DETERMINANTS OF EXPORT SURVIVAL: EMPIRICAL EVIDENCE FROM UKRAINE

by

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A thesis submitted in partial fulfillment of
the requirements for the degree of

MA in Economic Analysis

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Kyiv School of Economics

2018

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Abstract

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International trade plays a crucial role in economic development. Ukraine is not an exception with over 40% export share in the GDP structure. However, more than a half of Ukrainian firms cease their export activities after the first several years from entering a foreign market. Such situation was found to be an important issue not only for Ukraine but for other developing countries as well. The purpose of our study is to explore what factors influence export duration the most. We conducted the survival analysis on the sample of 8,414 Ukrainian manufacturing firms during 2001-2013. We found that the most significant factor that increases export duration is the intensive margin, while the extensive margin is the second important factor. Productivity is the third by the positive impact on the survival rate of exporting. In addition, we showed that the firm's size should be considered as a major factor in choosing which region to export. The results are generally consistent with the empirical studies for other countries, though industry-specific characteristics do not seem that important for survival as in other similar findings.

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ACKNOWLEDGMENTS

The author wishes to express the sincere gratefulness to her thesis advisor Professor Volodymyr Vakhitov for his insightful comments and readiness to help while conducting the study.

I thank my mentor Professor Tymofiy Mylovanov. His open-mindedness and kindness motivate and inspire to make decisions that help others.

I express my very great appreciation to my senior colleague Oleksandr Ivanov for his patience and support during all this time.

I would also like to acknowledge professors Olena Besedina, Olga Kupets and Tymofii Brik for their valuable recommendations.

GLOSSARY

"Death". The situation when firm stops its export activity and leaves the international market

Exit. Same as "Death"

Export survival rate. The probability that firm will continue its export activity given that it has survived until the period *t*

Failure. Same as "Death"

Hazard rate. Opposite to survival rate. The probability that firm will shut down its export activity given that it has survived until the period *t*

KVED. The standard Industrial Classification code

Chapter 1

INTRODUCTION

Over the last fifteen years the total amount of exported products in the world more than doubled, and following the World Trade Organization Database, it has reached about 17,420 bln USD by 2017.

Ukraine goes in line with the global trends. According to the State Statistics Service of Ukraine, the share of export in GDP structure is about 40% and has been increasing over the past years. However, more than a half of Ukrainian firms cease their export operations after the first several years of exporting, 25% of which do not survive even the first year and more than 15% disappear after the first year of exporting. It is a rather high level if we compare Ukraine with more developed countries where the "death" rate of exporters is typically less than 10% for the first year (Brenton et al., 2009). At the same time, in the least developed countries (LDCs) 50% of exporters stop their export activity within the first year (Nicita et al., 2013).

In this respect situation in Ukraine was similar to that in China at the beginning of the 2000s, where almost a half of enterprises survived on the export markets for less than three years. Fu and Wu (2012) found that firm size, productivity, and private ownership were the most crucial factors for export duration flows. Thus, we assume that these factors might be significant for Ukrainian exporters as well. In the analysis, we focused on the firm size and productivity.

We study these factors to be able to design better trade policies, which are essential for economic growth, and to assist potential exporters to allocate their resources more efficiently.

Many studies for other countries investigate the relationships between the export activity and both country and firm-specific characteristics. Among the primary determinants of export survival experts identify the firm's productivity rate (Pelkmans-Balaoing et al., 2017), previous exporting experience (Mohammed, 2010), product diversification (Nicita et al., 2013) and the level of cooperation with peers (Stoian et al., 2016) as well as the distance from the country of destination, common border and language (Besedes and Blyde, 2010) and country's GDP growth (Nicita et al., 2013).

The effect of various factors was estimated using different models and data types. The most widespread methods are panel data estimation and survival analysis. For the longitudinal data, probit (Siba and Gebreeyesus, 2015), logit (Stirbata et al., 2013) and structural equation models (SEM) (Stoian et al., 2016) were used most often. Some authors also used the GMM approach (Bernard and Jensen, 2004) to account for the state dependence of the export flow duration in dynamic linear probability models. For the survival analysis there are three groups of models which are used by economists: non-parametric estimators (Kaplan-Meier procedure and life tables), semi-parametric models (different variations of the Cox Proportional Hazards Model, Prentice-Gloeckler approach for grouped survival data) and parametric models (exponential model, Weibull regression, log-normal regression, log-logistic regression, generalized gamma regression).

We have found the survival analysis, especially the variations of Cox Model are the most appropriate. This model explores the effect of different parameters, such as external business conditions, various constraints, and firm-related factors, on the survival of a company in the export market. Our central hypothesis is that firm's productivity, and both intensive and extensive margins are the most crucial factors of export survival for Ukrainian companies.

In our study, we use the longitudinal data set of Ukrainian exporters for 2001-2013 provided by the State Statistics Service of Ukraine. The final sample contains the data of 8,414 Ukrainian manufacturing firms. Our data set includes all general information about a company and the financial results, such as the size, the registration date, output, costs (material and labor), industry classification (KVED), data of export-import operations, countries of destination, etc.

The results are consistent with the literature and indicate that an intensive margin has a higher magnitude than an extensive margin. The total factor productivity is only the third by the power of impact on export duration. The analysis has demonstrated that ceteris paribus, the probability of export survival increases with the firm size. A half of small firms disappear from the international market after the 4^{th} year of exporting, while the medium size enterprises remain for about seven years and big firms for almost nine years. The size is also crucial when we consider the effect of regional development. Thus in 2001-2013, for small firms, it was safer to diversify geographical distribution or to export in CIS countries. The partnership with CIS and EU countries had a positive effect on survival rate for medium size companies. Large companies had an opportunity to export in either CIS, EU and Asian markets with a low hazard of "death".

