Self-Selection and Learning-by-Exporting Hypotheses: Micro Level Evidence

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Abstract

This aim of this empirical paper is to investigate the self-selection and learning-by-exporting hypotheses. This study addresses the reverse causality between innovation, productivity and exporting using micro level data on 29 countries from Eurasia and Central and Eastern Europe (CEE). CDM estimation results suggest that innovation and productivity positively influence the firm's exporting and vice versa. This study has supported the self-selection and learning-by-exporting hypotheses. Previous studies provided mixed outcome on the analysis of these two major hypotheses. Similarly, innovation by exporting is examined using multiple proxies of innovation such as product/process innovation, R&D and organizational innovation. Findings imply that innovation is an important determinant of firms' exporting and this outcome is robust across Eurasian and CEE firms. Moreover, foreign owned firms are more likely to export and innovate than domestic firms due to their technological superiority over domestic firms. Concerning policy implications, economic policies should address the firm's innovation, productivity and exporting performance. This would result in better economic integration between Eurasian and CEE firms. By removing the firm's barriers such as access to finance, trade regulations and taxation etc would encourage trade networks between Eurasian and CEE firms.

Keywords: Innovation, productivity and Exporting.

1. Introduction

International trade theories emphasized the role of innovation and productivity growth for accelerating export performance, while international trade unions such as European Union (EU), Organization for Economic Cooperation and Development (OECD) and Eurasian economies are striving to compete in terms of technological innovation in order to increase their trade volume. Concerning the global trade linkages, European Neighbourhood Policy (ENP) is an example of establishing the European economies trade networks with neighbouring countries such as Azerbaijan, Belarus, Georgia, Israel, Turkey and Russia. ENP covers diverse and multilateral economic ties with each neighbouring country in terms investment, competition, labour and technological standards (Liargovas, 2013). Contrary to international trade, it is worth to mention that whether developed or developing countries

they must maintain a minimum threshold of GDP per capita to sustain their economic development. To be economically developed, countries continuously need to make investment in innovation activities because the more they innovate, the larger are their exports share which result in gain in foreign income. Regarding innovation, numerous endogenous growth models (e.g., see Lachnmaier and Wobmann, 2006; Jose and Alvaro, 2014; Monreal-Perez et al. 2011) endogenize the innovation factor and predict the productivity-export relationship. The innovation factor stems from the fierce competition in the international markets which forces exporting firms, first, to improve their productivity i.e., to cover the sunk costs of international markets, and second, to remain competitive, they need to develop high quality products/services. Thus, maintaining high quality products result in increasing the likelihood of innovation.

Without a second thought, exporters are better performers than non exporters because exporting is associated with high productivity and competitiveness (Imbriani et al. 2014). Consequently, exporters tend to pay higher wages, hired more skilled employees and are more capital and technological intensive than non exporters (Trofimenko, 2008). In particular, the empirical literature on international trade has extensively discussed the self-selection (SS) and learning-by-exporting (LBE) hypotheses. Several quantitative studies (e.g., Harris and Li, 2008; Manez-Castillejo et al. 2009; Haidar, 2012) identified the endogenous link between productivity and exporting, while another group of researchers (e.g., Sharma and Mishra, 2012) investigated the relation between innovation and exporting. These past studies asserted that innovation and productivity significantly boost the export performance and vice versa.

Earlier studies (Claudio, Jose and Alvaro, 2014; Cassiman and Golovoko, 2007) have provided little evidence in terms of empirical analysis of the SS (pre-entry performance) and LBE (post-entry performance) hypotheses. This study has revisited the reverse causality between innovation, productivity and exporting by introducing two research questions. Does reverse causality exist between innovation, productivity and exporting? How multiple proxies of innovation affect exporting using micro level data? Previous studies were focused on the single country analysis and were limited in terms of generalizing their results. In this paper, these two (SS and LBE) hypotheses are estimated on 29 countries mainly from Eurasian and Central and Eastern European (CEE) countries. To estimate the affect of innovation on exporting, this empirical paper divided data into two economic blocs (Eurasia and CEE) and

used multiple proxies of innovation such as product and process innovation, R&D and organizational innovation. This strategy has examined the separate effect of each innovation proxy on exporting which is neglected by the previous studies.

