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of Ukrainian firms**

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Determinants of export performance of Ukrainian firms

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Abstract:

Following the new strand in the new trade theory literature that focuses on firm heterogeneity in this paper we investigate determinants of firm export performance in Ukraine. The study is based on the BEEPS firm level data compiled by EBRD and the World Bank. The study covers the period starting in 2005 and ending in 2013. We estimate probit regressions for each year of our sample as well as for the pooled dataset that includes all years. Our pooled estimation results indicate that the probability of exporting is related to the level of productivity, the firm size, R&D expenditure, the share of university graduates in productive employment, as well as the internationalization of firms. The estimation results obtained for particular countries reveal some degree of heterogeneity. In particular, the firm age is significant only in the last years of our sample.

Introduction

After the collapse of the Soviet Union in 1991 Ukraine emerged as an independent country and followed its own way of economic transition from central planning to a market economy. This way was different from the path followed by Central and Eastern European (CEE) countries which

radically liberalized their multilateral and regional trade and integrated successfully with the European Union. The scope of economic and trade liberalization in Ukraine was significantly lower and structural and social reforms were less radical. This resulted in relatively poor economic performance compared to the transition countries which became member of the European Union in three waves of the Eastern Enlargement. As a result of increased integration with the EU firms from these countries gained the access to foreign markets and became the leaders in export activity among the post-transition countries. Given the economic success of these countries Ukraine changed its political orientation towards the West and signed the association agreement with the EU.

The main goal of this paper is to verify to which extent the Ukrainian firms are able to operate in the competitive market environment. In particular, we want to analyse whether the determinants of export performance of Ukrainian firms are similar to those of the firms from CEE countries that are the members of the EU. Therefore, in this paper we study empirically the relationship between labor productivity and exporting of Ukrainian firms, having controlled for other firm characteristics.

The majority of previous studies for Ukraine evaluating the effects of trade liberalization were traditionally based on aggregate trade flows data and gravity models (Movchan et al., 2010, Shepotylo, 2008, Nasadiuk, 2012). However, more recently the attention in the empirical trade literature has switched from the country-level to the firm-level determinants of successful export performance. This kind of empirical evidence for Ukraine is still missing.

Up to now the literature on Ukrainian enterprises based on analysis of firm-level data focused on determinants of long-term productivity. For example, Pivovarsky (2003) analyzed the impact of ownership

concentration on the firm performance in Ukraine. Earle et al. (2014), using the panel of 7000 manufacturing enterprises, demonstrated that political favoritism, in the context of weak institutions, can have substantial redistributive impact on economic productivity. Kostenko (2014) confirmed that innovation activity had a positive impact on labor productivity of Ukrainian firms. Yemelyanova (2014) analyzed the impact of ownership structure on the effectiveness of Ukrainian enterprises. This paper contributes to the literature by analyzing the determinants of export performance of Ukrainian firms, focusing on the role of labor productivity.

In contrast to the international trade literature which assumed that firms are symmetric the recent strand in the new trade theory stresses the firm heterogeneity and its effect on export performance. This strand was initiated by Melitz (2003) and Helpman et al. (2004) who relaxed the key assumption of the firm symmetry in the Krugman (1979, 1980) monopolistic competition model and introduced firm heterogeneity in terms of labor productivity. In the Melitz model (2003) model the relationship between the level of labor productivity and exporting was placed in the center of analysis. This model assumes that productivity differences are exogenously given and each firm has to pay fixed costs of entry into domestic and foreign markets. The model predicts that only the most productive firms with lowest marginal costs can cover the fixed cost of entry and become exporters.

A large number of empirical studies based on firm-level data compiled for many countries confirm the key prediction of the Melitz (2003) model, i.e. that more productive firms self-select into foreign markets. The existing empirical evidence shows that only a small fraction of the most productive firms are responsible for the majority of exports and

most firms do not export at all concentrating their activities on domestic markets only.

