

# The Influence of Firm Characteristics and Export Performance in Central and Eastern Europe: Comparisons of Visegrad, Baltic and Caucasus States

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## ABSTRACT

**Objective:** In this paper we study the firm-level determinants of export performance in three groups of countries: the Visegrad, Baltic and Caucasus countries.

**Research Design & Methods:** Our analytical framework refers to the most recent strand in the new trade theory literature based on the Melitz (2003) model that stresses the importance of firm productivity in entering the export markets. The empirical implementation of the theoretical framework is based on the probit model and the BEEPS data set.

**Findings:** Our empirical results confirm the importance of firm characteristics for export performance in the CEE countries. Also heterogeneity between different country groups within the region has been reported.

**Implications & Recommendations:** Export competitiveness of firms from the CEE countries can be improved through the development of modern educational systems allowing to accelerate the accumulation of human capital. The financial support to research and development and innovation activities should also have a positive impact on the export performance of firms from the CEE countries.

**Contribution & Value Added:** We take into account labor productivity and other firm characteristics that may affect export performance such as the age and the size of the firm, the use of human capital, and the degree of firm internationalization.

**Article type:** research paper

**Keywords:** export activity; firm heterogeneity; Central and Eastern Europe

**JEL codes:** F14, P33

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## INTRODUCTION

In the recent years a new strand in the new trade theory literature that stresses the firm heterogeneity in terms of productivity and export performance has emerged. In contrast to the previous international trade literature which assumed that firms are symmetric this new literature stresses the firm heterogeneity in terms of productivity and export performance. The existing empirical evidence based on firm-level data suggests that only a small fraction of the most productive firms accounts for the majority of exports and most firms do not export, concentrating their activities on domestic markets only (EFIGE, 2010).

The majority of empirical studies are conducted mainly for developed and a limited number of developing countries while the empirical evidence for the post-transition economies of Central and Eastern Europe is still rather scarce. Therefore, the main goal of this paper is to investigate the role of individual firm characteristics for their export performance. In particular, we are interested in studying the relationship between labor productivity and exporting, having controlled for other firm characteristics in three groups of Central and Eastern European countries: Visegrad (V-4) group, the Baltic states and the Caucasus countries. In the early 1990s these countries faced transition from non-market to market economies and liberalized their trade policy. Our study is based on the BEEPS firm-level data for the post-transition period starting in 2002 and ending in 2009.

First, we start with estimating probit regressions for the pooled dataset that includes all three country groups, and then we disaggregate the sample into particular country groups. Our estimation results obtained for the whole sample indicate that the probability of exporting increases with the higher firm productivity, having controlled for the share of university graduates in productive employment, spending on R&D activities, the use of foreign technology licenses, the foreign ownership, and the firm size. The results obtained for particular country groups reveal some degree of heterogeneity among them.

The structure of this paper is as follows. In Section 2 we review the relevant literature. In Section 3 we discuss the dataset and the empirical methodology. In Section 4 we discuss our empirical results. Section 5 summarizes and concludes with directions for further studies and policy recommendations.

## LITERATURE REVIEW

Following the recent developments in the empirical trade literature a new strand in the new trade theory literature has emerged. This new strand in the trade theory was initiated by the Melitz (2003) model. In particular, Melitz (2003) relaxed the key assumption of the firm symmetry in the Krugman (1980) monopolistic competition model and introduced firm heterogeneity in terms of labor productivity. In this model the relationship between the level of labor productivity and exporting has been placed in the center of analysis. Melitz (2003) model assumes that productivity differences among firms 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<sup>1</sup>.

The majority of empirical studies find support for the theoretical prediction of the Melitz (2003) model, i.e. that more productive firms self-select into foreign markets. This has been demonstrated, for example, by Bernard and Wagner (1997) for German firms, Bernard and Jensen (1999) for US firms, Clerides et al. (1998) for Columbia, Mexico and Morocco, and Castellani (2002) for Italy. 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 confirmed by the EFIGE (2010) report. In this report it has been demonstrated that firm export performance in seven EU countries depends on labor productivity and other firm characteristics. Unfortunately, these studies did not include the countries of Central and Eastern Europe with the exception of Hungary.