To estimate the reverse causality between innovation, productivity and exporting, this study has used the modified CDM (Crepon, Duguet and Mairesse, 1998) model. CDM model addresses the selectivity, simultaneity and endogeneity biases. Using micro level data on 29 countries, SS and LBE hypotheses suggested that reverse causality exists between innovation, productivity and exporting. Similarly, innovation by exporting hypothesis is estimated using 2SLS of instrumental variables approach. Results show that firms that are engaged in product/process innovation, R&D and/or organizational innovation are more likely to involve in exporting. This finding is robust across all Eurasian and CEE firms. Similarly, foreign owned firms are more likely to engage in innovation activities as well as exporting due to their technological superiorty over domestic firms.

The remainder of the paper is organized as follows: section 2 reviews the empirical literature and section 3 provides information on the data source and empirical analysis of hypotheses. Sections 4 conclude and present policy implications.

2. Related Literature

Innovation is an important factor in explaining the productivity-export relationship. A firms' innovation capabilities provide sustain competitive advantage because innovation is an important asset which is difficult to imitate, substitute and valuable (Guan and Ma, 2003). In particular, international markets select the most productive and innovative firms. Several studies (e.g., Masso and Vahter, 2011; Lopez, 2009; Claudio, Jose and Alvaro, 2014; Harris and Li, 2008; Manez-Castillejo et al. 2009) have estimated the link between innovation, productivity and exporting. They categorized their relationship into two major hypotheses. First, the self-selection hypothesis (SS) i.e., highly productive or most innovative firms self select the export markets, while learning-by-exporting (LBE) hypothesis suggest that exporting positively influence the innovation and productivity performance. In other words, there is a reverse causality between innovation, productivity and exporting. Nevertheless, past studies provided little empirical evidence regarding the estimation of reverse causality between these variables. To shed light on the SS and LBE hypotheses, this study present

review of the past empirical studies in terms of innovation, productivity and exporting relationship and then presented the empirical analysis.

2.1. Self-Selection (SS) Hypothesis

Selling goods abroad by the firms carry extra costs (sunk costs) e.g., collection of information related to the demands of international customers, transportation costs, distribution or marketing costs and the costs of managing foreign networks (Haidar, 2012; Harris and Li, 2008). To cover sunk costs, exporting firms' require prior high productivity. Without prior high productivity, firms cannot afford to export their products and services. Harris and Li (2008) investigated the productivity-export relationship.[1] They argued that exporters are highly productive than non-exporters and before exporting, firms should improve production efficiency, increase technological quality of their products and services which result in higher productivity (Guan and Ma, 2003). Masso and Vahter (2011) study on Estonian firms analyzed that innovation and productivity have endogenous link. A similar study is provided by Baumann and Kritikos (2016) on German SMEs which suggested that innovation (product and process innovation) and productivity (total factor productivity) are important determinants of SMEs performance. However, both studies have failed to establish the causal link between innovation, productivity and exporting. While other studies e.g., Antonielly and Cainelli (2010) panel study on Italian manufacturing firms, Banri and Ayumu (2013) study on Japanese firms and Movahedi and Gaussens (2011) investigated French SMEs, their empirical findings have supported the SS hypothesis. They argued that innovation and productivity are the important determinants of export performance. Consequently, this indicates that firms require high productivity and investment in innovation activities before exporting. Claudio, Jose and Alvaro (2014) investigated the Chilean manufacturing firms. They found that innovative firms (R&D firms) are more likely to export than non innovative firms. Similarly, Cassiman and Golovoko (2007) examined the innovation, productivity and export relationship for Spanish manufacturing firms. They stated that innovation and productivity drives firms' to export because innovative and productive firms can easily afford the entry costs of international markets which is not possible for less innovative and productive firms (Lopez, 2009; Cassimann et al. 2010).

[1] All factors (inputs) of production process except labour. To measure total factor productivity (TFP), this study has used output as sales turnover, intermediate inputs (cost of sales less remuneration) and capital stock (tangible assets).

