

# Corruption and Export Performance in Post-communist Countries: Evidence from Firm-level Data

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## Abstract

In this paper we investigate the empirical relationship between corruption and export performance of firms in 30 post-communist countries. Our analytical framework refers to the recent strand in the new trade theory literature based on the Melitz (2003) model that stresses the importance of firm productivity and trade costs in entering the export markets. The empirical implementation of the theoretical framework is based on the fractional logit model and the IV–V BEEPS dataset covering the period 2008–2014. Our empirical results for over 20 thousand surveyed companies confirm the negative and statistically significant relationship between corruption and export performance in post-communist countries.

**Keywords:** export activity, firm heterogeneity, post-communist countries

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## **1. Introduction**

In the early 1990s several former communist countries started their economic transition from non-market to market economies. The degree and the speed of the transition differed across countries but they all liberalized their international trade and investment policies allowing for the participation of foreign capital in their economies, although the extent of liberalization differed across countries. Some of them radically liberalized their multilateral and regional trade and integrated successfully with the European Union in three subsequent waves of the Eastern enlargement in 2004, 2007 and 2013. Given the positive changes in the international institutional environment and deepening integration with the EU firms from these countries gained the access to foreign markets and became the leaders in export activity among the post-communist countries.

At the same time corruption remains one of the most important problems in the post-communist countries. Corruption in these countries has been recognized as an integral part of the communist system (Aslund 2002; Sandholtz and Taagepera 2005). The simultaneous processes of developing a market economy, designing new political and social institutions, and the redistribution of state-owned assets in the post-communist countries have created fertile ground for corruption to flourish. After the fall of communism non-transparent privatization, stalled liberalization of prices and commerce, and underdeveloped legal and regulatory systems worsened the situation even further and have all come in for their share of sometimes well-deserved criticism. Not surprisingly, corruption in some of the countries that emerged from the former Soviet Union is perceived to be the heaviest in the world, comparable to/on par with corruption in many African countries, imposing a heavy burden on their economies and slowing down their economic development (Cieřlik and Goczek 2015a, 2105b).

The majority of previous empirical studies for evaluating the effects of corruption on international trade were traditionally based on trade flows data aggregated to the country level and a variety of gravity models that were derived either from the neoclassical or new trade theories. Examples of this approach include studies by Dutt and Traca (2008), Thede and Gustafson (2012) and Ghodsi (2013). It has been argued that corruption may have different effects on trade depending on the level of protectionism. On the one hand, if the level of protectionism is low, corruption may result in bribe extortion from exporters and importers by corrupt customs officials which may lead to a lower level of trade (the extortion effect). On the other hand, if the level of tariffs is high the corrupt officials allow exporters and importers to avoid tariff barriers (the evasion effect).

However, most recently the attention in the empirical trade literature has switched from the country-level to the firm-level determinants of export performance. In contrast to the previous literature which assumed that firms wer-

esymmetric in terms of their export performance the most recent strand in the international trade literature stresses the role of firm heterogeneity and its effect on export activity. Several empirical studies based on firm-level data compiled for a number of countries show that only a small fraction of firms are responsible for the majority of exports and most firms do not export at all (EFIGE 2010). In addition, the exporters are found to be bigger and more productive than non-exporters.

At the same time, the majority of empirical studies investigating the relationship between corruption and international trade so far have been conducted for individual developed and developing countries while the empirical evidence for the post-communist countries is rather limited. In particular, firm-level evidence for the post-communist countries is still missing. Therefore, in this paper we study empirically the relationship between corruption and exporting in post-communist countries, having controlled for firm and country characteristics. In particular, in our study we devote specific attention to the role of obstacles to trade, as well as firm level characteristics such as productivity, foreign ownership, age and size. Our study is based on the 4th and 5th edition of the BEEPS firm-level data on 22 297 firms from 30 countries for the post-transition and post financial crisis period starting in 2008 and ending in 2014.

The structure of this paper is as follows. In Section 2 we provide the review of the relevant literature. In Section 3 we describe the analytical framework and the empirical methodology. In Section 4 we discuss the properties of the dataset. In Section 5 we report our empirical results. Section 6 summarizes and concludes.

