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The impact of financial and human resources on the export performance of Russian firms

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ABSTRACT

This study contributes to the literature by investigating for the first time the effects of the entrepreneurial environment on export survival in Russia. Using the continuous-time Cox model and discrete-time complementary log-log and probit models, we study the effects of the availability of human and financial resources on export survival across Russian regions between 2002 and 2010. Taking into account uncertainty and time effects reveals that these effects are falling over time and are more important for larger exporters. Thus, there is evidence of a learning curve for exporters when the latter become more efficient in dealing with regional-level resources and the regulatory environment over time.

1. Introduction

The recent empirical literature on international trade provides us with the following three important results. First, firms are highly heterogeneous in terms of productivity. Heterogeneity of firms in the presence of fixed costs can explain why not all firms engage in international trade, why exporters are more productive than domestic producers, and why an important share of the variations in total exports comes from adjustments in the extensive margin of trade, i.e., in the number of exporters (Bernard and Jensen, 2004; Eaton et al., 2004; Melitz, 2003). Second, at the macro level, financial development has a significant and positive impact on bilateral trade flows (among others, see Beck, 2002; Berthou, 2006; Manova, 2008), both on the number of bilateral trade flows and the mean value of shipments. Thus, it could be argued that heterogeneity in terms of access to finance (within and between countries) and the availability of financial resources may be an important determinant of exporting behavior at the micro level. Third, at the micro level, there are several factors that could explain the differences in productivity among the companies and hence could be perceived as determinants of export activities at the firm level. In particular, human and management resources are often considered as the major determinants of firms' export performance. Attitudes, perceptions and managerial characteristics seem to have a significant influence on export activities at the micro level.

Starting with the pioneering paper by Greenaway et al. (2007), a growing number of empirical papers looked at the links between financial development, financial constraints and export activities using data at the firm level of analysis. While

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using different measures of financial constraints and applying different econometric methods to investigate the links between these constraints and export activities, most of these empirical studies focus on the link between credit constraints and export participation or the share of exports in total sales. Only 9 studies covering 5 single countries and 2 comparative studies covering several developing and emerging countries deal with the extensive margins of exports – the number of goods exported and the number of destination markets for export. Given that the extra costs of exporting often have to be paid for each export good and each destination country, we expect that credit constraints will be negatively related to the extensive margin. Studies of Belgium (MuÛls et al., 2008; MuÛls, 2015), France (Askenazy et al., 2011), Italy (Bottazzi et al., 2014; Forlani, 2010; Tamagni, 2013), Germany (Wagner, 2015) and China (Manova et al., 2015) report results that are in line with these hypotheses. In a recent study, Fauceglia (2015) examines whether financial development reduces the impact of credit constraints on export decisions using firm-level data across 17 developing countries. The regression analysis confirms that the positive effect of a firm's liquidity on the exporting probability is larger for firms located in financially less developed countries. This result highlights the importance of financial development in reducing credit constraints. In a related study, Berman and Héricourt (2010) explore the interaction effect between financial development and credit constraints on export margins at the firm level using data for 9 developing and emerging economies. They find that a firm's liquidity and leverage ratio, which are used to proxy for credit constraints, become stronger determinants of export participation as a country's private credit to GDP ratio rises. These results contribute to the literature documenting the role of fixed costs and the extensive margin of trade in total trade adjustment, providing micro-level evidence of the positive impact of financial development on trade found in the previous literature.

Human resources and management practices constitute resources that can improve the export performance of firms (Katsikea and Skarmeas, 2003). In a meta-analysis study, El Makrini et al. (2012) focus on personnel and managerial determinants, which are classified into skill-based and attitudinal characteristics. The attitudes, perceptions and characteristics of managers play a significant role in the export success of firms (Maurel, 2009). They are considered as unique resources that allow obtaining and maintaining a better export performance. Despite the fact that many studies evaluated the elements of management characteristics between 1990 and 2012 (Zou and Stan, 1998), the findings are sometimes conflicting.

This paper studies the effects of the availability of human and financial resources on export survival in Russian regions between 2002 and 2010. To the knowledge of the authors, this is the first paper that deals with export survival across Russian regions and estimates the effects of the entrepreneurial environment on exporters' performance in foreign markets. Because of the high regional heterogeneity in the costs of doing business and the availability of resources for Russian firms, the regional perspective of the study is especially important and provides implications for national and regional economic policymakers. The remainder of the paper is organized as follows. Section 2 describes the variables, discusses data issues and provides stylized facts. Section 3 discusses the empirical results. The final section summarises the main findings and provides some policy implications.