Concerning the empirical strategies to estimate the SS hypothesis, numerous researchers (Caldera, 2010; Monreal-Perez et al. 2011; Halpern and Murakozy, 2012; Faustino and Matos, 2015) have examined the link between innovation, productivity and exporting. Caldera (2010) and Monreal-Perez et al. (20111) have used the two stage least square (2SLS) method to resolve the endogeneity between innovation (product/process) and exporting. However, their study failed to address the reverse causality between innovation and exporting. In addition, Halpern and Murakozy (2012) analyzed the innovation, productivity-export relationship for Hungarian firms. In order to correct the selectivity and simultaneity bias between innovation and productivity, they used Crepon-Duguet-Mairesse (CDM) model.[2] They asserted that innovation positively influences the firm's productivity and exporting. However, their findings have neglected to identify the reverse causality between innovation and exporting. On the other hand, the causal link between innovation (product/process) and exporting is identified by Lachenmair and Wobmann (2006) using micro level data on German manufacturing firms. Further, Manez-Castillejo et al. (2009) investigated the simultaneous relationship between innovation, productivity and exporting using panel data (1990-2000) on Spanish firms. Their empirical analysis *i.e.,* dynamic trivariate probit model results showed that highly productive firms self select the international markets for exporting. Therefore, higher the labour productivity, the more probability to introduce process innovation and the greater is the firm's probability to export. However, no statistical evidence is found while using the product innovation in explaining the innovation, productivity-export relationship. The next subsection provides the reverse causality of SS hypothesis i.e., LBE.

2.2. Learning-by-Exporting (LBE) Hypothesis

LBE means just as learning-by-doing, in other words, it refers to the firm post entry performance. Specifically, when firms enter to into the international markets they acquire superior knowledge through innovative demands of foreign customers, adopt new production techniques with higher capacity utilization which increases the firm's productivity and innovation performance (Lu and Beamish, 2006; Castellani, 2002; De Loecker, 2013). On the other hand, the "born global" theory of firms' internationalization suggest that firms should start exporting in early stage without going through different stages of

[2] CDM model which is based on a set of four procedures i.e., firms decision to invest in R&D, decision regarding R&D level, R&D transformation into product and process innovation and innovation output transformation into productivity.

internationalization (e.g., when firms' initially start exporting via agents) (see Bell *et al.* 2003; Johanson and Vahlne, 1977). Born global firms experience high productivity and innovation performance in the international markets. Evidence on LBE hypothesis is provided by Martins and Yang (2009). They conducted a meta-analysis of the LBE hypothesis on more than 30 papers and identified that exporting significantly improve the productivity of firms' in developing countries due to their greater distance to the technological frontier.

In addition, Trofimenko (2008) investigated the learning-by-exporting hypothesis for 1057 Columbian manufacturing firms using quantile regression analysis. Trofimenko study revealed that exporting to advance countries provide efficiency gains which is generated through the information on production methods, product quality and design which result in decreasing product costs and consequently improve the firms' productivity. Sharma and Mishra (2012) conducted a panel (unbalance) study on Indian automobile manufacturing firms. They analyzed the causal link between exporting and productivity by estimating the two main hypotheses. First, the SS hypothesis *i.e.,* firms that require higher productivity before exporting. Second, the LBE hypothesis *i.e.,* firms become more productive when they enter export markets. However, their empirical findings supported only LBE hypothesis which suggest that exporting positively influence the productivity. A similar study is presented by Damijan, Kostevc and Polanec (2010). They studied the causal link between innovation (product and process) and exporting using a panel data on Slovenian firms. However, their empirical results only found that exporting increases the probability of firm's undertaking process innovation than introducing product innovations. Their results demonstrated that LBE effect take place through the mechanism of process innovation which improves the firm's technical efficiency and thus result in high productivity.

In addition, De Loecker (2013) conducted a study on Estonian firms. De Loecker (2013) found that Slovenian firms substantially gains productivity from entering into the export markets. Harris and Moffat (2011) examined the link between R&D, innovation (product/process) and exporting using probit regression analysis for UK firms. Their empirical study found that R&D, innovation and exporting has causal link and these three endogenous variables are economically interdependent. Similarly, Greenaway and Yu (2004) investigated the reverse causality between productivity and exporting for UK chemical industry. Their study empirical outcome has supported the both SS and LBE hypotheses.

However, Greenway and Yu (2004) study provided no empirical evidence related to innovation. Very recently, Haidar (2012) conducted a study on Indian manufacturing using unbalance panel data. Haidar found that productivity influence exporting but exporting does not influence productivity. In other words, his study failed to provide evidence for learning-by-exporting hypothesis.

To conclude, aforementioned studies provided mixed outcome regarding the reverse causality between innovation, productivity and exporting. Similarly, the direction of causality is not very clear and robust across several countries using micro level data. This study would revisit the SS and LBE hypotheses by using a rich micro level data on 29 countries. This research study has formed the basic research question. Does reverse causality exist between innovation, productivity and exporting? This paper also adds to the empirical literature by introducing an additional hypothesis i.e., innovation by exporting using the multiple proxies of innovation.