## 2. Literature review

The empirical literature on the firm-level determinants of export performance was initiated by Bernard and Jensen (1995) for the United States and Clerides *et al.* (1998) for Columbia, Mexico and Morocco. Subsequently, a large number of empirical studies for particular countries followed. The majority of these studies were conducted for developed countries and emerging markets. Examples of such studies include studies by Bernard and Wagner (1997) and Wagner (2002) for Germany, Delgado *et al.* (2002) for Spain, Castellani (2002) for Italy, Girma *et al.* (2003, 2004) for the UK; Baldwin and Gu (2003) for Canada, Hansson and Lundin (2004) for Sweden.<sup>1</sup>

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<sup>1</sup> The summary of empirical evidence on the determinants of export performance is provided by Wagner (2007, 2012). The importance of the firm characteristics for exporting is also emphasized by the EFIGE (2010) report. In this report it has been demonstrated that firm export performance in several EU countries depends on labour productivity as well as other firm characteristics.

The empirical evidence for the post-communist economies of Central and Eastern Europe is, however, much less abundant. In particular, the firm-level evidence on export performance for these countries is still scarce and limited mainly to country studies based on firm surveys. Empirical studies for Poland and other Visegrad countries (i.e. the Czech Republic, Slovakia, Hungary) were initiated by Cieřlik *et al.* (2012, 2013a, 2013b). In their more recent studies, Cieřlik *et al.* (2014a, 2014b) and Cieřlik *et al.* (2015) extended their analysis to include also other post-communist countries in addition to the Visegrad countries. They estimated probit regressions for the pooled dataset that included all countries and then they disaggregated the sample into particular countries to study the differences and similarities between them. Their approach was an equivalent to studying the extensive margin effects. In other words, this meant that a positive effect on export could manifest itself through an increased number of exporting firms or products exported.

Their estimation results generally confirmed the importance of firm characteristics for export performance in the post-communist countries. In addition, they found significant heterogeneity between different countries and country groups. In particular, their estimation results obtained for the pooled sample of the post-communist countries indicated that the probability of exporting increased 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. In addition, the internationalization of the firms, proxied by the use of foreign technology licenses and foreign ownership, was also found to be positively related to the probability of exporting. Moreover, they found that firm size was a significant variable for the probability of exporting. Hence, their empirical results for the post-communist countries were quite similar to the results obtained for the firms from the large EU countries that were published in the EFIGE (2010) report.

In addition, their estimation results obtained for particular groups of the post-communist countries indicated that the probability of exporting was positively related to firm productivity only in three groups of countries: the Baltic states, the Visegrad countries, and the Caucasus countries, while in the Eastern European and Central Asian countries no statistically significant relationship between the level of productivity and the probability of exporting was reported. In all country groups the probability of exporting was positively related to the firm size, foreign ownership and the share of university graduates in total employment.

However, in none of the aforementioned studies corruption and other variables measuring potential obstacles to trade were taken into account. Therefore, in this study we focus on the empirical relationship between corruption and exporting in post-communist countries, having controlled for a number of firm and country characteristics. In particular, in our study we devote specific attention to the

role of obstacles to trade that were not taken into account in the previous studies. These obstacles include unofficial payments/gifts to deal with customs/imports and how much of an obstacle to trade are customs and trade regulations. In addition we control for the standard set of firm level characteristics such as productivity, foreignownership, age and size. Therefore, the current study can be viewed as an extension of the previous studies.

Moreover, in contrast to the earlier studies we use a different estimation technique, i.e. instead of using a simple probit model, that disregards the information about the level of export engagement of firms, we use the fractional logit model. The latter estimation technique seems to be better suited to study the relationship between corruption and export performance than the former. In addition, the use of an alternative estimation technique allows us to investigate the robustness of previous empirical results on the relationship between individual firm characteristics and export performance. Finally, in contrast to earlier studies, we also use the most recent available data that includes years 2013–2014.

### **3. Analytical framework and empirical methodology**

Following the early developments in the empirical trade literature based on firm-level data a new strand in the theoretical trade literature has emerged. This strand was initiated by the theoretical model developed by Melitz (2003) who relaxed the key assumption of the firm symmetry in the Krugman's (1980) monopolistic competition model and introduced firm heterogeneity in terms of labour productivity. In this model the relationship between the level of labour productivity and exporting was placed in the centre of analysis. Melitz (2003) 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 the lowest marginal costs can cover the fixed cost of entry and become exporters. We extend the previous analysis by introducing the additional costs associated with corruption that may affect the firm export performance.