Similar studies for the Visegrad countries (i.e. the Czech Republic, Slovakia, Hungary and Poland) and separately for Poland were conducted by Cieřlik, Michałek and Michałek (2012; 2013a; 2013b). Their analysis showed that the productivity of the labour force was positively related to the probability of exporting. In addition, in their empirical studies, other factors such as spending on R&D, size of the firm, internationalization of the firm, and the stock of the human capital that may affect export business decisions were examined. These results were similar to the results presented in the EFIGE (2010) report.

The firm-level evidence on export performance for the Baltic economies is still rather scarce and limited to country studies based on firm surveys. The notable exception is the recent study by Putniņš (2013) who employed an international business approach to study the determinants of export competitiveness of Latvian firms. He finds that exporters are larger, younger, faster growing and pay higher wages compared to non-exporters. His findings regarding wages are consistent with the view that exporters have higher labor productivity or utilize more skilled labor. Especially, direct exporters tend to be more innovative, proactive and risk taking, and therefore have higher entrepreneurial orientation. Moreover, foreign-owned companies reveal a higher propensity to export compared to domestic-owned firms. His findings are generally in line with the findings of other empirical studies based on most recent strand in the new trade theory literature that focuses on the relationship between the level of labor productivity and exporting. To the best of our knowledge no evidence on the Caucasus countries is available.

The new strand of trade theory provides a useful tool for the analysis of trade performance at the firm-level. In this study we focus on the determinants of firm decisions to export which is an equivalent of studying the extensive margin effects which means a positive effect on trade through an increase in the number of exporting firms or products exported. In particular, we examine empirically the nexus between firm-level

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<sup>1</sup> Helpman *et al.* (2004) extended the Melitz (2003) model to show that the internalization of firms can take place not only through exporting but also via horizontal foreign direct investment (FDI). In their model the most productive firms become multinationals, firms with intermediate level of productivity and lowest productivity firms operate only in domestic market.

productivity and exporting postulated by the Melitz (2003) model in three groups of Central and Eastern European countries: Visegrad (V4) group, the Baltic states and Caucasus countries.

In addition, we try to 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, and the degree of firm internationalization proxied by the use of foreign technology licenses and the role of foreign ownership. Internationalization of firms can generate technology transfers that improve firm productivity. In particular, productive knowledge can be purchased from external suppliers or can be transferred between subsidiaries of multinational firms.

## MATERIAL AND METHODS

### Data Description

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

Our study focuses on three groups of Central and Eastern European countries: the Visegrad Group (V4), the Baltic states and the Caucasus countries. The Visegrad countries include: the Czech Republic, Hungary, Poland and Slovakia. The Baltic states include: Estonia, Latvia and Lithuania. The Caucasus countries include; Armenia, Azerbaijan and Georgia. The Visegrad countries and the Baltic states were the leaders in multilateral and regional trade liberalization in the early 1990s. Already in December 1991 the Visegrad countries signed the Europe Agreements creating free trade agreements with the European Union (the European Communities at that time) and the Baltic states in 1994-1995. The Caucasus countries participate in the Eastern partnership agreements but still have not signed the free trade agreements with the European Union.

Given the positive changes in the international institutional environment and deepening integration with the EU of the Visegrad countries and the Baltic states one can expect that firms from these regions are also the leaders in export activity. Therefore, it is worth comparing the propensity to export of firms in these countries with the Caucasus countries and other countries covered by the BEEPS.

The export activity is defined as the situation when at least one percent of sales revenue comes from the sales made abroad. In Table 1 we present the export propensity of firms from the Visegrad countries, the Baltic states and the Caucasus countries as well

as other former communist countries treating Turkey as a benchmark – a market economy from the region free of the communist past.

Table 1 reveals a great degree of heterogeneity across the firms in the whole region. It can be noted that on average firms in Turkey are the most export-oriented among the firms in the region. The high share of exporting firms is also typical for the countries that emerged from the former Yugoslavia. Those countries were more market-oriented and had more liberal trade regimes in the past compared to the other communist countries. The share of exporting firms from the former Soviet Union is the lowest. The exception are the Baltic states while the Caucasus countries confirm this regularity. The Visegrad countries are located in the upper-middle of the group. However, a great deal of heterogeneity in export performance cannot be explained by the country characteristics only and it is worth studying also the role of firm characteristics in determining the export performance.