The research is structured in the following way: Chapter 2 investigates the theoretical framework for the further analysis, Chapter 3 and 4 describe the data and methodology of model specification; Chapter 5 highlights the primary estimation results and key findings, Chapter 6 concludes all together and explains the opportunities of policy implication and potential questions for further analysis.

Chapter 2

LITERATURE REVIEW

The topic of export activity and its duration occupies a significant part of researchers' discussion. However, despite the variety of different studies there is still no theoretical model, which would give a unique answer to the question: which factors influence export survival (Brenton et al. 2009, Hess and Persson, 2011). The main literature on this topic are empirical estimates for Asian and African countries such as China, Vietnam, Ethiopia etc.

The effect of various factors was estimated using different models and data types. The most widespread methods are panel data estimation and survival analysis. For the longitudinal data, probit (Siba and Gebreeyesus, 2015), logit (Stirbata et al., 2013) and structural equation models (SEM) (Stoian et al., 2016) were used most often. Some authors also used the GMM approach (Bernard and Jensen, 2004) to account for the state dependence of the export flow duration in dynamic linear probability models. For the survival analysis there are three groups of models which are used by economists: non-parametric estimators (Kaplan-Meier procedure and life tables), semi-parametric models (different variations of the Cox Proportional Hazards Model, Prentice-Gloeckler approach for grouped survival data) and parametric models (exponential model, Weibull regression, log-normal regression, log-logistic regression, generalized gamma regression).

However, the main focus of the researchers is the explanatory variables itself rather than the model since most models for this type of analysis produces similar results.

Theoretical framework mainly explores the role of different types of costs such as search-cost (Rauch and Watson, 2003), fixed and sunk costs (Roberts and Tybout 1997; Albornoz et al., 2016) on exporting duration of the firm. Albornoz et al. (2016) also investigated the effect of distance between exporter and importer and exporting experience. The central conclusion is that the previous experience is beneficial for export flows duration and in the case of entering a new market, "the probability of export survival increases with the ratio of sunk to fixed costs" since the sunk costs in this case mainly associated with an effort spent on learning a new market (Albornoz et al., 2016).

Numerous of empirical studies, dedicated to export survival denote the firm size, age, productivity, production field and exporting experience as significant factors of export duration for countries with different levels of development.

Considering the data-type, the scope of studies can be divided into two parts:

1. Studies based on the aggregated data on the country or industry level;

2. Studies based on the firm-level data.

The former body of literature analyzed macro- factors, for example: the effect of the country size (by GDP) of both exporters and importers (Besedes and Prusa, 2006), the effect of initial export values (Fugazza and Molina, 2016), the impact of market diversification in the country (Besedes and Prusa, 2006), and contract institutions (Araujo, Mion and Ornelas, 2012).

Researchers, who worked with the second type of data, tended to incorporate both macro- and micro- parameters. Generally, in order to make estimates more accurate, they tried to capture the country or industry-specific factors. The major outcome of these studies is that the distance between countries, their GDP level, common border, and language have a substantial impact on the firm's decision regarding international trade. Some authors determine the productivity level (Hiller, Schröder and Sørensen, 2013) and the firm size (Albornoz et al., 2016) as main drivers of export activity (in terms of duration). Yu (2012) showed that the SMEs in larger-size and monopoly industries, located in less agglomerated regions, or of individual types, had better survival prospects. Furthermore, an explicit analysis implied that the SMEs of different technology intensity and monopoly level were characterized by different survival features. Another critical factor is the firm's age. Henrik et al. (2004) analyzed the SMEs' survival from the point of view of the government, their main findings that the government support has a diminishing effect over the company's life cycle: the most valuable support for the start-ups and new-established companies. Other authors define the product diversification and comparative advantage (Reyes et al., 2014) as main determinants of export survival. Nicita et at. (2013) agreed that comparative advantage is one of the main factors of export dynamics; however, they claimed that the power of its impact depends on the production sector. Liua and Pangb (2006) state that for survival the crucial role plays R&D activities and state-ownership; firm performance, operation stability and seasoned equity offering increase both economic growth and survival probability. The third group of authors states that networks (Tovar and Martinez, 2011) and previous experience (Mohammed, 2010) are the most significant parameters, which influence the foreign trade duration. Stirbata et al. (2015) revealed the positive impact of the prior experience with the exporting product and destination, the experience with importing, as well as using a developed neighboring country as a launch platform, a tremendous impact of networks comes from the province level aggregations of firms selling the same product at the same market. Bekele and Worku (2008) found out that participation in social capital and networking (iqqub schemes) was critically helpful for long-term survival in the African countries.

Some authors went even further and tried to estimate the probability of export survival using the product level data (Besedes and Prusa, 2011). They explored the effect of intensive and extensive margin and found out that the intensive margin had a higher impact on export rather than the extensive margin. Such findings are consistent with those of Felbermayr and Kohler (2006), Eaton et al. (2007), and Helpman et al. (2008). In addition, they investigated that "export survival for developing countries is shorter than that for developed countries. As a result, changes in the extensive margin are far less informative for developing countries".

From the above, we can see that there are many approaches to investigate the problem of high "death" rate among exporters using different types of data (macro- (country specific), and micro-level (firm and product specific)). Yet, the chief target for all researchers is to find variables that can explain this issue in a most precise manner. Since we have a firm-level data, we focus on the micro-factors, such as firm's productivity level, age, size, extensive and intensive margin, and regional spread around the world.

Chapter 3

METHODOLOGY

As was stated above, for estimating export activity duration, we use the survival analysis. Such method is the most appropriate to explore the data in which the time until the event (exit from exporting in our case) is of interest. It is helpful when the data is censored meaning that for some observations the event had not been reached during the study. In such a case usual multiple regressions' results could be misleading.

Two measures are being used in the survival analysis utilizing which can be expressed the same process: survival function and hazard rate. The nature of the survival function can be expressed in the following way: "using statistical techniques of survival analysis, duration can be modeled as a sequence of conditional probabilities that a trade relationship continues after *t* periods given that it has already survived for *t* periods" (Besedes and Blyde, 2010). Similarly, the hazard function is the probability that the firm shuts down its export operations after period *t* given that fact that it has survived until the *t*.