The extensive summary of recent empirical evidence on the relationship between the productivity and export performance is provided by Wagner (2007, 2012). The importance of the firm productivity for exporting has also been emphasized by the EFIGE (2010) report. In this report it has been demonstrated that firm export performance in several EU countries depends on labor productivity and other firm characteristics. Unfortunately, these studies did not include the post-communist countries with the exception of Hungary.

Similar studies for CEE countries were initiated by Cieřlik, Michałek and Michałek (2012, 2013). In their most recent study, Cieřlik, Michałek and Michałek (2014) included in their analysis the Baltic, Caucasus and Visegrad countries. First, they estimated probit regressions for the pooled dataset that included all three groups of countries, and then they disaggregated the sample into particular country groups to study the differences and similarities between these groups of countries.

Their estimation results obtained for the whole sample indicated that the probability of exporting increases with the higher level of productivity and the measures of human capital, including the share of university graduates in total employment and spending on R&D activities. Moreover, the internationalization of the firms, proxied by the use of foreign technology licenses and the foreign ownership, was found to be positively related to the probability of exporting. Finally, they found that firm size was also a significant variable for the probability of exporting. These results were similar to the results presented in the EFIGE (2010) report obtained for the firms from the large EU countries.

The estimation results obtained separately for specific country groups revealed a similar pattern in the case of the Visegrad countries and the Baltic states, although a smaller number of explanatory variables were statistically significant. However, in the case of the Caucasus countries only two explanatory variables were statistically significant: the firm size and the R&D variable, while the link between the level of productivity and the probability of exporting was not statistically significant. Thus, the firm size was the only explanatory variable which was statistically significant in the case of all groups of countries. This confirmed the importance of economies of scale for exporting.

Our study is based on the BEEPS firm-level data for the post-transition period starting in 2002 and ending in 2013. In our study we devote specific attention to the role of firm productivity as the main determinant of export performance. In addition, we study the role of other firm characteristics such as the role of foreign capital participation and the use of foreign technology.

The structure of this paper is as follows. In the next section we describe the empirical methodology. Subsequently, we discuss the properties of the dataset. Then we present our empirical results. In the final section we summarize and conclude.

Methodology of the research

In this study we analyse empirically the firm-level determinants of export decisions. In particular, we focus on estimating the theoretical relationship between firm-level productivity and exporting postulated by the Melitz (2003) model in Ukraine. This approach is an equivalent of studying the extensive margin effects. In other words, this means a positive effect on

trade through an increase in the number of exporting firms or products exported.

In addition, we take into account other firm characteristics that may affect export performance such as the age and the size of the firm, the use of human capital proxied by R&D spending and the share of university graduates in total employment, as well as the role of foreign and state ownership.

To investigate empirically the relationship between labor productivity and exporting, postulated by the theory, we employ the probit regression, having controlled for the additional firm characteristics. We develop the following empirical model to investigate the impact of individual firm characteristics on firm export performance. Let Y_i^* be our dependent variable indicating the export status of firm i . According to this model the export status of i -th firm can be related to the set of individual firm characteristics X in the following way:

$$Y_i^* = X_i\theta + \varepsilon_i \quad (1)$$

where the error term ε_i is independent of X_i which is a vector containing explanatory variables that affect exports with the first term equal to unity for all i , θ is the vector of parameters on these variables that needs to be estimated and ε_i is assumed to be normally distributed with a zero mean.

However, instead of observing the volume of exports for a particular firm, we observe only its export status described by the binary variable Y_i^* .

$$Y_i = \begin{cases} 1 & \text{if } Y_i^* > 0 \\ 0 & \text{if } Y_i^* = 0 \end{cases} \quad (2)$$

Hence, the probability whether a particular firm exports ($Y_i^* > 0$), expressed as a function of firm characteristics, can be written as follows:

$$\Pr(Y_i = 1|X_i) = \Phi(X_i\theta) \quad (3)$$

where $\Phi(\cdot)$ denotes the standard normal cumulative distribution function (cdf).