2. Data

2.1. Variables and data issues

The primary data used is transaction data on Russian regions' export flows. Our data are from the database of the Federal Custom Service of the Russian Federation, and consist of electronic copies of customs declarations from 2002 to 2010 on a yearly basis. We use 4-digit level data of the commodity nomenclature, which corresponds to HS 4-digit classification. The dataset allows identifying the export market (country of destination) for each trade flow and the export value measured by the FOB (free on board) price. Our classification of export markets is based on Akin and Kose (2008), who distinguish between DS = Developing South, ES = Emerging South and N = North countries. We add a fourth region group of SECIS = South-Eastern Europe and post-Soviet countries, since SECIS countries are among the main trade partners of the Russian regions (see Appendix A for details). Since the Russian regions are highly heterogeneous in terms of export share in gross regional product, we only consider the data of 30 Russian regions that have an export quota of more than 10%. The structure of the available data consists of 132,995 export flows.

The choice of explanatory variables for the model is determined by the prior interest in estimating the effects of human and financial resources on export survival across Russian regions. We consider the following groups of variables, which reflect regional entrepreneurial environment conditions, industry- and destination-market-specific characteristics.

First, we consider human and financial resource characteristics at the regional level. An important factor reflecting the survival of export flows is the quality of the business environment. A number of studies employ data from the Doing Business project as a proxy for business costs to estimate export performance determinants (see, e.g., Fugazza and Molina, 2016). The peculiarity of this study is the regional dimension of human and financial resources, which significantly narrows the range of potential variables within the existing databases. For example, the Doing Business project was carried out at the regional level in Russia for 10 cities in 2009 and for 30 cities in 2012. However, not all the cities in the sample are capital cities, therefore not all the data can be used for the aim of the current study. We employ data from the study "Entrepreneurship Environment in Russia: Opora's Index", which is based on interviews with small and medium enterprises in 35 Russian regions and assesses the quality of the business climate in manufacturing industries by four sub-indices: quality of infrastructure, financial resources, human resources, administrative barriers. The indices are measured between 1 and 35,

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with 1 corresponding to the region with the best conditions in the respective sub-index. We employ the index of financial resources, which measures the availability of financial resources for the short, medium and long term from different financial institutions in the region, and the index of human resources, which measures the availability of skilled engineers and technicians, skilled workers, and the availability and quality of specialized educational programs for business development in the region.

Second, gravity variables and product characteristics are basic explanatory variables employed in the vast majority of empirical papers on the determinants of trade flow performance. A large number of empirical studies, including recent results of meta-analysis (Disdier and Head, 2008; Head and Mayer, 2013), has shown that the gravity model explains the volume of trade between countries fairly well. Gravity variables may therefore also explain the duration of trade flows. We employ the standard gravity equation variables pioneered by Anderson and van Wincoop (2003) and the results of the meta-analysis of the factors of international trade proposed by Disdier and Head (2008) and Head and Mayer (2013). The list of our gravity variables includes: exporter GRP per capita (in logs), importer GDP per capita (in logs), a dummy for common border, a dummy for post-Soviet countries, and a dummy if landlocked. Definitions and data sources for the variables are listed in Appendix B. One of the major explanatory variables in the gravity model is transportation costs. In order to account for transportation costs of exports we use two proxy variables: the logarithm of the distance to the closest seaport in km and the logarithm of the distance from the closest seaport to the export market in km.

Third, one of the major problems is product heterogeneity. According to Besedeš and Prusa (2006a), trade flows of differentiated products on average last longer and have lower initial volumes combined with higher search costs and initial investments. To control for product-specific heterogeneity, we include a set of variables that allow taking into account the sectoral and geographical features of export flows from Russian regions. We follow Rauch's (1999) approach and distinguish between the following three product groups: homogeneous products traded in organized markets, reference priced products for which prices can be quoted without mentioning the name of the manufacturer, and differentiated products (the rest) (for the classification of goods, see Rauch, 1999).

Fourth, we believe that export flows are also affected by the specificities of competition in foreign markets. Export flows of different sizes and export flows that meet different levels of competition in the destination markets may have different survival rates. Thus, we follow Albornoz et al. (2014) and Feng et al. (2012) in employing a variable that measures the logarithm of the average value of exports and include a variable in the regression that is calculated as the average number of Russian regions that export product i to country j, following Fugazza and Molina (2016).

Fifth, in all specifications we employ industry, destination and year dummies and use robust standard errors clustered at the product-destination level to account for possible demand shocks, which are correlated across product-destination levels. It could be argued that a list of dummies and clustered standard errors might not fully solve the endogeneity problem. Indeed, an endogeneity problem might be caused in the model by the probable simultaneity between regional characteristics and the survival of export flows and the existence of self-selection in exporting. A number or recent empirical studies pay special attention to the endogeneity problem with regard to export performance. Among others, Commander et al. (2008) consider the issue of the empirical relationship between firm performance and the business environment and argue that it is necessary to account for possible unobserved heterogeneity and hence to isolate the effects of inputs, the perceived business environment and structural factors on a firm's performance from the effects of performance on the explanatory variables. Hummels et al. (2009) and Sequeira and Djankov (2008) also mention the endogeneity of transport costs and markets when empirically estimating international trade. In this paper, we deal with the endogeneity problem caused by the perceived business environment and self-selection effects by introducing the following two types of variables. First, we perform a pairwise multiplication of the availability of human and financial resources and the duration of the export flow. Since these two variables capture the current length of the spell of activity, it allows accounting for learning-by-exporting effects when export flows with a longer duration may have lower hazards even in regions with low availability of human and financial resources. Second, we perform a pairwise multiplication of the availability of human and financial resources and the average value of the export flow. We believe that this allows capturing the size-specific effects of the export flow and, in particular, accounting for self-selection effects when export flows with a larger value may have higher survival rates.