To investigate empirically the theoretical relationship between corruption and exporting activity, having controlled for labour productivity and other variables postulated by the Melitz (2003) model, we employ the fractional logit regression. We develop the following empirical model to investigate the impact of corruption and individual firm characteristics on firm export performance. Let  $Y_i$  be our dependent variable indicating the export status of firm  $i$ , i.e. the percentage of the export sales in firm total sales. According to this model the export status of the  $i$ -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  $\varepsilon_i$  is independent of  $X_i$  which is a vector containing explanatory variables that affect export with the first term equal to unity for all  $i$ ,  $\theta$  is the vector of parameters on these variables that need to be estimated and  $\varepsilon_i$  is assumed to be normally distributed with a zero mean.

Since we aim at investigating a ratio variable, it is natural to find that many firms report a zero value for their export ratio. A linear regression model would ignore the zero lower bound and thereby would not take account of firm's decision not to engage in export activity. This problem has been resolved in the empirical literature in two possible ways. One is to treat the export ratio as a discrete binary choice variable estimated with probit or logit models. This approach, however, disregards the information about the level of export engagement of firms and therefore by definition is ineffective. Therefore, almost all of the microeconomic research on ratios has employed a second approach based on the Tobit model, which combines the Probit likelihood that a zero value will be observed with a linear regression likelihood to explain the continuous non-zero values. The second approach undoubtedly improves upon a standard linear regression as a result of taking account of the data mass at zero and does not disregard the information about the level of the ratio contained in the data.

In contrast to the aforementioned two dominant approaches we choose following Goczek (2013) the Fractional Logit model proposed by Papke and Wooldridge (1996). As argued by the authors, the Tobit model provides a non-random censoring that is not valid in cases in which values outside of the censoring points are infeasible. This is the case of the export ratio bounded by 0 from below and 100% from the above and exercising this infeasibility. The authors argue that a generalized linear model with a binomial distribution and a logit link function, which they name the 'fractional logit' model, is the most fitting. The equation for estimating the model of interest therefore becomes:

$$E(y|x) = G(x\beta) = \frac{\exp(x\beta)}{1 + \exp(x\beta)} \quad (2),$$

In this model, one can estimate the vector of parameters  $\beta$  using the following Bernoulli log-likelihood function:

$$l(\beta) = y \log[G(x\beta)] + (1 - y) \log[1 - G(x\beta)] \quad (3),$$

Assuming a logit function for  $G(z)$  gives the following variance:

$$\text{Var}(y|x) = \sigma^2 \cdot G(x\beta)[1 - G(x\beta)] \quad (4),$$

The fractional logit model is then computed using quasi log-likelihood methods.

#### 4. Data description

The data used to estimate the empirical model is derived from an empirical study, the Business Environment and Enterprise Performance Survey (BEEPS) of 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. The surveys provide data on the business operating environment of firms in Central and Eastern Europe, such as their relationship with the state, methods of financing, difficulties in recruiting staff, infrastructure shortages, informal payments and corruption.

The survey was conducted in 30 post-communist countries of Central and Eastern Europe. The fourth and fifth round of the BEEPS were conducted in 2008–2014 and covered 22 297 enterprises in 30 countries of Eastern Europe and Central Asia: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, FYR Macedonia, Georgia, Hungary, Kazakhstan, Kosovo, Kyrgyz Republic, Latvia, Lithuania, Moldova, Mongolia, Montenegro, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia, Tajikistan, Turkey, Ukraine, and Uzbekistan. These countries belong to five different groups: the Visegrad (V-4), the Baltics, the Caucasus, Eastern European and Central Asian countries. The surveyed companies are either in private or state hands and are foreign, have different sizes, reach different levels of income and have different types of core business – and are representative for their country and sector of operation. Unfortunately, these data are not strictly panel, because a large fraction of firms in the region ceased to exist and the survey suffered from a high degree of sample attrition between editions. This in turn required the selection of new companies to the BEEPS survey in its subsequent editions. This makes a traditional panel investigation infeasible. The percentage of non-replies differed depending on the question.

Enterprises were rather willing to respond to the question concerning corruption as an obstacle to the firm operation, but much less willing to respond to the question concerning the actual bribe payments they were making. Although the credibility of the data collected by the World Bank and the EBRD is high, we cannot exclude the possibility that the answers to the question what percentage of firm income goes to the bribe payments can be underestimated due to some concerns of respondents – the number of firm answers to this second question dropped by half.

Definitions of variables used in our empirical study and their descriptive statistics are reported in Table 1.