3. Data Description

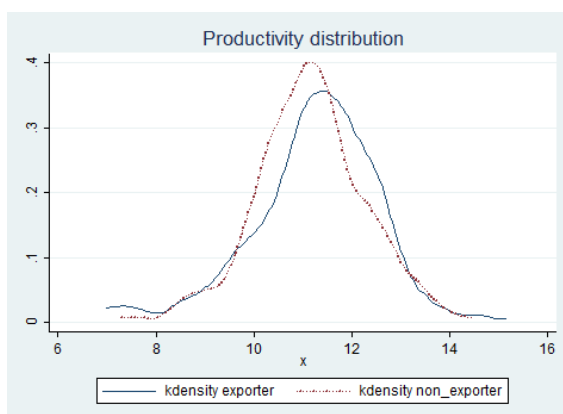
Our study is based on "Bank Business Environment and Enterprise Performance Survey (BEEPS)" data. This dataset is collected jointly by the World Bank and the European Bank for Reconstruction and Development. The main objective of the BEEPS survey is to obtain feedback from enterprises on the state of the private sector. The survey examines the quality of the business environment as determined by a wide range of interactions between firms and the state. The surveys cover manufacturing and services sectors and are representative of the variety of firms according to sector and location within each country. They cover the post-communist countries located in Europe and Central Asia (**ECA**) as well as Turkey. The data were collected for years 2002, 2005, 2009 and 2013.

Our study focuses on Ukraine which along with other Eastern European countries, with the exception of Russia, participates in the Eastern Partnership agreements. The Eastern Partnership works in the framework of the European Neighborhood Policy, which covers the EU's neighbors in the East and South. Moreover, Ukraine has recently signed the association agreement with the EU. This initiatives aim at tightening the relationship between Ukraine and the EU by deepening political cooperation and economic integration.

The export activity is defined as the situation when at least one percent of sales revenue of the firm comes from the sales made abroad. If we apply this benchmark about 20 percent of the analysed Ukrainian

enterprises in 2013 were exporting. Data for Ukrainian enterprises for 2005, 2008 and 2013 show that on average exporters have larger productivity compared to non-exporters. On average mean of logarithm of output per full-time worker amounted to 10.11 for exporters and 9.36 for non-exporters in 2005-2013 period. The distribution of productivity in 2013, presented in the Graph 1, shows that the pattern of distribution was similar to that observed in the majority of the EU countries (EFIGE, 2010).

Graph 1: The kernel distribution of logarithms of productivity of exporting and non-exporting firms in Ukraine in 2013.



The key explanatory variables stressed by the Melitz (2003) model – labor productivity is expressed as the total amount of annual sales per full time employee (*productivity*). Other factors that may affect firm export performance include the level of innovation proxied by the R&D spending (*innovation*), the use of license from a foreign firm (*foreign_tech*), the use of imported materials (*import_mat*). We also control for the foreign ownership (*foreign_owned*) and private ownership (*private_owned*), as well as the age of the firm (*firm_age*) and the size of the firm (*firm_size*). In

addition, we control for the effects of belonging to particular geographic region in Ukraine (*west, east, north, south and kyiv*) and individual time effects for particular years of our sample.

The detailed descriptions of firm characteristics used in our study are shown in Table 1.

Table 1. Description of variables used in empirical study

Variable Name	BEEP input Name	Description
Export	Based on the sum of d3b (direct exports as the share of total sales) and d3c (indirect exports as the share of total sales)	binary variable, that takes the value 1 if the establishment is exporting and 0 if not
Productivity1	Calculated as $\text{prod} = \log(\text{prod})$ $\text{prod} = d2/11$	logarithm of productivity expressed as total amount of annual sales per full time employee
Productivity2	Calculated as $\text{prodty2} = \log(\text{prodty2})$ $\text{Prodty2} = (d2 - n2a - n2e - n2f - n2b - n2ra - n2rb) / 11$	Logarithm of productivity expressed as total amount of value added per full time employee
Firm_size	11	Logarithm of no. of permanent, full-time employees of this firm at end of last fiscal year
Firm_age	Calculated as difference between the year of survey and year of firm's establishment	Logarithm of number of years since start of operations
Foreign_tech	Based on e6	binary variable, that takes the value 1 if the establishment uses technology licensed from a foreign-owned company and 0 otherwise*
Innovation	Based on h6	Binary variable, that takes the value 1 if the establishment is involved in innovation and 0 otherwise
Private ownership	Based on the sum of b2a (share of capital owned by private domestic	binary variable, that takes the value 1 if the establishment is fully private (both by domestic and