3.1. Data Source

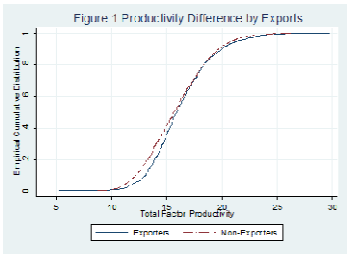
This empirical study has obtained cross sectional micro level data though the World Bank's enterprise survey. The survey has been jointly conducted in CEE and Eurasian economies by the World Bank in cooperation with European Bank for Reconstruction and Development (EBRD). Countries were surveyed in 2012 under the title of Business Environment and Enterprise Performance Surveys (BEEPS), and the survey questions refer to fiscal year 2011. The survey includes 15,883 observations from 29 countries in the Eurasian and CEE regions (see Appendix 2). Over 90% questions are specifically designed to ask objectively about the country business environment characteristics (e.g., infrastructure). The remaining questions were design to measure the firms' growth and obstacles to their business. Regarding sampling procedure, a stratified random sample of firms were selected which were representative of a country's manufacturing and service sectors. Enterprise surveys usually are conducted in cooperation with business organizations and government institutions. The data is collected from business owners and top managers from formal (registered) firms with 5 or more employees are targeted for interview.

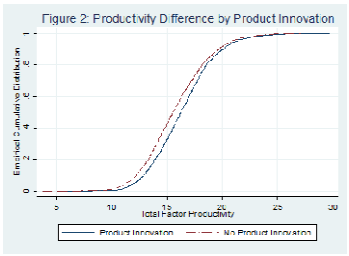
The method of data collection is face-to-face interviews. The strength of the dataset is, it provides micro level data on 29 countries using innovation, productivity and exporting variables. The survey collected comprehensive information related to key variables such as

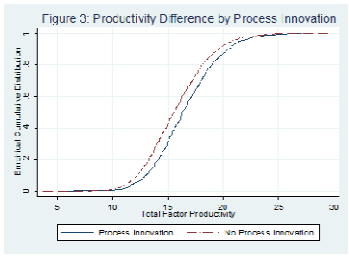
firms' size, age, sales, exports, obstacles to the business and on innovation variables *i.e.,* product and process innovation, R&D, marketing and organizational innovation. The innovation variables were coded dummy 1 if firms' were engaged in whether product/process, R&D, marketing and organizational innovation, otherwise 0. Moreover, information on costs of input variables such as fuel and electricity, raw material and intermediate goods and labour costs allows this study to measure TFP (see Appendix A1). The average numbers of employees are approximately 65 and the average age of the firms are 16 year.

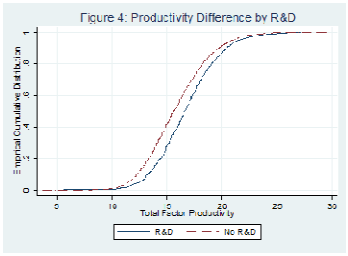
3.2. Innovation, Productivity and Export Distribution – A Graphical Assessment

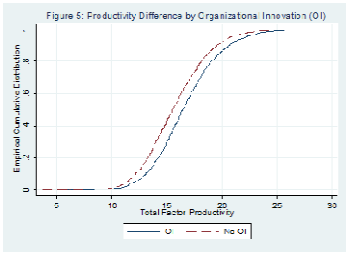
Prior to estimation, Figures 1 shows the graphical assessment of productivity difference between exporters and non exporters. Productivity distributions for exporters and non exporters are coincided. In addition, Figure 2-6 compares the productivity of innovators and non innovators. The visual comparison indicates that productivity is higher for firms' that are engaged in product/process, R&D, organizational and marketing innovation. This indicates that productivity for innovators have stochastic dominance over non-innovators. Moreover, Figure 7-11 presents the visual comparison of exports distribution of innovators and non innovators. Overall, Figure 7-11 implies that innovators are more likely to export than non innovators. In other words, innovation (i.e., product/process, R&D, organizational and marketing innovation) plays a vital role in the productivity and export performance. Figure 12 shows the productivity difference between foreign and domestic owned firms. The productivity distribution is higher for foreign owned firms because they are superior in skills and technology than domestic firms. To sum up, innovators firms' have stochastic dominance in terms of productivity and export performance over non-innovators.