**Table 1. Definitions of variables and summary statistics**

	Variable	Obs	Mean	Std. Dev.	Min	Max
Exports% of total sales	exp	22297	0.103237	0.251029	0	1
Firm size measured by the no. full-time employees	ll	22297	91.64726	454.9879	0	37772
Firm age	age	22297	43.58295	239.0877	0	2023
Firm productivity	Eff	22296	3.69E+07	3.23E+09	0	4.55E+11
Foreign ownership	b2b	22297	5.840113	21.84916	0	100
Percent of sales paid in informal payments	j7a	11942	1.249707	4.606693	0	100
how much of an obstacle is: transportation?	d30a	22297	0.82307	1.781742	0	4
how much of an obstacle is: customs and trade regulations?	d30b	22297	0.205588	2.86507	0	4
technology licensed from a foreign-owned company?	e6	15480	1.69509	1.24157	0	2
unofficial payments/gifts to deal with customs/imports	ecaq41a	22297	0.189084	3.648318	0	6

Source: BEEPS dataset.

The export performance is explained using variables relating to obstacles to exporting. In this sense we aim to assess the impact of the percent of sales paid in informal payments (% bribe tax) and unofficial payments/gifts to deal with customs/imports, while controlling for other costs of exporting – mainly transportation obstacles and how much of an obstacle are customs and trade regulations? These variables are measured on the Likert scale. Furthermore, when studying the relationship between corruption and export performance we need to control for the role of individual firm characteristics in determining the export performance stressed in the recent strand in the new trade theory. In particular, the theoretical model developed by Melitz (2003) emphasizes the positive relationship between firm-level productivity and exporting. 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 firm export performance include the foreign ownership (*foreign\_owned*), technology licensed from a foreign firm (*foreign\_tech*), as well as the age of the firm (*firm\_age*) and the size of the firm (*firm\_size*) measured by the number of full time employees. In addition, we control for individual country, sector and time effects for particular years of our sample.



### 5. Estimation results

In this section we discuss our estimation results reported in Table 2. Since our sample concerns a relatively large number of firms we decrease the relevant significance levels to \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$  to provide more robust results. Columns (1)–(4) report various specification sensitivity tests, differing in combinations of dummies controlling for time, country and sector effects. In column (1) we show the results for the specification including sectoral, country, and time effects, in column (2) we present estimation results obtained having not controlled also for individual effects for particular years of our sample. In column (3) we report estimation results obtained for just the sectoral effects. In column (4) we report estimation results obtained for the country effects only.

Although our choice of model baseline specification is based on information criteria (both BIC and AIC resolve the problem of overfitting by introducing a penalty term for the number of parameters in the model) we report our results to be insensitive to these effects. The AIC minimization occurs in the model presented in column (1) with all of the effects included, the BIC minimization occurs in the model presented in column (2) without the time effects. This is an expected difference since BIC overpenalizes and AIC underpenalizes larger models. It seems that in general these results are very similar. We chose to minimize the AIC, therefore the finally obtained baseline specification includes our measure of corruption having controlled for individual firm characteristics as well as country and sector effects and controlling for individual effects for particular years of our sample (reported in column (1)).

In all the cases the estimation results came from the same specification that includes the productivity variable (*prod*), having controlled for additional firm-level determinants of export activity such as the foreign ownership (*foreign\_owned*), the age of the firm (*firm\_age*) and the size of the firm (*firm\_size*).

**Table 2. Estimation results**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm size	0.0002*** (4.09)	0.0002*** (4.06)	0.0003*** (4.57)	0.0002*** (3.46)	0.0003*** (4.25)	0.0003*** (4.22)	0.0003*** (4.94)	0.0002*** (3.57)
Firm age	0.00002 (0.15)	0.00002 (0.19)	0.00004 (0.35)	0.0001 (1.17)	0.00004 (0.34)	0.00004 (0.37)	0.00006 (0.54)	0.0001 (1.21)
Firm productivity	4.54e-12 (1.32)	4.11e-12 (1.20)	5.00e-12 (1.53)	2.17e-12 (0.62)	5.16e-12 (1.49)	4.72e-12 (1.37)	5.63e-12 (1.72)	2.84e-12 (0.82)
Foreign ownership	0.0125*** (11.98)	0.0124*** (11.94)	0.0132*** (13.71)	0.0130*** (12.77)	0.0130*** (12.42)	0.0129*** (12.37)	0.0139*** (14.38)	0.0138*** (13.78)
% sales paid in informal payments	-0.00280 (-0.40)	-0.00561 (-0.80)	-0.00535 (-0.79)	-0.0238** (-2.84)	-0.00006 (-0.01)	-0.00276 (-0.40)	-0.00138 (-0.21)	-0.0216** (-2.64)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
How much of an obstacle is: transport?	-0.0347 (-1.79)	-0.0357 (-1.85)	-0.0481** (-2.58)	-0.0590*** (-3.33)	0.0239 (1.31)	0.0222 (1.23)	0.0179 (1.03)	-0.00136 (-0.08)
How much of an obstacle is: customs and trade regulations?	0.147*** (8.18)	0.145*** (8.17)	0.173*** (9.84)	0.153*** (9.63)				
Technology licensed from a foreign-owned company?	-0.102*** (-5.17)	-0.101*** (-5.14)	-0.103*** (-5.63)	-0.120*** (-6.42)	-0.0957*** (-4.89)	-0.0950*** (-4.86)	-0.0960*** (-5.32)	-0.117*** (-6.36)
Unofficial payments/gifts to deal with customs/imports	0.0193* (2.06)	0.0173 (1.85)	0.0193* (2.16)	0.0194* (2.17)	0.0269** (2.85)	0.0250** (2.66)	0.0292** (3.23)	0.0306*** (3.45)
Sectoral effects	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Country effects	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Time effects	Yes	No	No	No	Yes	No	No	No
Observations	11021	11021	11021	11021	11021	11021	11021	11021
AIC	5019.8	5025.5	5476.2	5525.3	5064.3	5069.7	5542.3	5594.6
BIC	5575.2	5573.6	5753.9	5861.4	5612.3	5610.4	5812.7	5923.4