Since we deal with trade data in the form of single export relationships, we need to account for several issues. First of all, there is the problem of data censoring. Besedes and Prusa (2006b) note that it is often unknown whether a trade relationship ends because of failure or other reasons. Consequently, there is uncertainty about the beginning or the end date (or both) of some trade relationships. In our case, we apply a left censoring procedure, since it is unknown whether trade flows existing in 2002 started in that year or earlier. Therefore, we excluded some of the data and used only those trade flows that were initialized as of 2003.

The second issue is the problem of goods classification due to the fact that the Russian Federal Customs Service periodically revises its product definitions, sometimes splitting a single code into multiple codes and other times combining multiple codes into fewer codes. Unfortunately, there is no available information to allow us to map old product codes into new ones. We recognized that these code changes may affect trade flows and attempted to ensure that we always used the correct classification of the time the data was collected.

Third, there is an issue with interrupted trade flows. A trade flow may be suspended and then resumed after one or more years for economic or other reasons. In the database, 18% of the trade flows are interrupted once or more than once, although this could be attributed to human error. Moreover, the probability of error when the interruption period lasted only one year

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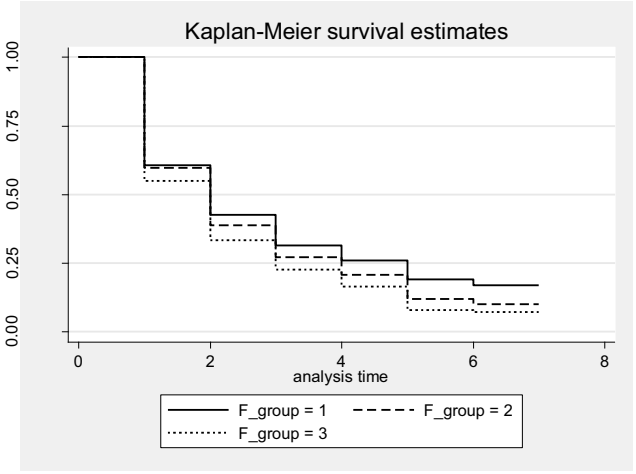

Fig. 1. Survival functions by availability of financial resources.
Notes: Group 1 (19,757 obs.) represents the survival function for the regions ranked from 10 to 1 in Opora Russia according to the index measuring financial resources in a region, Group 2 (19,925 obs.) represents the survival function for the regions ranked from 20 to 11, and Group 3 (18,000 obs.) for those ranked from 35 to 21.

is quite high. To control for possible omissions in the data, we added a dummy variable for those export flows which are interrupted and then resumed, in line with Besedeš and Blyde (2010), Besedeš and Prusa (2006a, 2006b), Cadot et al. (2013) and Fu and Wu (2014).

The choice of explanatory variables imposes several restrictions on the database. First, these concern the limitations on data censoring described above, and second, the fact that the Opora Index provides data for only 35 Russian regions and the sample of the regions is not fully consistent with the sample used in this study. Third, the choice of four geographic regions of the world imposes some constraints on the sample. Finally, following the strategy of a number of empirical studies (Freund and Pierola, 2010; Fugazza and Molina, 2016), we include only those export flows that exceed 1000 USD in the sample. Therefore, taking into account all limitations, the export survival analysis will be carried out on data of 57,682 flows from 20 Russian regions to 124 countries of the world economy for the period 2002–2010, classified by the 4-digit HS classification.[1] According to the Rosstat statistics, the 20 Russian regions covered in the database on average account for 29% of the Russian gross domestic product and 37% of the Russian gross domestic product excluding Moscow. In addition, the regions considered in the database account for 24% of gross Russian exports and about 40% of gross Russian exports excluding exports from Moscow and the strongly oil-oriented regions Khanty-Mansiysk and Yamalo-Nenets Autonomous District.

2.2. Stylized facts on export survival in Russian regions

Before the empirical estimation of export survival factors, we perform duration analysis and employ the non-parametric Kaplan-Meier estimator to examine differences in exit rates across trade flows from Russian regions. More specifically, we examine survival functions of trade flows for regions ranked in different sub-groups within the Opora Russia indices of financial and human resources. Fig. 1 presents the Kaplan-Meier curves plotted for three groups of regions with different positions in the rating according to the availability of financial resources. Fig. 1 shows that the survival rates of export flows in regions ranked among the top 10 according to the availability of financial resources are on average higher than those ranked lower. The differences in hazard rates between regions ranked in the top 10 and others increase with a longer duration of export flows. These results suggest that a better availability of financial resources in a region could increase export duration.