	individuals) + b2b (share of capital owned by private foreign individuals)	foreign individuals) and 0 if the ownership is mixed with the state
Foreign ownership	Based on b2b	binary variable, that takes the value 1 if shares are owned by private foreign individuals, companies or organizations and 0 otherwise
Imp_Mat	Based on d12b	Logarithm of share of foreign material inputs or supplies in all material inputs and supplies

*For 2005 data foreign_tech indicates whether a firm obtained a technology license and for 2008 and 2013 dataset foreign_tech variable denotes whether a company obtained a license from a foreign-owned firm

Source: BEEPS dataset.

Estimation results

In this section we discuss our estimation results for Ukrainian firms.

The estimation results obtained from the probit regression are reported in Table 2.

Table 2. Estimation Results for Ukraine (separate years and pooled, logarithm, 1st type of productivity)

VARIABLES	2002	2005	2008	2013	2002-2013 pooled
	(1)	(2)	(3)	(4)	(5)
Productivity1	.1297336	.1179986	.2263101	.1321429	0.139104
	(1.84*)	(1.53)	(3.49***)	(2.12**)	(4.74***)
firm_size	.7035328	.4347147	.5312628	4359668	.4864285
	(4.00***)	(2.20**)	(7.09***)	(6.96***)	(11.85***)
age	-.0043056	.091018	.1765472	.1583597	.0959625
	(-0.04)	(0.53)	(1.36)	(1.16)	(1.63)
foreign_tech	-.3694898	-.088718	.6276513	.4910174	.1921729
	(-1.87*)	(-0.42)	(2.95***)	(2.63***)	(2.00**)
innovation	.3915163	.7003084	.3626654	.6576011	.5206947
	(2.49**)	(2.46**)	(1.56)	(2.51**)	(4.97***)
Foreign ownership	.1919814	.4867075	.5592494	.5166891	.393798
	(0.97)	(2.11**)	(1.84*)	(1.82*)	(3.44***)
Imp_Mat	.0103082	-.0015799	.0173807	.0207036	.0111286
	(2.09**)	(-0.32)	(2.89***)	(3.87***)	(4.42***)
South			.5148726 (1.67*)	-.1753995 (-0.69)	
North			.6053601 (2.10**)	.3004525 (1.26)	
East			.3255024 (0.99)	-.2794832 (-1.23)	
West			.4619815 (1.61)	-.3377126 (-1.46)	
2002					1.90195
					(7.83***)
2005					1.687312
					(7.35***)
2008					-2.2165268
					(-1.85*)
Constant	-1.93362	-2.358959	-6.096864	-3.889579	-1.93362
	(-5.44***)	(-3.94***)	(-6.38***)	(-4.86***)	(-5.44***)
Number of Observations	374	439	321	530	1664
Log likelihood	-168.78959	-163.6163	113.58987	219.78917	-693.23025
Pseudo R2	0.1866	0.1431	0.4121	0.2469	0.2246

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: own estimations based on the BEEPS data.

In column (1) we display the estimation results for 2002 obtained from the specification that includes the labor productivity variable (*lprod*), having controlled for additional firm-level determinants of export activity mentioned in other studies. These include the size of the firm (*firm_size*), the age of the firm (*firm_age*), imported materials (*Imp_Mat*), the dummy variables for innovation (*innovation*), the use of foreign technology (*foreign_tech*), and the foreign ownership (*foreign_owned*). The dummy variable on private ownership was eliminated from the estimation due to the statistical insignificance of the estimator in various model specifications.