Let T be a non-negative random variable and denotes the time to a failure event. The survivor function of T is:

$$S(t) = \Pr(T \geq t) \tag{1}$$

At the period $t = 0$, $S(t) = 1$ and goes down (towards 0) as t raises.

The hazard function (instantaneous failure rate) is:

$$h(t) = \Pr(T = t | T \geq t) \quad (2)$$

The function can take values from 0 to infinity. The lower the hazard rate, the lower the risk of failure at given point in time.

In order to estimate the probability of failure and thus, duration of the event, researchers use two main approaches:

1. Parametric models (including semi-parametric models);

2. Non-parametric estimates.

The simplest and most often used is a non -parametric method – Kaplan-Meier procedure. Using this model we compute risk as the fraction of spells of interest (where survival/failure occurred) to the total number of spells starting from 0 to the period t.

The Kaplan-Meier product limit estimator of the survivor function is:

$$\hat{S}(t) = \prod_{j|t_j \leq t} \left(\frac{n_j - d_j}{n_j}\right) \quad (3)$$

where

n_j - the number of spells at risk at time t_j

d_j - the number of failures at time t_j

t_j denotes the period when failure occurred.

Analogically, a non-parametric computation of the hazard function is:

$$\hat{h}(t) = \frac{d_j}{n_j} \tag{4}$$

Parametric models allow estimating the probability of the event incidence depending on various factors. The most popular semi-parametric model is Cox-Proportional Hazard model. It estimates the partial likelihood ratio based on the concept of hazard function. The standard equation of the Cox- Proportional Hazard model is:

$$h\{(t),\, X_t\} = h_0(t) * ex\,p(X_t, \beta) \tag{5}$$

where:

X_t – set of the explanatory variables;

$h_0(t)$ - baseline hazard.

Baseline hazard means the risk of the incidence when all independent variables are equal to zero. Betas for variables are the difference of hazard for subjects in period *t* compared to subjects at baseline or time = 0 when all the other covariates are held constant.

Its main benefit for researchers is the absence of assumptions about the shape of the baseline hazard function. However, "this convenience relies heavily on the assumption that the baseline hazard function summarizing the pattern of duration dependence can be separated from the individual specific non-negative function of covariates. Hence, the function of covariates scales the baseline survivor function with a constant factor independent of survival time. If the data are not consistent with this assumption, the model is misspecified" (Brenton et al. 2009).

In order to avoid such misspecification in our analysis, we make use of the extended Cox Model adding the time-dependent variable. The function is the following:

$$h\{t\} = h_k(t) * ex\, p(\beta_1\, x_1 + \beta_2 x_2) \quad (6)$$

where the hazard rate at time *t* depends on the value of x_2.

All time depended covariates are internal time dependent variables. It means that the change of the covariate over time is related to the behavior of the particular firm. The coefficient for time varying covariate (β_2) is the change of the hazard ratio for subjects that will occur for every unit change in time when other variables in the model are held constant.

The set of X's in our model includes total factor productivity, firms' size, firms' age, export duration, extensive margin, intensive margin, geographical spread and main region, industry.

Total Factor Productivity

There are several techniques to estimate productivity. The basic one is to obtain the residuals from the standard OLS regression or the fixed effect model. However, more recent studies argued that in this case the results will be biased due to selection and simultaneity biases. To address this issue Olley and Pakes (1996) (OP) introduced two-stage semi-parametric approach using the investments as a proxy for productivity. Levinson and Petrin (2004) (LP) modified a model of Olley and Pakes using the input prices (material costs) as a proxy instead of investments. In order to fight identification problems in OP and LP models, Wooldridge (2005) proposed different instruments for different equations and applied one stage GMM. In 2006 Ackerberg, Caves, and Frazer (ACF) suggested correction for OP and LP models in order to avoid collinearity.

Since we have material costs in our data, we estimate TFP using the ACF corrected LP model. We suppose that the effect of productivity should coincide with the literature and firms that are more productive will have higher survival prospects. Also, we assume that TFP will have the highest magnitude among other covariates for Ukrainian firms.

Industry

Based on the KVED (NACE rev. 1.1) classification of industries, we use only manufacturing firms. The list of sectors includes a production of food products and beverages, manufacturing of clothes, leather, and goods from it, manufacturing of basic pharmaceutical products and pharmaceuticals, machinery etc. The full list of industries is presented in Appendix A.

Extensive margin

The concept of using an extensive margin is well known in international trade analysis. Helpman et al. (2008) claimed, that "traditional estimates are biased due to the omission of the extensive margin".

In our case, an extensive margin was calculated as the total number of destination countries for each firm during the specific year. We assume that extensive margin will have a high significant positive impact on the survival probability for firms in our sample.

Intensive margin

An intensive margin is the total amount of export for each firm each year. Not surprisingly, we expect a significant positive impact on export duration. According to the literature, an intensive margin should have a higher magnitude than the extensive margin for developing countries (Besedes and Prusa, 2011). In our models, we use this parameter in logarithmic form.

Export duration

Export duration spell was calculated as the difference between the earliest year when the firm appeared in the data and a given year. If there was a gap more than two years between the time spells, we consider it as a re-entry.

Export duration associated with the exporting experience and considered to give a high positive impact on export survival probability (according to Mohammed, 2010). Thus, with each additional year of exporting the hazard rate should decrease.

Regional spread

To calculate regional spread, we consider worldwide geographical regional split (the USA and its dependencies, Asia, Africa, Europe (excluding EU countries), North and South America) plus CIS and EU-countries as separate groups. Also, we separate off-shore countries (according to IMF classification). The full list of countries by region is in Appendix B.

After creating regions, we calculate a share of total export which was delivered to that specific region by each firm in a given year.