Fig. 2 presents a similar graph for three groups of regions with different positions in the rating according to the availability of human resources. Similarly to the previous graph, we see that export flows from regions ranked among the top 10 according to the availability of human resources have higher survival rates in comparison to other export flows. However, it is worth mentioning that export flows from regions placed from 20th to 10th place in the rating according to the availability of human resources have lower survival rates than outsider regions ranked lower than 20th place. This could suggest a necessity to control for unobserved heterogeneity and industry- and export-market-specific effects, as was discussed in the section above.

Finally, we carry out a series of log-rank tests of equality of hazard functions across groups of regions. Table 1 indicates that the hypothesis is easily rejected, indicating that there are statistically significant differences across export flows from regions ranked in different groups according to the availability of financial and human resources. However, it should be noted

[1] The descriptive statistics for the variables used are presented in Appendix 3 and the correlation matrix in Appendix 4.

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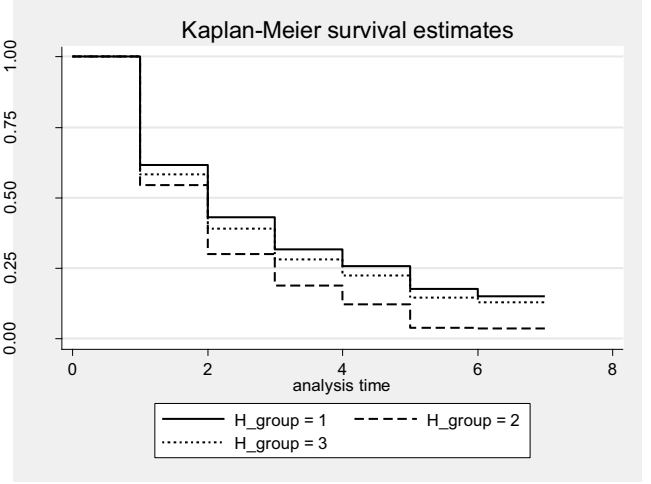

Fig. 2. Survival functions by availability of human resources.
Notes: Group 1 (19,705 obs.) represents the survival function for the regions ranked from 10 to 1 in Opora Russia according to the index measuring human resources in a region, Group 2 (14,241 obs.) represents the survival function for the regions ranked from 20 to 11, and Group 3 (23,736 obs.) for those ranked from 35 to 21.

Table 1
Cox test for equality of survivor functions*.

		Log-Rank	Wilcoxon	Taron-Ware	Peto-Peto	Log-Rank + industry fixed effects
Financial resources	Chi2	2878.59 (0.000)	1691.96	2202.00	1948.30	822.77
	Pr > Chi2		(0.000)	(0.000)	(0.000)	(0.000)
Human resources	Chi2	3469.44	1943.76	2595.06	2275.66	1519.20
	Pr > Chi2	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: Regions are grouped in the same way as in Figs. 1 and 2.

that non-parametric analysis is a univariate approach without controlling for the effects of other explanatory variables and unobserved effects. Thus, it is necessary to conduct a deeper empirical analysis in order to investigate the effects of the availability of financial and human resources on export survival.

3. Empirical strategy and results

As a baseline estimation procedure, we employ a pioneering semi-parametric approachproposed by Cox (1972), which has the following specification in the general form:

$$h(t, x, \beta) = h_0(t)\exp(x'\beta),$$

where x is the vector of independent variables and β is the vector of estimated coefficients. The baseline hazard $h_0(t)$ is characterized as a function of time. A particular advantage of the Cox model is that the baseline hazard is left unspecified and is not estimated (Besedeš and Prusa, 2006a). However, the Cox model has been criticized for the problem of unobserved heterogeneity and the validity of the hazard proportionality assumption (see Hess and Persson, 2012). The unobserved heterogeneity problem may potentially cause parameter bias and bias in the estimated survivor function. Also, the assumption of the proportionality of hazards means that the effects of explanatory variables on survival are constant over time. Obviously, the effects of explanatory variables may be intrinsically non-proportional. This is especially important if time-varying covariates are among the explanatory variables, which is the case in this study (exporter GRP per capita, importer GDP per capita). Additionally, it is reasonable to assume a time-dependent hazard rate because of learning-by-exporting effects, which are well represented in the recent empirical literature (Martins and Yang, 2009; Silva et al., 2012). These may decrease hazard rates and, in other words, increase the survival of export flows.

We follow Fu and Wu (2014), Hess and Persson (2012) and Ilmakunnas and Nurmi (2010) and employ an alternative discrete-time duration model in which the hazard rate is assumed to be of a complementary log-log (cloglog) form, which is, in nature, a discrete time form of the continuous time proportional hazards model. In addition, we estimate the probit model with random effects as a robustness check. This method corresponds to Hess and Persson (2012) and has been implemented in a number of papers (Fugazza and McLaren, 2014; Fugazza and Molina, 2016). The main advantage of probit estimation with random effects is that it explicitly allows controlling for unobserved heterogeneity in the hazard specification.