**Table 1. Comparison of the propensity to export among the firms from Central and Eastern European countries and Turkey**

Export (national sales less than or equal 99% of establishment's sales)		
Country	Mean	Frequency
Turkey	0.57896874	2463
Slovenia	0.55167394	687
Croatia	0.41551724	1160
Serbia	0.37222222	900
<b>Slovakia</b>	<b>0.36555891</b>	<b>662</b>
FYRMacedonia	0.36005435	736
<b>Estonia</b>	<b>0.35454545</b>	<b>660</b>
<b>Lithuania</b>	<b>0.35441176</b>	<b>680</b>
<b>Hungary</b>	<b>0.35099913</b>	<b>1151</b>
<b>Czech Republic</b>	<b>0.34458673</b>	<b>859</b>
Bosnia	0.34366577	742
Bulgaria	0.31840259	1853
<b>Latvia</b>	<b>0.28527607</b>	<b>652</b>
Albania	0.27459016	732
<b>Poland</b>	<b>0.27253886</b>	<b>1930</b>
Belarus	0.25825472	848
Moldova	0.2356257	887
Ukraine	0.21819138	1902
Romania	0.21345876	1382
<b>Armenia</b>	<b>0.18994413</b>	<b>895</b>
Russia	0.18341232	2110
Kyrgyz Republic	0.1704918	610
<b>Georgia</b>	<b>0.1689008</b>	<b>746</b>
Montenegro	0.13636364	154
Uzbekistan	0.12526998	926
Tajikistan	0.11836735	735
<b>Azerbaijan</b>	<b>0.11</b>	<b>900</b>
Kazakhstan	0.10079768	1379
<b>Total</b>	<b>0.28795883</b>	<b>29341</b>

Source: own calculations based on the BEEPS data.

The probability of exporting of firms from the analysed country groups can be related to the explanatory variables on firm and sector characteristics. These variables are based on the survey questions regarding identification of firm, sector of activity, legal

and economic status, characteristics of managers and size of the firm are assembled, the infrastructure of services in analysed country, economic performance and key characteristics of reviewed firms, as well as stakeholders, e.g. employers organizations, employees organizations, local government, central government, ICT industry, SMEs, academics, etc.

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 (*prod*). Other factors that may affect export activity include the level of innovation proxied by the R&D spending (*R&D*), the stock of human capital proxied by the percentage of employees with university degrees (*univ*). In addition, we control for the foreign ownership (*foreign\_cap*), the use of foreign technology (*foreign\_tech*), the age (*firm\_age*), and the size of the firm (*firm\_size*).

The sample used in our econometric analysis includes cross-section data for firms located in three groups of Central and Eastern European countries: the Visegrad (V-4) group, the Baltic states and the Caucasus countries for which explanatory variables were available in all analysed years. The exact definitions of firm characteristics used in our study are presented in Table 2.

**Table 2. Description of variables used in empirical study**

Variable Name	BEEP input Name	Description
Export	d_d3a	binary variables, that takes the value 1 if the establishment is exporting and 0 if not
prod	prod=log(lprod) prod=d2/l1	logarithm of productivity expressed as total amount of annual sales per full time employee
firm_size	l1	logarithm of no. permanent, full-time employees of this firm at end of last fiscal year
Firm_age		logarithm of number of years since start of operations
Foreign_tech	e6	binary variable, that takes the value 1 if the establishment uses technology licensed from a foreign-owned company and 0 otherwise
Foregin_cap	b2a	binary variable, that takes the value 1 if shares owned by private foreign individuals, companies or organizations and 0 otherwise
R&D	R&D=(ECAo4/d2)*100	logarithm of % of total annual sales spent on research and development
Univ	IECAq69	logarithm of % employees at end of fiscal year with a university degree

Source: BEEPS dataset.

### Empirical methodology

We use the probit model to study the relationship between labor productivity and exporting, having controlled for other firm characteristics. Building on the previous theoretical literature we develop an empirical model to investigate the effects of various firm characteristics on their export performance. Our variable follows:

$$Y^{i*} = X_i \theta + \varepsilon_i \quad (1)$$

Where  $X_i$  is vector of firm characteristics affecting profits,  $\theta$  is the vector of parameters on these characteristics that needs to be estimated, while  $\varepsilon_i$  is an error term which is assumed to be normally distributed with the zero mean.

Instead of observing the volume of exports we observe only a binary variable indicated the sign of  $Y^{i*}$ .

$$Y^i = \begin{cases} 1 & \text{if } Y_i^* > 0 \\ 0 & \text{if } Y_i^* = 0 \end{cases} = X_i\theta + \varepsilon_i \quad (2)$$

The probability that a firm exports as a function of firm, industry and country characteristics can be written as:

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

## RESULTS AND DISCUSSION

In this section we present two sets of the estimation results. First, we discuss the pooled estimation results obtained jointly for all three groups of countries. Then, we discuss the results for the individual country groups.