Also, we construct a variable ***"main region"*** which define the region as main if the share of export to that region was above 75% of total export of the specific firm in a given year. We define a value "No main region" in the case if there was no such region where the share of export was above 75%.

Since Ukraine had special trade agreements with CIS countries, we assume that it was safer to export in that specific region during the period of the study. Besides, we assume that trade with EU countries should also increase the probability of export survival.

Other variables

We also control for different firm specific characteristics, such as a firm's age and size. Size groups are defined by the Law of Ukraine "On Introduction of

Changes to the Law of Ukraine "On Accounting and Financial Reporting in Ukraine" (in respect of improvement of certain provisions)" No. 2164-VIII, where:

- Small firms: 10 – 50 employees ;
- Medium size firms: 51 – 250 employees;
- Big enterprises: more than 251 employees.

We expect that the bigger size of a firm is positively correlated with its' export survival probability.

Chapter 4

DATA DESCRIPTION

For our analysis, we use panel dataset with the firm-level data provided by the State Statistics Service of Ukraine. The data is restricted and available upon the request only. The dataset initially contained 4,578,526 observations for 12 years (2001-2013). However, only 663,612 of them (89,507 companies) were for exporters, and 89,405 firms (661,116 observations) reported relevant data.

By the first look on the data of exporters, we found that the absolute majority of firms cooperated with 1 or 2 countries and only 10% of firms in the data cooperated with 3 or more countries simultaneously (Figure 1).

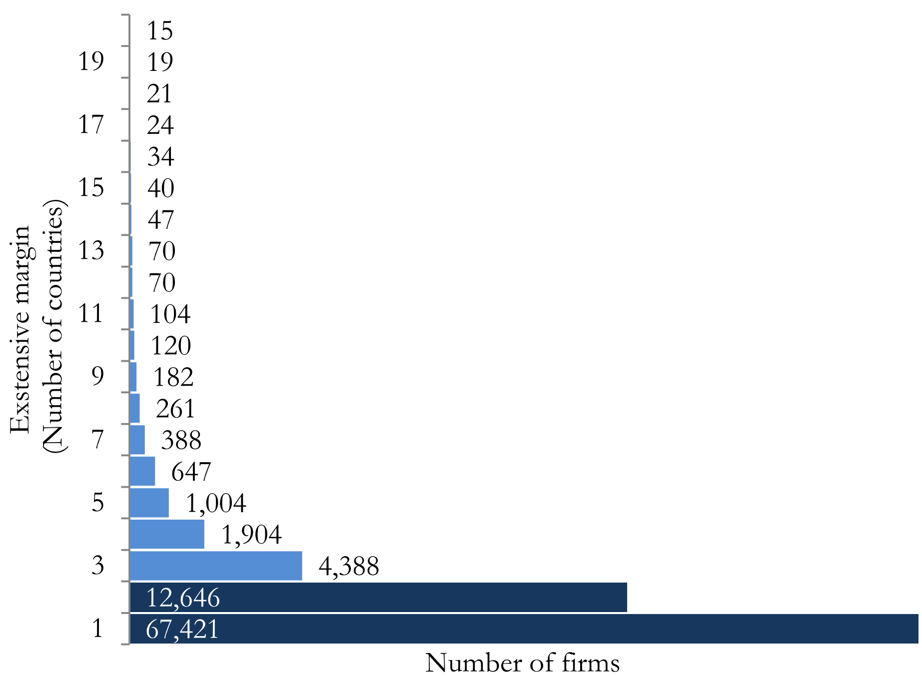

Figure 1. Firms-exporters: Extensive margin

From the Table 1, it can be seen that the main Ukrainian international trade partners were CIS countries: Russia, Moldova, and Belarus. 32% of all export operations provided with EU-countries. According to the State Statistics Service of Ukraine in 2016 situation has not changed dramatically. Russia remains a main trade partner, and about 38% of total export was delivered to CIS countries.

Table 1. The frequency of export operations by countries

Country Code	*Frequency (observations)*	*Percentage*
RUS	83,665	12.61
MDA	43,174	6.51
BLR	37,768	5.69
POL	37,166	5.60
DEU	34,691	5.23
ITA	21,359	3.22
HUN	20,760	3.13
LTU	19,097	2.88
KAZ	18,676	2.81
TUR	16,997	2.56
GEO	16,455	2.48
CZE	13,111	1.98
NLD	12,856	1.94
LVA	11,779	1.77
SVK	11,650	1.76
BGR	11,503	1.73
AZE	11,249	1.70
USA	11,013	1.66
GBR	9,675	1.46
ESP	9,636	1.45
All Other	*208,836*	*31.47*

For the further analysis we left only manufacturing firms (based on the KVED (NACE rev. 1.1) classification of industries) with 10 or more employees and positive output. To avoid computational error we also dropped firms that left the international market in the same year they entered it (~25% of the sample).

The possible issue may arise due to selection bias, which for now is out of the scope of the discussion. Such bias may occur since only more productive firms make a decision to enter the foreign market.

Conducting the survival analysis researchers should account for the censoring. Thus, it is essential to define the censored variable at the beginning of the analysis. Censored variables are those for which we cannot precisely define either the beginning or the ending date (or both) for some observations. In our analysis, there are both right- and left-censoring in the failure variable, which define whether the firm considered as an exporter in a given year. Left-censored are observations for 2001 since our data starts from this period we do not know whether the firm provided export operations before that time or not. The right-censored are observations in 2013 since it is the last observed period in the data.

The first entry time means the time when the company started operating, in our case it is always 0 which means that we assume that the company did not produce before it appeared in our data.

The exit time denotes the time when the company left the international market, the majority of Ukrainian firms are exporters only for about four years, and the median is about 5.2 years (Figure 2).