The estimated parameter on the labor productivity variable displays a positive sign but it is statistically significant only at the 10 per cent level. This result weakly confirms the link between the level of productivity and the probability of exporting predicted by the theory in the case of Ukraine. Moreover, the majority of our control variables are statistically significant. The exceptions are foreign ownership and firm age.

In column (2) we show the estimation results for 2005. These results are different from the results reported in column (1) in a number of ways. In particular, the estimated parameter on the labor productivity variable is no longer statistically significant. The same applies to foreign technology and imported materials estimators. Moreover, the estimated parameter on the foreign ownership variable displays the expected positive sign and becomes statistically significant at the 5 per cent level.

In columns (3) and (4) we report the results for the most recent years 2008 and 2013 and in addition we control for the geographical location of firms. It turns out that the geographical location of firms is only weakly statistically significant in the case of 2008 and not significant in

2013. The estimated parameters on the remaining variables are statistically significant in both years with the exception of firm age which is not significant at all and innovation which is significant only in the most recent year 2013.

In column (5) we report estimation results based on the largest number of observations obtained from the pooled regression covering the period 2005-2013 and controlling for individual time effects by including time dummies for specific years. These results show that the productivity variable is statistically significant already at the 1 per cent level. This result confirms the major prediction of the theory regarding the link between firm productivity and exporting. All control variables are statistically significant, at least the 5 per cent of statistical significance, with the exception of the firm age variable. The sensitivity tests of based on the alternative measure of productivity are reported in Table 3 in the Appendix. These results confirm the existence of a positive link between productivity and exporting only for the most recent year of our sample.

Conclusions

In this paper we investigated the determinants of export activity of firms in Ukraine. The study was based on firm level data for the period starting in 2002 and ending in 2013. Our empirical results obtained for particular years revealed significant degree of heterogeneity among them. In particular, the estimation results indicate that the probability of exporting increases with the higher firm productivity, having controlled for other explanatory variables which is in line with predictions of the theory. However, this relationship is more pronounced in more recent years of our sample. This means the Ukrainian firms are becoming similar to the firms

operating in Central and Eastern European countries that joined the European Union.

Moreover, the probability of exporting was positively related to a number of firm-level characteristics such as the firm size, foreign ownership, the use of foreign technology, innovation and imported materials. These results allow us to formulate a number of policy recommendations for the development of the export promotion strategy for the Ukrainian authorities. In particular, the export competitiveness of Ukrainian firms can be improved by further liberalization and internationalization of the Ukrainian economy within the framework of the EU Association Agreement. In particular, this can be achieved by attracting more foreign direct investment, more intensive use of foreign technology and imported materials. Foreign direct investment can not only directly affect export performance of firms with the participation of foreign capital but can also generate the whole range of positive spillovers onto domestically-owned firms.

Appendix

Table 3. Estimation Results for Ukraine (separate years and pooled, logarithm, 2nd type of productivity)

VARIABLES	2008	2013	2008-2013 pooled
productivity	.0782875	.1058661	.0922169
	(1.49)	(2.25**)	(2.56*)
firm_size	.5196913	.4190063	.4491626
	(7.05***)	(6.22***)	(9.06***)
Age	.0918765	.1535283	.1228141
	(0.72)	(1.08)	(1.29)
foreign_tech	.5927411	.5463049	.5721563
	(2.72***)	(2.61***)	(3.82***)
innovation	.4415263	.8433279	.571874
	(1.84*)	(3.09***)	(3.18***)
foreign	.4637448	.4536422	.5598686
	(1.56)	(1.44)	(2.58*)
Imported Materials	.016788	.0238208	.0212988
	(2.74***)	(4.24***)	(5.08***)
South			.111315 (0.51)
North			.4909383 (2.49**)
East			.0337709 (0.17)
West			.0120383 (0.06)
2005			-.2484382 (-1.78*)
Constant	-3.763467	-3.525463	-3.546842
	(-5.28***)	(-5.69***)	(-7.33***)
Number of Observations	278	468	746
Log likelihood	-105.85922	-190.76226	-293.42599
Pseudo R2	0.3815	0.2418	0.3103

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: own estimations based on the BEEPS data.

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