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The empirical equation to be estimated is given in the following form:

$$\Pr(x_{jdt,i} > 0 | X_{idt,j}) = F\left(GRP_{it} + GDP_{dt}\beta + Exp_{ijd}\theta + G_{id}\rho + F_i\vartheta + H_i\mu + M_{jd}\varphi + D_j^1 + D_d^2 + D_t^3 + u_{jdt,i}\right),$$

where $x_{jdt,i}$ denotes export from region i to country d in sector j at time t. When the model is estimated using the complementary log-log model, $F(\cdot) = 1 - \exp[-exp(\cdot)]$, when the model is estimated with probit, $F(\cdot)$ takes the form of the cumulative distribution function of the standard normal distribution function. Our variables of interest are $F_i\vartheta$ and $H_i\mu$, which measure, respectively, the availability of financial and human resources in the exporting region. The variables GRP_{it} and $GDP_{dt}\beta$, measure, respectively, gross regional product per capita of the exporting region and gross domestic product per capita of the importing region. The set of export-flow-specific characteristics $Exp_{ijd}\theta$ includes the average export value of the export flow and a dummy variable that shows whether the export flow has been interrupted and resumed. The set of variables $G_{id}\rho$ reflects the variables of the gravity model and includes distance to the closest seaport, distance from the seaport to the destination market, whether the region has a common language or a common border with the destination market, whether the exporting region is landlocked, and whether the destination market is a post-Soviet country. The set of variables $M_{jd}\phi$ allows controlling for unobserved heterogeneity in the destination markets and includes two variables: the

Table 2
Estimation results for 2003–2010; 4-digit data.

	Cox			Probit			cloglog		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Average export value (log)	−0,0276[a]	−0,0082[a]	−0,0345[a]	−0,0952[a]	−0,0322[a]	−0,0489[a]	−0,0934[a]	−0,0302[a]	−0,0386[a]
	(0,0015)	(0,0013)	(0,0035)	(0,0027)	(0,0019)	(0,0031)	(0,003)	(0,0018)	(0,003)
Human resources	0,0018[a]	0,0397[a]	0,0322[a]	0,0034[a]	0,0343a	0,0269[a]	0,0034[a]	0,0425[a]	0,0368[a]
	(0,0004)	(0,0005)	(0,0009)	(0,0007)	(0,0009)	(0,0014)	(0,0007)	(0,0009)	(0,0014)
Financial resources	−0,0009[b]	0,0568[a]	0,0498[a]	0,0023[a]	0,0523[a]	0,0494[a]	0.0007	0,0688[a]	0,0695[a]
	(0,0004)	(0,0007)	(0,001)	(0,0007)	(0,001)	(0,0016)	(0,0008)	(0,0011)	(0,0017)
Human resources * Duration		−0,0240[a]	−0,0240[a]		−0,0163[a]	−0,0162[a]		−0,0237[a]	−0,0236[a]
		(0,0003)	(0,0003)		(0,0004)	(0,0004)		(0,0004)	(0,0004)
Financial resources * Duration		−0,0386[a]	−0,0384[a]		−0,0249[a]	−0,0247[a]		−0,0385[a]	−0,0383[a]
		(0,0006)	(0,0006)		(0,0005)	(0,0005)		(0,0007)	(0,0007)
Human resources * Export value			0,0008[a]			0,0008[a]			0,0006[a]
			(0,0001)			(0,0001)			(0,0001)
Financial resources * Export value			0,0007[a]			0,0003[b]			−0.0001
			(0,0001)			(0,0001)			(0,0001)
Distance to seaport (log)	−0,0457[a]	0,0718[a]	0,0697[a]	−0,1612[a]	−0.01	−0.0109	−0,1521[a]	0,0361[a]	0,0356[a]
	(0,0047)	(0,0048)	(0,0046)	(0,0128)	(0,0126)	(0,0125)	(0,012)	(0,0122)	(0,0122)
Distance to export market (log)	0,0152[a]	0,0089[b]	0,0077[b]	0.0113	0.0045	0.0035	0.0179	0.0065	0.0064
	(0,0053)	(0,0039)	(0,0039)	(0,0111)	(0,008)	(0,008)	(0,0113)	(0,0074)	(0,0074)
Common language	−0,0459[a]	−0,0294[b]	−0,0275[b]	−0,0986[a]	−0.008	−0.0051	−0,1048[a]	−0.0019	0.0001
	(0,0176)	(0,0126)	(0,0126)	(0,0279)	(0,0174)	(0,0174)	(0,0312)	(0,0163)	(0,0163)
Common border	−0,1525[a]	0.0089	0.0145	−0,3389[a]	−0,0889[a]	−0,0805[a]	−0,3896[a]	−0,0822[a]	−0,0761[a]
	(0,0175)	(0,0119)	(0,0119)	(0,0277)	(0,0283)	(0,0282)	(0,0317)	(0,0271)	(0,027)
Post-soviet	0.0114	−0.0111	−0.0128	0.0307	−0.0028	−0.0055	0.037	−0.0038	−0.0054
	(0,0122)	(0,0114)	(0,011)	(0,0224)	(0,0205)	(0,0204)	(0,0237)	(0,0195)	(0,0194)
Landlocked	−0,0391[a]	−0,0915[a]	−0,0906[a]	−0,0478[b]	−0.0258	−0.0267	−0,0619[a]	−0,0435[b]	−0,0444[b]
	(0,0091)	(0,0063)	(0,0064)	(0,0237)	(0,0208)	(0,0207)	(0,0231)	(0,0198)	(0,0197)
Exporter GRP per capita (log)	0,1359[a]	−0,0435[a]	−0,0383[a]	0,3360[a]	0,1232[a]	0,1299[a]	0,3471[a]	0,0887[a]	0,0940[a]
	(0,0173)	(0,0093)	(0,0094)	(0,0436)	(0,0357)	(0,0357)	(0,0437)	(0,0312)	(0,0313)
Importer GDP per capita (log)	0,0138[a]	−0,0063[c]	−0,0061[c]	0,0373[a]	0.0032	0.0028	0,0380[a]	−0.0039	−0.0042
	(0,005)	(0,0034)	(0,0033)	(0,0096)	(0,0068)	(0,0068)	(0,0101)	(0,0064)	(0,0064)
Import tariff	0,0000	−0.0009	−0.0009	0,0064[a]	0.0026	0.0026	0,0045[b]	0.0028	0.0029
	(0,0012)	(0,0006)	(0,0006)	(0,0019)	(0,002)	(0,002)	(0,0019)	(0,002)	(0,002)
Competition	−0,0059[a]	−0,0018[a]	−0,0016[a]	−0,0135[a]	0,0027[a]	0,0031[a]	−0,0142[a]	0,0032[a]	0,0034[a]
	(0,0008)	(0,0005)	(0,0005)	(0,0012)	(0,0009)	(0,0009)	(0,0013)	(0,0008)	(0,0008)
Sector dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Export market dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Multiple spells	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cons	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Number of clusters	4878	4878	4878	4878	4878	4878	4878	4878	4878