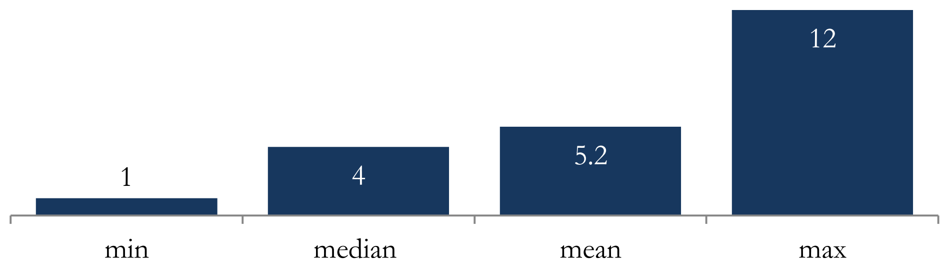

Figure 2. The descriptive statistics of exits, per subject

The dynamics of exits is represented in Figure 3. The peaks may be explained by the world economic crisis in 2008 and by a significant decrease in production and weak economic conditions in Ukraine in 2012. The total number of incidents is 4,991 for 12 years.

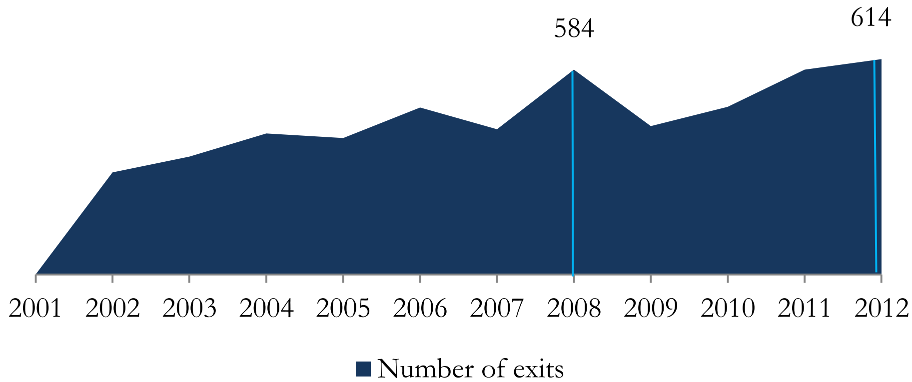

Figure 3. The dynamics of firms' exit from the foreign market in 2001-2012

Table 2 represents the general statistics for main variables of interest given the firm size. It shows that in the sample small firms are usually younger than the bigger ones. The mean age for the small firms is about eight years while for medium-size and big companies its around nine years. At the same time, the variation of age distribution decreases with the firm size. Both extensive and intensive margins positively correlate with the firm size and the maximum amount of export substantially higher for big enterprises.

Table 2. The descriptive statistics of main variables

Variable	*Mean*	*Std. Dev.*	*Min*	*Max*
Age				
Small	8.015	4.850	0	24
Medium-size	9.187	4.683	0	29
Big	9.325	4.384	0	33
Extensive margin				
Small	1.917	1.656	1	33
Medium-size	2.730	2.689	1	42
Big	4.186	3.804	1	46
Intensive margin				
Small	12.311	1.682	2.887	18.272
Medium-size	13.419	1.843	.176	18.549
Big	14.532	1.781	5.096	20.036

Chapter 5

ESTIMATION RESULTS

The basic step of the survival analysis is to estimate a non-parametric function using Kaplan-Meier procedure.

The initial results of this procedure on total sample show that almost 50% of all firms disappeared in the first year of exporting (Figure 4). Nicita et al. (2013) discovered that this tendency is common for least developed countries.

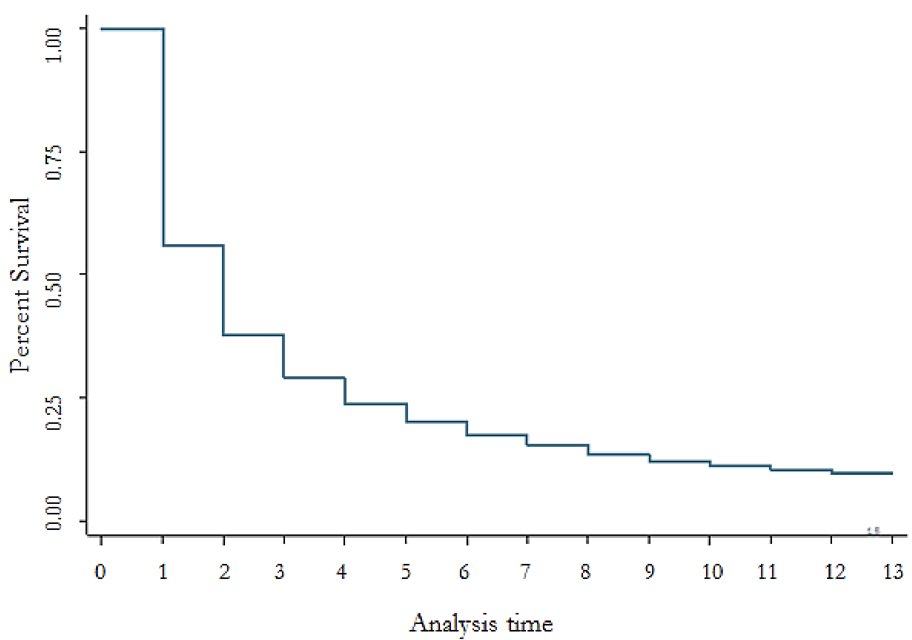

Figure 4. Kaplan-Meier survival estimator (total sample)

The estimates, displayed in Figure 5 was conducted for the final sample with active manufacturers only. We assume size to be a crucial factor for exporters and build a Kaplan-Meier model based on this presumption. The results show that ceteris paribus, the probability of export survival increases with the firm size. In the first year of exporting 20% of small firms cease their international trade operation, while for bigger firms this amount is much lower: about 13% for medium size enterprises and 10% for big companies. Half of the small firms disappear from the international market after the 4-th year of exporting while the medium size enterprises survive for about seven years and big firms for nine years.