### Results for all Country Groups

In column (1) of Table 3 we report baseline results that come from the specification that includes the productivity variable, having controlled for standard factors mentioned in other studies. These include the R&D spending (*R&D*), the stock of human capital proxied by the percentage of employees with university degrees (*univ*), the foreign ownership (*foreign\_cap*), the use of foreign technology (*foreign\_tech*), the age (*firm\_age*), and the size of the firm (*firm\_size*).

Our estimation results reveal that the estimated parameter on the measure of productivity displays an expected positive sign and is statistically significant at the 10 per cent level. This means that the higher level of productivity is positively related to the probability of exporting. This result is in line with the main prediction of the Melitz (2003) model concerning the positive nexus between productivity and exporting. The majority of control variables are statistically significant at the 1 per cent level with the exception of the firm age which is not statistically significant. The estimated signs of parameters on our explanatory variables are also in line with the expectations and results of other studies discussed in the literature review section.

In particular, the firm size variable displays a positive sign indicating the importance of economies of scale for exporting. The estimated parameters on the human capital variables also display positive signs. This means the level of R&D and the share of workers with university degrees in total employment are positively related to the probability of exporting. Both variables measuring the foreign ownership and the use of foreign technology display the expected positive signs which means that the probability of exporting increases with the internationalization of the firm.

In column (2) we control for the country specific effects by including the regional dummies for the Baltic states and the Caucasus countries, while the Visegrad group is treated as the reference group. The inclusion of the regional dummy variables does not affect the signs and statistical significance of the other variables in a major way with the exception of the productivity variable which now becomes statistically significant at the 1 per cent level.

**Table 3. Results for all country groups**

VARIABLES	(1)	(2)	(3)	(4)
Prod	0.0133*	0.0334***	0.0337***	0.0308***
	(0.00703)	(0.00801)	(0.00759)	(0.00635)
firm_size	0.284***	0.278***	0.248***	0.243***
	(0.0218)	(0.0219)	(0.0209)	(0.0168)
age	-0.000921	-0.000844	.	.
	(0.00179)	(0.00182)	.	.
foreign_cap	0.00943***	0.00897***	0.00937***	0.00813***
	(0.00117)	(0.00119)	(0.00119)	(0.000919)
foreign_tech	0.668***	0.754***	0.00155	.
	(0.168)	(0.172)	(0.198)	.
R&D	0.125***	0.157***	0.176***	0.135***
	(0.0429)	(0.0439)	(0.0459)	(0.0306)
univ	0.0391***	0.0555***	0.0608***	0.0662***
	(0.0102)	(0.0107)	(0.0106)	(0.0102)
d_baltic	.	0.108	.	.
	.	(0.0849)	.	.
d_caucas	.	-0.733***	-0.808***	-0.703***
	.	(0.0919)	(0.0935)	(0.0701)
Constant	-1.699***	-1.930***	-0.835***	-1.795***
	(0.132)	(0.150)	(0.197)	(0.120)
time effects	No	no	yes	Yes
sectoral effects	No	no	no	Yes
Observations	2,305	2,305	2,314	3,065
Log likelihood	-1185	-1148	-1119	-1551
Pseudo R2	0.172	0.198	0.222	0.202

Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: own estimations based on the BEEPS data.

The estimated coefficient for the Baltic group displays a positive sign but it is not statistically significant which means that the firms from these countries do not differ significantly from the firms from the Visegrad countries, having controlled for their individual characteristics. The estimated coefficient for the Caucasus group displays a negative sign and it is statistically significant already at the 1 per cent level. This means that the firms from these countries differ significantly from the firms from the other two groups of countries. This result is in line with the results of our descriptive analysis from the previous section which reveals that firms from the Caucasus countries are less export oriented.

In column (3) we show estimation results obtained for the specification in which we control for the time specific effects by including the dummy variables for specific years of the sample and exclude the statistically not significant age variable. The inclusion of the time dummy variables does not affect the signs and statistical significance of the other variables in a major way with the exception of the use of foreign technology variable which loses its previous statistical significance.