Notes: Standard errors are clustered at the 2-digit product-destination level. Cluster-robust standard errors in parentheses. Cox regressions employ the Breslow method for ties. Beta-coefficients for the Cox model are provided. Marginal effects are provided for the probit and cloglog models.

[a] Significance level: $p < 0.01$.
[b] Significance level: $p < 0.05$.
[c] Significance level: $p < 0.10$

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average applied import tariff for the period and the average number of export flows from other Russian regions to this destination market. The proposed model includes a series of fixed effects for industries D^1_j, destination markets D^2_d and time periods D^3_t. Both the complementary log-log and the probit models employ random effects, and thus the error term takes the following form: $u_{jdt,i} = (\varepsilon_{jd,i} + \varepsilon_{jdt,i})$.

The results are shown in Table 2. Columns (1), (4) and (7) present the estimation results for the baseline specification. Columns (2), (5) and (8) show the estimation results for the modified model, where we include pairwise multiplications of the variables measuring the availability of human and financial resources and the duration of the export flow; the latter allows capturing the current length of the spell of activity for each trade relationship. These variables additionally allow controlling for unobserved heterogeneity caused by time effects and accounting for possible learning-by-exporting effects. Finally, columns (3), (6) and (9) present the estimation results where we include both pairwise multiplications of the variables measuring the availability of human and financial resources with the duration and the average value of the export flow. This allows controlling for both duration-specific and size-specific effects on export survival. According to Table 2, the Cox model, cloglog and probit estimation approaches provide similar impact levels of the coefficients. The results are also robust to additional time- and size-specific controls provided by the pairwise multiplication with the financial and human resource variables. Before interpreting the results, it is important to mention that the variables of human and financial resources are proxied by the position of the regions in the rating, and thus a lower value of a variable means a higher availability of resources.

We obtain from all specifications that a better availability of human and financial resources improves export survival across Russian regions. Even after controlling for size and time effects, an increase in the availability of human resources according to the Opora Russia Index by 1 position lowers the hazard rates for exporters by 3.3–4.3%. Similarly, an increase in the availability of financial resources for exporters lowers the hazard rates by 5.0–6.9%. However, these effects fall over time. The interaction terms between human and financial resources and export duration are negative and statistically significant. In addition, the empirical results suggest a complementary effect of the average export value and human and financial resources. In other words, the positive effect of improving the quality of financial and human resources in the region is higher for larger exporters. To sum up, the empirical results suggest that the effects of the availability of financial and human resources fall over time and are more important for larger exporters. Thus, there is evidence of a learning curve for exporters when the latter become more efficient in dealing with resources and the regulatory environment over time.