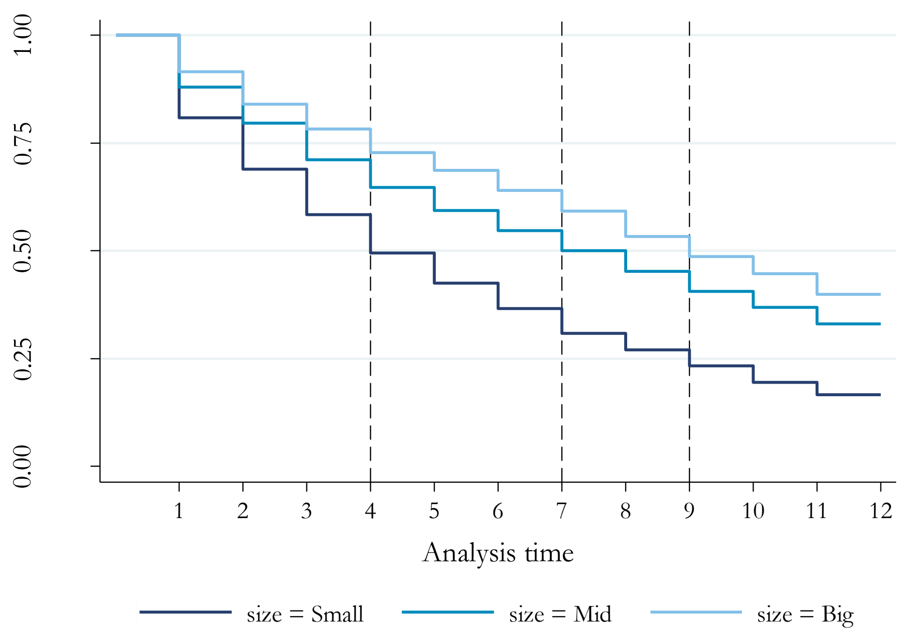

Figure 5. Kaplan-Meier survival estimator (by firm size)

Thus, the survival rate of export duration positively correlates with the firm's size. These results are consistent with the literature and support our hypothesis.

For the semi-parametric analysis, we construct several models with different specifications.

The first two models represented in Table 3. Both models include robust estimates of variance. Such estimates use the efficient score residual for each subject in the data for the variance calculation and account for the possibility of the firm to appear repeatedly in the risk pools. The main difference between the two models is an assumption about the function of analysis time. In the first model, it assumed to be logarithmic, while for the second model the function is a regular time span. In the second specification, we also include additional industry factors.

From the Table, we can state that there is no significant difference between the results. Both models are consistent with the theory and show that bigger and more experienced firms survive better. Models also show that the intensive margin has the highest influence on the survival probability. Increasing the total export by 1 p.p. reduced the hazard almost by 10% (according to the first model), according to the second model – by 2.5%. The second highest by the power of impact is TFP. Among regions exporting only to the CIS countries reduced the hazard of exporter's "death" while delivering products to EU, Asia and Africa significantly increased it in 2001-2013.

Table 3. Cox-Proportional Hazard Regression: Estimation Results

	Model 1	*Model 2*
ext_marg	0.952***	0.987***
	(0.008)	(0.002)
int_marg	0.909***	0.975***
	(0.005)	(0.002)
age	0.911***	0.991***
	(0.012)	(0.001)
age^2	1.002***	

Table 3. Cox-Proportional Hazard Regression: Estimation Results - Continued

		Model 1	*Model 2*
		(0.001)	
	tfp	0.947***	0.983***
		(0.014)	(0.005)
	peers	1.001*	1.000
		(0.000)	(0.000)
Size			
	Mid	0.880***	0.959***
		(0.020)	(0.006)
	Big	0.960	0.978*
Main region		(0.032)	(0.010)
	CIS	0.915**	0.985
		(0.032)	(0.010)
	EU	1.093**	1.024*
		(0.040)	(0.011)
	USA	1.040	1.002
		(0.108)	(0.029)
	Asia	1.126**	1.029*
		(0.058)	(0.015)
	Africa	1.398***	1.083**
		(0.146)	(0.031)
	Europe	0.857	0.960
		(0.194)	(0.062)
	America	1.115	1.025
		(0.121)	(0.032)
	Australia and Icelands	1.130	1.023
		(0.255)	(0.071)
	Off-shores	1.193**	1.048
		(0.105)	(0.028)
	Industry	*No*	*Yes*

Notes: The coefficients show is represented in terms of the hazard rate. We should interpret it as the comparison with the baseline hazard (reduces the hazard if β<1 and increases - if β>1). N = 36,219, Standard errors in parentheses. * if p-value < 0.05, ** if p-value < 0.01, *** p < 0.001.

The third model is based on the logarithmic function of time and includes industry-specific factors. It also includes the interaction terms between the size of the firm and its main destination region since we want to estimate whether there is a dependency between the manufacturer size and its global diversification strategy, and how such dependency affects survival probability.

From Appendix C we can see that the hazard function, in general, follows the 45-degree line very closely except for high values of time (which should not be a reason for concern). It means that our model plausibly fits the data.

The main conclusions of this model are similar to the previous ones. The estimation results are represented in Table 4.

The intensive margin has the highest positive effect on survival rate for Ukrainian firms. An increase of export by one p.p. allows reducing the hazard by 17%. The extensive margin is the second by the power of impact and reduces the hazard by 15% with each additional country. The high magnitude of extensive margin is more common for low-developed countries while the effect of intensive margin is prevail in developed countries. Our estimated put Ukraine somewhere in the middle but closer to the low developed and developing countries.

The total factor productivity takes the third place by the effect on export survival probability. It increases survival rate almost by 10% per each unit increase.