standard errors in parentheses

\* p<.05, \*\* p<.01, \*\*\* p<.001

Source: own estimations based on the BEEPS data.

Turning to the parameter significance discussion, the estimation results reveal that the estimated parameter on the general measure of corruption (*per cent of sales paid in informal payments*) displays an expected negative sign but is not robustly significant in all specifications. This measure is significant on 1% level only when the country dummies are not included (column (4) and (8)). The significance of this interplay shows that what matters for export activity is the difference in bribe payments on country level, not sectoral or firm level.

Having controlled for the general level of bribe payments, we investigate the results concerning the measure of unofficial payments to deal with customs. In our preferred specification it is negative and significant. In columns (4)–(8) the variable: “How much of an obstacle is: customs and trade regulations?” is removed to obtain more interesting results. It seems that that firms not wanting to discuss the bribe tax with the surveyors had a general notion to regard the customs and trade regulations as obstacles, since removal of this variables renders the bribe payments in customs very significant on 1% level. This suggests that firms portray corruption as a side-effect of customs and trade regulation. Moreover, customs and trade regulations as a measure of an obstacle to trade are statistically significant already at

the 1% level and display an unexpected positive sign. This can be explained by additional regressions of customs and trade regulation variable without corruption. In these specifications customs and trade regulation displays an expected negative sign. This reconfirms the notion that firms in post-communist countries associate trade regulation with corruption.

As for the control variables, transportation as the measure of obstacles to trade is not robust and not significant in the baseline specification and across the board in all specifications. Furthermore, the majority of individual firm characteristics are statistically significant. In particular, the estimated parameters on the firm size, foreign ownership and the use of foreign technology are statistically significant already at the 1% level while our measures of firm productivity and firm age are not statistically significant at any of the usually accepted levels of statistical significance. The fact that firms with foreign ownership export more, but with foreign technology export less is quite puzzling. While the first notion is in line with the theory, the latter can be explained by the fact that in corrupt environments foreign nationals fear appropriation of their advanced technology by their competitors (Wei and Smarzyńska (2000) present empirical evidence on this effect).

As for robustness, the estimated parameters on the firm size, foreign ownership and the use of foreign technology remain statistically significant at the 1% level in all specifications reported in Table 2. At the same time our measures of firm productivity and firm age remain statistically not significant.

## 6. Conclusions

In this paper we investigated the empirical relationship between corruption and export activity of firms from the post-communist countries. The study was based on firm level data for the period starting in 2008 and ending in 2014. Our empirical results for over 20 thousand surveyed companies generally confirmed the negative and statistically significant relationship between corruption and export performance in the post-communist countries. In particular, the estimated parameter on the measure of unofficial payments to deal with customs was statistically significant in almost all estimated specifications. Although, the estimated coefficient on the transportation variable as the measure of obstacles to trade was not statistically significant in the majority of estimated specifications, the majority of individual firm characteristics were statistically significant and displayed expected signs. In particular, the estimated parameters on the firm size, foreign ownership and the use of foreign technology were highly statistically significant which is in line with the results of the previous studies based on the probit model. However, in contrast to those studies the estimated parameter on the firm productivity variable was not statistically significant in any of the estimated specifications.

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