITY ESTIMATES

	(1) Destination	(2) Product
Intention-to-treat effects	0.0003***	0.0002***
	(0.000)	(0.000)
1st. stage estimates	-0.005***	-0.003***
	(0.002)	(0.001)
1st. stage *F*-statistics	12.45	14,78
Observations	248,758	2,425,526
BW Loc. Poly. (h)	51	58
Intention-to-treat effects (200% h)	0.0002**	0.0001***
	(0.001)	(0.000)
Intention-to-treat effects (50% h)	0.0003***	0.0002***
	(0.000)	(0.000)

Notes: The table displays our FRDD survival estimates of the local average treatment effects on the treated (LATT) of a Swedish quasi-natural experiment. The first-stage estimates the effect of being below the cut-off for treatment on the probability of receiving treatment. The second-stage estimates the LATT in terms of the differences in outcomes between $t-1$ (before potential treatment) and t for the response variable export duration. We control for all the covariates in the main estimation of the discrete-time hazard model. An optimal bandwidth was determined using the data-driven technique, with a triangle kernel weight. We also present the second-stage estimates when using half or twice the optimally chosen bandwidths. Polynomial fit of order 1. The robust standard errors are in parentheses and clustered at firm-destination and firm-country-product levels, respectively. * p < 0.10, ** p < 0.05, *** p < 0.01.

TABLE A4

ROBUSTNESS ANALYSIS - THE FINANCIAL CRISIS, FIRM-COUNTRY LEVEL

	(1)	(2)
Odds ratio	Not use the guarantees	Use the guarantees
Guarantees(D)$_{t-1}$	0.541***	0.397***
	(0.089)	(0.050)
Log likelihood	-453,634.2	-453,658.6
Rho	0.020	0.020
Observations	865,214	865,214

Notes: The table displays results at the firm-country level and across non-usage/ use of guarantees during the outbreak of the financial crisis. Column (1) shows the results of using the guarantees excepting the year 2007 and year 2008. Column (2) shows the results of using any guarantees under the year 2007 and 2008. Baseline indicator, year and spell number dummy are included. Standard errors clustered at firm-country level. * p < 0.10, ** p < 0.05, *** p < 0.01.

TABLE A5

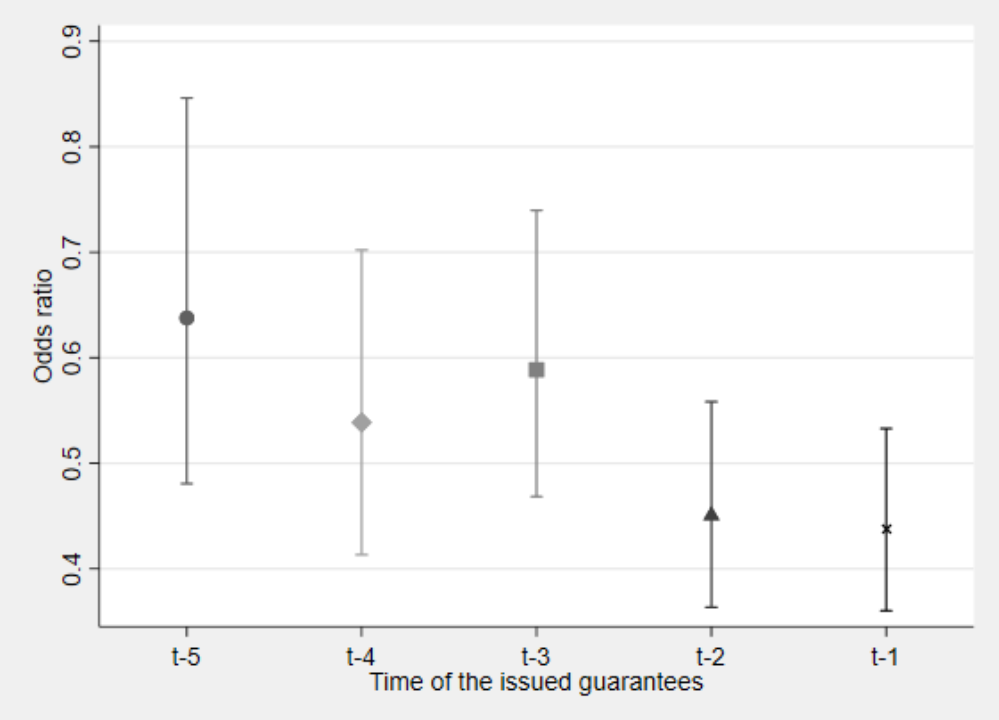
ROBUSTNESS ANALYSIS - EXCLUDING MULTIPLE USE/SPELLS, FIRM-COUNTRY LEVEL

	(1)	(2)
Odds ratio	Excluding the guarantees are used repeatedly	Excluding multiple spells
Guarantees(D)$_{t-1}$	0.463***	0.303***
	(0.029)	(0.054)
Log likelihood	-453,572.0	-171,47512.8
Rho	0.021	0.051
Observations	865,214	424,228