The firm size also matters when we consider the effect of regional spread. Thus, for small firms, it was safer to diversify geographical distribution or to export in CIS countries in 2001-2013. For the medium size companies, it was better to operate on CIS and EU markets. The large companies might cooperate with CIS, EU, and Asian countries without fearing to leave the international market rapidly.

Table 4. Cox-Proportional Hazard Regression: Model 3. Estimation results

Variable	*Estimates*
ext_marg	0.857***
	(0.009)
int_marg	.834***
	(.007)
age	0.965***
	(0.004)
tfp	0.919***
	(0.019)
peers	0.999
	(0.001)
Region/Size	
No main#Mid	0.775***
	(0.076)
No main#Big	0.696***
	(0.083)
CIS#Small	0.936
	(0.075)
CIS#Mid	0.628***
	(0.051)
CIS#Big	0.593***
	(0.055)
EU#Small	1.276***
	(0.104)
EU#Mid	0.708***
	(0.062)
EU#Big	0.616***
	(0.074)
USA#Small	1.251
	(0.247)
USA#Mid	0.864
	(0.182)
USA#Big	0.582
	(0.211)
Asia#Small	1.313**
	(0.146)
Asia#Mid	1.007
	(0.116)
Asia#Big	0.666**
	(0.125)
Africa#Small	1.745**
	(0.470)

Table 4. Cox-Proportional Hazard Regression: Model 3. Estimation results - Continued

Variable	*Estimates*
Africa#Mid	0.952
	(0.296)
Africa#Big	1.041
	(0.339)
Europe#Small	0.842
	(0.325)
Europe#Mid	0.721
	(0.364)
Europe#Big	0.773
	(0.775)
America#Small	1.134
	(0.296)
America#Mid	0.691
	(0.236)
America#Big	0.725
	(0.423)
Australia and Ice.. # Small	0.339
	(0.340)
Australia and Ice.. #Mid	2.073
	(1.476)
Australia and Ice.. #Big	3.407
	(3.420)
Off-shores#Small	1.047
	(0.224)
Off-shores#Big	0.773
	(0.266)
Off-shores#Mid	1.015
	(0.221)
Industry	
Textile production	0.915
	(0.115)
Production of leather goods	0.921
	(0.196)
Wood processing	0.874
	(0.094)
Pulp and paper production; publishing activity	1.107 (0.202)
Production of coke, refined petroleum products and nuclear materials	1.034 (0.273)
Chemical production (including Farmacy)	0.900 (0.132)

Table 4. Cox-Proportional Hazard Regression: Model 3. Estimation results - Continued

Variable	*Estimates*
Manufacture of rubber and plastics products	0.878 (0.136)
Manufacture of other non-metallic mineral products	0.915 (0.131)
Metallurgical production and production of finished metal products	0.911 (0.070)
Manufacture of machinery and equipment	0.891*** (0.038)
Manufacture of electric, electronic and optical equipment	0.879 (0.083)
Manufacture and repair of transport equipment and equipment	0.954 (0.138)
Other industries	1.008 (0.154)

Notes: The coefficients show is represented in terms of the hazard rate. We should interpret it as the comparison with the base line hazard (reduces the hazard if $\beta<1$ and increases - if $\beta>1$). N = 36,219, Standard errors in parentheses. * if p-value < 0.05, ** if p-value < 0.01, *** p < 0.001.

The results above are mainly consistent with the literature and our hypothesis. However, in the study, we have found that the number of companies within the industry is not significant in Ukraine (for all three model specifications) while it does in the studies for other countries. We use this variable as a proxy to the level of competition in the industry. Our findings show that for Ukrainian exporters individual firm-specific characteristics are more important for survival rather than industry-level factors.

C h a p t e r   6

CONCLUSIONS AND FURTHER DISCUSSION

Export activity is vital for economic growth, and export survival rate of firms is likely to be related to the development level of the country. On the sample of Ukrainian exporters from 2001-2013, we have found that their exit rate was about 25% before the first year and 15% after the first year, which puts Ukraine on par with less developed countries and is more common for LDCs where 50% of firms disappear after the first year. The issue of the low export duration was broadly investigated for Asian, African and some EU countries, while Ukraine lacks such studies. In our analysis, we focused on determinants of the survival probability of Ukrainian firms.

We conducted a survival analysis for 8,414 exporting manufacturing firms in 2001-2013. Following vast literature, we used the extended Cox Model with time-dependent explanatory variables (to avoid misspecification of the model). Since we were able to use firm-level data, we could focus mostly on micro factors such as firm's size, age, productivity, intensive and extensive margins of trade, and geographical distribution of the firm's export flows. We also accounted for such factors as the industry and the number of domestic exporters-competitors within the same industry.

The results of our study are similar to those from other countries and show that the most crucial factors of export survival are intensive and extensive margins and total factor productivity. Similarly to Felbermayr and Kohler (2006), Eaton et al. (2007), Helpman et al. (2008) and Besedes and Prusa (2011), we found that the intensive margin has a larger magnitude on export duration than the extensive margin. Another finding is also consistent with the literature and reveals a positive correlation between the export survival rate and the firm size. Based on this finding we may propose several strategies for exporting firms depending on their size. Thus, for smaller firms, it was safer to diversify geographical distribution or to export to CIS countries in 2001-2013. The partnership with CIS and EU countries had a positive effect on survival rate for medium-sized companies. Large companies faced a lower risk of exit if they exported to either CIS, EU or Asian markets. However, we found that in contrast to global tendencies individual firm-specific characteristics of Ukrainian exporters are more important for survival than industry-level factors.

Using these results government might be able to design better trade policies, which are essential for economic growth, and also to assist exporters to allocate their resources more efficiently.

In order to improve the study in the future one may apply this analysis to more recent data once it becomes available. The results may change significantly since a substantial number of exporters were located in the Eastern part of Ukraine, which was subject to the military conflict in 2014-2017 and a consecutive decline in trade with Russia and the rest of CIS. In addition, the European Commission in 2016 approved the decision to increase trade preferences for Ukraine, and as a result in 2018 additional zero tariff quotas were introduced for some categories of agricultural goods. These policy changes may increase the export survival probability for firms that had trade agreements with Europe and, on the contrary, decrease survival probabilities for firms which exported mainly to Russia and CIS.