Finally, in column (4) we report estimation results obtained for the specification in which, in addition to time specific effects, we also control for the sectoral effects by including the dummy variables for specific industries and exclude the statistically not



significant variable measuring the use of the foreign technology. However, the inclusion of sector-specific dummies does not affect the statistical significance of the other explanatory variables.

### Results for Individual Country Groups

The estimation results obtained for the individual groups of countries are reported in Table 4. In column (1) we report estimation results obtained for the Visegrad countries. In column (2) we present estimation results obtained for the Baltic countries and in column (3) we report estimation results obtained for the Caucasus countries.

**Table 4. Results for individual country groups**

Country groups	Visegrad	Baltic	Caucasus
VARIABLES	(1)	(2)	(3)
Prod	0.0415*** (0.0100)	0.0468* (0.0261)	0.0189 (0.0190)
firm_size	0.234*** (0.0258)	0.327*** (0.0516)	0.648*** (0.0909)
age	-0.000602 (0.00228)	-0.00786* (0.00430)	0.00324 (0.00448)
foreign_cap	0.00880*** (0.00153)	0.00858*** (0.00237)	0.00367 (0.00366)
foreign_tech	0.809*** (0.272)	0.677** (0.298)	0.458 (0.348)
R&D	0.167*** (0.0587)	0.136 (0.0858)	0.201* (0.113)
univ	0.0599*** (0.0118)	0.0696** (0.0296)	0.0306 (0.0615)
Constant	-1.941*** (0.182)	-2.029*** (0.362)	-3.597*** (0.563)
<b>Observations</b>	1,496	419	390
<b>Log likelihood</b>	-776.1	-220.0	-135.0
<b>Pseudo R2</b>	0.173	0.219	0.282

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 the Visegrad group. These results are very similar to the results obtained for the whole sample of countries reported in column (1) of Table 3 and also to the results obtained for the old EU members discussed in the literature review (EFIGE, 2010). Furthermore, the level of statistical significance for the productivity variable is statistically significant already at the 1 per cent level. This means the estimated relationship between the level of productivity and the probability of exporting in this groups of countries is more pronounced than in other country groups.

In column (2) we display the estimation results for the Baltic group. These results differ significantly from the results obtained for the Visegrad group. The estimated parameter on the productivity variable displays a positive sign but it is statistically significant only at the 10 per cent level. This means that the link between the level of productivity and the probability of exporting in the case of the Baltic countries is weaker. Moreover, the age variable displays a negative sign and is statistically significant at the

10 per cent level. This surprising finding is in line with the recent study by Putniņš (2013) for Latvian firms who finds that younger firms are more dynamic and export oriented. In addition, the estimated parameters on the R&D variable is not statistically significant while the share of university graduates in total employment and the use of the foreign technology variables are statistically significant only at the 5 per cent levels.

In column (3) we report estimation results for the Caucasus countries. In the case of this country group the link between the level of productivity and the probability of exporting is not significant. Moreover, almost all control variables are not statistically significant. The few exceptions include the firm which is statistically significant at the 1 per cent level and the R&D variable which is statistically significant at the 10 per cent level. These results show that the major variable which affects the export performance is the firm size.

### CONCLUSIONS

In this paper we investigated the determinants of export activity of firms in three groups of countries: the Visegrad countries, the Baltic states and the Caucasus countries. The study covered Armenia, Azerbaijan, the Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, Poland and Slovakia. The study was based on firm level data for the period starting in 2002 and ending in 2009. First we started with estimating probit regressions for the pooled dataset that included all three groups of countries, and then we disaggregated the sample into particular country groups.

Our 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 positively related to the probability of exporting. Finally, the firm size was also a significant variable for the probability of exporting.

The 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. 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 significant. Thus, the firm size was the only explanatory variable which was statistically significant in the case of all groups of countries. This confirms the importance of economies of scale for exporting. In further studies it would be desirable to complement this empirical evidence by including also firms from other successor states of the former Soviet Union. Moreover, it would be also useful to control for country characteristics which would allow to take into account macroeconomic determinants of exporting.

Our empirical results allow us to formulate a number of strategic policy recommendations for the development of the export promotion strategy for the authorities of Central and Eastern European countries. In particular, the export competitiveness of firms from the CEE countries can be improved through the development of modern educational systems allowing to accelerate the accumulation of

human capital. The financial support to research and development and innovation activities should also have a positive impact on the export performance of firms from the CEE countries. Finally, the export performance can be improved by attracting export-oriented FDI which can generate positive spillovers onto domestic firms.

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