The estimated results for the gravity variables in all specifications are to some extent in line with the existing theoretical and empirical evidence. If a Russian region has a common border with a foreign market, this lowers the hazard rate of the export flow by 8.9% when controlling for unobserved time and size effects. Survival of export flows for regions located closer to a seaport is higher, which is in line with the idea of negative effects of transportation costs on export survival found in the recent literature. We do not find any statistical effects of the distance from the closest seaport to the destination market on export survival. This could be evidence of the fact that transportation costs within the country and to the border are much more important for local exporters than international transportation costs. If an exporting region is landlocked, it will on average have higher survival rates of export flows by 9.2% in the Cox regression and by 2.7–4.4% in the probit and cloglog models controlling for time- and size-specific effects. This result could be counterintuitive to some extent. However, taking into account that the more developed Russian regions are landlocked while the less developed ones are located closer to the borders and seaports, this effect could reasonably be expected.

4. Conclusion

In this paper, we explore the effects of the availability of human and financial resources on the survival of export flows in Russian regions. Our empirical strategy is built on recent theoretical developments and empirical findings, and based on data on export flows from 20 Russian regions to 124 destination markets by 4 HS classification in the 2002–2010 period.

Based on traditional Cox approach, probit and cloglog with random effects models, our empirical estimations show that the availability of both human and financial resources affects export survival. Indeed, as was shown even after controlling for size- and time-specific effects, a better availability of human and financial resources is associated with lower hazard risks. However, these effects are higher for larger export flows and decrease over time.

The empirical results not only strongly support the idea of learning by doing while exporting, but also suggest that one way to improve export survival rates is to increase export values and, in turn, export revenues. Indeed, in the case where the perspectives of business climate improvements are limited to some extent, it was shown that the effects of the business climate on survival are larger for experienced exporters of higher values, who also live longer on average. In line with this, Das et al. (2007) study Colombian manufacturing industries and find that producers do not begin to export unless the present value of their expected future export profit stream is large. In a similar vein, Easterly and Reshef (2014), using a database of African firms, find that success stories of exports were accompanied by a dramatic increase in export revenues.

Our results on higher positive effects from improvements in the availability of human and financial resources for larger export flows may have important economic policy implications at the national and regional levels. Since larger export flows (export flows with larger export values) benefit more from improvements in the availability of resources, policy measures aimed at such improvements should require co-financing from larger companies. This is especially important for the Russian

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economy, where there is relatively limited spending on support measures for exporters at the national and regional level and, simultaneously, only larger companies can afford co-financing policy support measures.

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Appendix A

Country	Group	Country	Group	Country	Group
Afganistan	DS	Trinidad and Tobago	DS	Romania	SECIS
Algeria	DS	Tunisia	DS	Serbia	SECIS
Angola	DS	Tanzania, United Rep.	DS	Tajikistan	SECIS
Bahamas	DS	Uganda	DS	Turkmenistan	SECIS
Bahrain	DS	United Arab Emirates	DS	Uzbekistan	SECIS
Bangladesh	DS	Uruguay	DS	Ukraine	SECIS
Bolivia	DS	Vietnam	DS	Australia	N
Cambodia	DS	Yemen	DS	Austria	N
Cameroon	DS	Zambia	DS	Belgium	N
Congo, Rep.	DS	Zimbabwe	DS	Canada	N
Costa Rica	DS	Argentina	ES	Czech Republic	N
Côte d'Ivoire	DS	Brazil	ES	Denmark	N
Dominican Republic	DS	Chile	ES	Estonia	N
Ecuador	DS	China	ES	Finland	N
El Salvador	DS	Colombia	ES	France	N
Guatemala	DS	Cuba	ES	Germany	N
Honduras	DS	Egypt	ES	Greece	N
Iran	DS	India	ES	Hungary	N
Iraq	DS	Indonesia	ES	Ireland	N
Jamaica	DS	Jordan	ES	Iceland	N
Kenya	DS	Malaysia	ES	Israel	N
Kuwait	DS	Mexico	ES	Italy	N
Laos	DS	Morocco	ES	Japan	N
Lebanon	DS	Pakistan	ES	Korea, Rep.	N
Liberia	DS	Peru	ES	Latvia	N
Mauritania	DS	Philippines	ES	Lithuania	N
Mongolia	DS	Singapore	ES	Netherlands	N
Mozambique	DS	South Africa	ES	New Zealand	N
Myanmar (Burma)	DS	Taiwan (China)	ES	Norway	N
Namibia	DS	Thailand	ES	Poland	N
Nepal	DS	Turkey	ES	Portugal	N
Nicaragua	DS	Venezuela	ES	Slovakia	N
Niger	DS	Azerbaijan	SECIS	Slovenia	N
Nigeria	DS	Armenia	SECIS	Spain	N
Oman	DS	Bosnia and Herzegovina	SECIS	Sweden	N
Panama	DS	Byelorussia	SECIS	Switzerland	N
Paraguay	DS	Croatia	SECIS	Great Britain	N
Qatar	DS	Georgia	SECIS	United States	N
Saudi Arabia	DS	Kazakhstan	SECIS		
Senegal	DS	Kyrgyzstan	SECIS		
Sri Lanka	DS	Macedonia	SECIS		
Sudan	DS	Moldavia	SECIS		
Syria	DS	Montenegro	SECIS		

Note: DS = Developing South, ES = Emerging South.
SECIS = South-Eastern Europe and post-soviet countries, N = North.