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APPENDIX A

Table 5. Industry classification by KVED in 2005 and 2010

Industry	*KVED 2005*[1]		*KVED 2010*[2]
Food and tobako	DA	15-16	10-12
Textile production	DB	17-18	13-14
Manufacture of leather, leather and other	DC	19	15
Treatment of wood and production of wood, except furniture	DD	20	16
Paper Products; publishing	DE	21-22	17-18
Production of coke, petro-making and nuclear materials	DF	23	19
Chemical Industry	DG	24	20-21
Manufacture of rubber and plastic	DH	25	22
Manufacture of other non-metallic mineral products	DI	26	23
Metallurgical production and production of finished metal products	DJ	27-28	24-25
Manufacture of machinery and equipment	DK	29	28
Production of electric, electronic and optical equipment	DL	30-33	26-27
Production of vehicles and equipment	DM	34-35	29-30
Other industries	DN	36-37	31-32

[1] Source: http://kved.ukrstat.gov.ua/KVED2005/SECT/KVED05_D.html

[2] Source: http://kved.ukrstat.gov.ua/KVED2010/kv10_i.html

APPENDIX B

Table 6. Regional classification, ISO 3

CIS	*EU*	*Asia*	*Africa*	*Europe*	*North and South America*	*USA and its dependencies*
ARM	AUT	AFG	AGO	ALB	ABW	ASM
AZE	BEL	ARE	BDI	AND	AIA	GUM
BLR	BGR	BGD	BEN	BIH	ARG	MNP
KAZ	CYP	BHR	BFA	CHE	ATG	PRI
MDA	CZE	BRN	BWA	CYP	BHS	USA
RUS	DEU	BTN	CAF	GIB	BLZ	VIR
TJK	DNK	CHN	CIV	ISL	BOL	
UZB	ESP	CYP	CMR	LIE	BRA	
	EST	GEO	COD	MCO	BRB	
	FIN	HKG	COG	MKD	CAN	
	FRA	IDN	COM	MNE	CHL	
	GBR	IND	CPV	NOR	COL	
	GRC	IRN	DJI	SMR	CRI	
	HRV	IRQ	DZA	SRB	CUB	
	HUN	ISR	EGY	VAT	DMA	
	IRL	JOR	ERI	YUG	DOM	
	ITA	JPN	ESH		ECU	
	LTU	KGZ	ETH		GBR	
	LUX	KHM	GAB		GLP	
	LVA	KOR	GHA		GRD	
	MLT	KWT	GIN		GRL	
	NLD	LAO	GMB		GTM	
	POL	LBN	GNB		GUY	
	PRT	LKA	GNQ		HND	
	ROM	MAC	KEN		HTI	
	ROU	MDV	LBR		JAM	
	SVK	MMR	LBY		KNA	
	SVN	MNG	LSO		LCA	
	SWE	MYS	MAR		MEX	
		NPL	MDG		MSR	

Table 6. Regional classification, ISO 3 - Continued

CIS	*EU*	*Asia*	*Africa*	*Europe*	*North and South America*	*USA and its dependencies*
		OMN	MLI		NIC	
		PAK	MOZ		PAN	
		PHL	MRT		PER	
		PRK	MUS		PRI	
		PSE	MWI		PRY	
		QAT	MYT		SLV	
		SAU	NAM		SUR	
		SGP	NER		TTO	
		SYR	NGA		URY	
		THA	RWA		USA	
		TKM	SDN		VCT	
		TLS	SEN		VEN	
		TUR	SLE		VGB	
		TWN	SOM		VIR	
		VNM	SSD			
		YEM	STP			
			SWZ			
			SYC			
			TCD			
			TGO			
			TUN			
			TZA			
			UGA			
			ZAF			
			ZMB			
			ZWE			

APPENDIX C

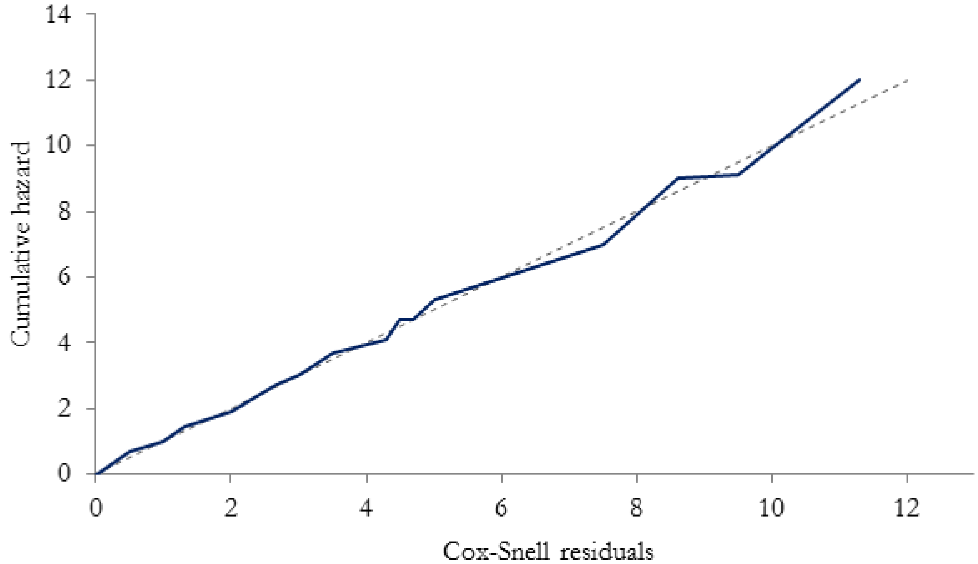

Figure 6. Goodness of fit of Model 3