Notes: The table displays results at the firm-country level and across non-repeated use and non-multiple use of guarantees. Column (1) shows the results of excluding the guarantees used more than once under an export duration. Column (2) shows the results of excluding repeated entry/exits of export. Baseline indicator, year and spell number dummy are included. Standard errors clustered at firm-country level. * p < 0.10, ** p < 0.05, *** p < 0.01.

FIGURE A1

Effect by the time of the issued guarantees - Country level



Notes: This figure shows the effects on the exports odds ratio of using the guarantees at $t-5, t-4, ..., t-1$ at the firm-country level while controlling for not using the guarantees in the later periods. Baseline indicator, year and spell number dummy are included. Standard errors clustered at firm-country level. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A6
Variable definitions and data sources.

Explanatory Variables	*Definitions*	*Sources*
log (employment)	Log value to the number of (full-time equivalent) employees	SBS
log (turnover)	Log value of the net turnover in millions of USD	SBS
log (value added)	Log value of the value added in millions of USD	SBS
log(cost of raw materials)	Log value of the cost of raw materials in millions of USD	SBS
log(cost of intermediate goods)	Log value of the cost of intermediate goods in millions of USD	SBS
log(cost of intermediate services)	Log value of the cost of intermediate services in millions of USD	SBS
Share post-sec. educ.	Share of employees that have some years of post-secondary educations	LISA
log (wage bill)	Log value of the wage and social benefits in millions of USD	SBS
log (physical capital stock)	Log value of the physical capital stock in millions of USD	SBS
Firm age	The number of years since firms entered officially statistics	FAD
Multinational status (D)	Part of an enterprise with firms abroad, zero otherwise	EGR
Foreign ownership (D)	Larger than 50 percent foreign ownership, zero otherwise	EGR
Export intensity	Export value over sales regarding a specific destination	FTS
Tot. import intensity	Total import value over sales	FTS
Tot. export intensity	Total export value over sales	FTS
Import intensity	Import value over sales regarding a specific country	FTS
Demand shock for importers in t	Change in demand shock for importers from t-1 to t	UN database and own calculation
Demand shock for exporters in t	Change in demand shock for exporters from t-1 to t	UN database and own calculation
Asset tangibility	The share of net property, plant, and equipment in total book-value assets	Own calculation
External financial dependence	External financial dependence	Own calculation
log(distance to export markets)	Bilateral distance to export markets	CEPII
log(GDP)	Gross domestic product (GDP) of destination countries	CEPII
WTO (D)	Member of WTO, zero otherwise	CEPII
FTA (D)	Part of free trade agreement with EU, zero otherwise	CEPII
Bank ownership	The extent that the banking industry is privately owned	FRASIER
Private sector credit	The extent that credit is supplied to the private sector	FRASIER
Interest rates of bank	The extent that controls on interest rates interfere with the credit market	FRASIER
Country risk	Scale of country risk	EKN
Δ log (turnover)	Changes in net turnover from t-2 to t-1	SBS and own calculation
Δ the share of post-sec. educ.	Changes in share of post-sec. educ from t-2 to t-1	LISA and own calculation
Δ log (wage bill)	Changes in wage bill from t-2 to t-1	SBS and own calculation
Δ log (physical capital stock)	Changes in physical capital stock from t-2 to t-1	SBS and own calculation

Notes: Sources from Statistics Sweden are structural Business Statistics (Företagens ekonomi), SBS; Longitudinal Integration Database for Health Insu
Market Studies, LISA; Enterprise Group Register (Koncernregistret), EGR; Foreign Trade Statistics (Utrikeshandel med varor, Utrikeshandel med tjänste
Firms and Plants' dynamics (Företagens och arbetsställenas Dynamik), FAD; and Business Register (Företagsdatabasen), FDB.