Appendix B. Independent variables

Variable	Description	Source
Average export value (log)	Average export value in USD	Authors' calculations
Human resources	Small business entrepreneurial environment, including availability of skilled engineers and technicians, skilled workers, availability and quality of specialized educational programs for business development. Ranges between 1 and 35, where 1 corresponds to the region with the best conditions for doing business.	Opora Russia

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(*Continued*)

Variable	Description	Source
Average export value (log)	Average export value in USD	Authors' calculations
Financial resources	Small business entrepreneurial environment, including availability of financial resources for the short, medium and long term from different financial institutions. Ranges between 1 and 35, where 1 corresponds to the region with the best conditions for doing business.	Opora Russia
Distance to seaport (log)	Distance in km between the capital city in the region and the seaport of export shipment	Authors' calculations
Distance to export market (log)	Distance in km between the seaport and the capital city in the foreign market	Authors' calculations
Common language	Dummy variable, equals 1 if common language	CEPII
Common border	Dummy variable, equals 1 if common border	Authors' calculations
Common history	Dummy variable, equals 1 if country is post-communist	Authors' calculations
Landlocked	Dummy variable, equals 1 if country is landlocked	Authors' calculations
Exporter GRP per capita (log)	GRP per capita in mln roubles for the period 2003–2010	Rosstat
Importer GDP per capita (log)	GDP per capita in USD for the period 2003–2010	World Development Indicators
Import tariff	Applied tariff including preferential tariffs, which is importer specific, %	World Development Indicators
Competition	Average number of countries that export product *i* from Russian regions over the spell	Authors' calculations
Multiple entry	Dummy variable, equals 1 if multiple entry	Authors' calculations

Appendix C. Descriptive statistics

Variable Obs	Obs	Mean	Std. Dev.	Min	Max
Duration	57682	1.58	1.13	1	7
Average export value (log)	57682	9.46	2.67	4.61	21.43
Human resources	57682	17.77	10.75	1	35
Financial resources	57682	16.68	9.64	2	35
Distance to seaport (log)	57682	9.07	0.67	5.78	9.73
Distance to export market (log)	57682	7.77	0.78	5.75	9.74
Common language	57682	0.11	0.32	0	1
Common border	57682	0.04	0.20	0	1
Post-soviet	57682	0.45	0.50	0	1
Landlocked	57682	0.81	0.39	0	1
Exporter GRP per capita (log)	57682	11.80	0.19	11.45	12.22
Importer GDP per capita (log)	57682	8.52	1.41	5.35	11.20
Import tariff	57682	4.65	5.22	0	47.92
Competition	57682	7.55	6.31	1	33

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Appendix D. Correlation matrix

	Average export value (log)	Human resources	Financial resources	Distance to seaport (log)	Distance to export market (log)	Common language	Common border	Post-soviet	Landlocked	Exporter GRP per capita (log)	Importer GDP per capita (log)	Import tariff	Competition	Duration
Average export value (log)	1													
Human resources	0.01	1												
Financial resources	0.01	−0.19	1											
Distance to seaport (log)	0.00	−0.16	−0.35	1										
Distance to export market (log)	0.00	0.01	0.03	−0.02	1									
Common language	−0.05	0.03	−0.04	0.01	0.09	1								
Common border	−0.04	0.12	−0.04	−0.09	−0.05	0.37	1							
Post-soviet	−0.05	0.01	−0.05	0.04	−0.36	0.40	0.19	1						
Landlocked	0.04	0.18	−0.30	0.36	0.15	0.03	−0.01	0.00	1					
Exporter GRP per capita (log)	0.03	−0.35	−0.03	0.21	0.07	0.01	−0.08	−0.01	0.39	1				
Importer GDP per capita (log)	0.04	−0.02	0.01	0.01	−0.10	−0.12	−0.02	−0.42	−0.04	0.04	1			
Import tariff	0.04	−0.01	0.02	0.00	0.29	−0.17	−0.11	−0.19	0.03	0.01	−0.27	1		
Competition	0.11	0.04	0.00	−0.07	−0.08	0.31	0.08	0.33	0.02	0.01	−0.06	−0.12	1	
Duration	0.22	−0.02	−0.05	0.10	−0.04	0.12	0.11	0.11	0.04	0.00	−0.03	−0.04	0.17	1

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