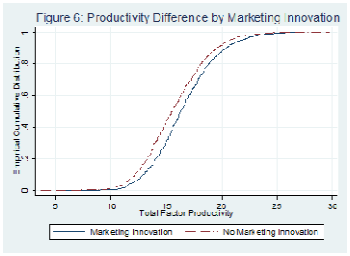


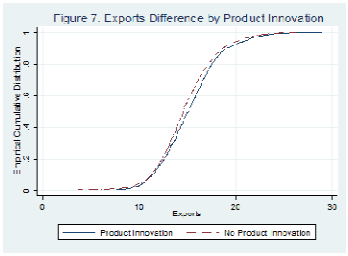


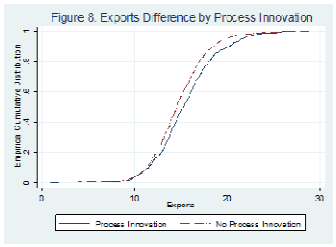


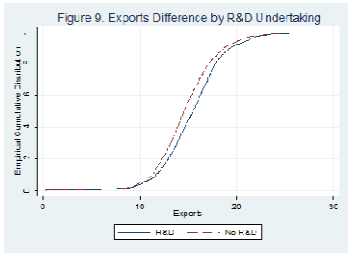


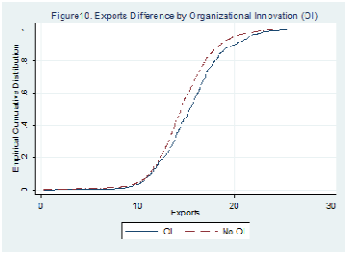


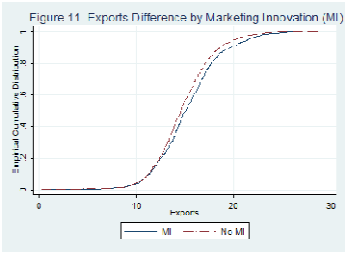


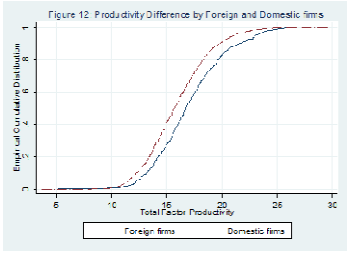












Further, Table 1 shows the total factor productivity (TFP) distribution of a various sample groups. The TFP distribution of these sample groups are sub-divided into exporting and non-exporting, product and non-product innovators, process and non-process innovators and so forth. Two-sided Kolmogorov-Smirnov test is used to reject the null hypothesis of identical distribution, alternatively it means that the TFP distribution of these sample groups have inequality. To simplify the interpretation, rejecting the null hypothesis implies that TFP is higher for exporters and innovators compared to non-exporters and non-innovators. From the Table 1, it is clear that TFP is higher for exporters and innovators (product/process, RD, OI, MI) which has rejected the null hypothesis, at 1% significance level. To conclude, productivity of exporters and innovators has stochastic dominance over non exporters and non innovators.

Table1: Two-Sample Kolmogorov-Smirnov Tests on the Distribution of TFP by Sub-Groups

Sub-Group	*Difference Favourable To:*	
	TFP (Yes=1)	*TFP (No=0)*
Exporting firms	0.0846***	-0.0021
Product Innovation	0.1026***	-0.0011
Process Innovation	0.1219***	-0.0009
R&D Firms	0.1527***	-0.0017
Organizational Innovation	0.1398***	-0.0001
Marketing Innovation	0.1318***	-0.0001

**** Denotes null hypothesis rejected at 1% significance level*

3.3. Empirical Strategy

In order to analyze the SS and LBE hypotheses, this study has followed the empirical strategies of Crepon, Duguet and Mairesse (1998); Viroj and Tavassoli (2014) and Baumann and Kritikos (2016). Crepon, Duguet and Mairesse (1998) have initially developed a model which is referred as CDM in the empirical literature. This model has corrected the selectivity and simultaneity bias between R&D, innovation and productivity (see Crepon, Duguet and Mairesse, 1998). They used four equations to estimate the R&D, innovation, productivity relationship and the model was applied on French manufacturing firms using cross sectional data. Later on, Viroj and Tavassoli (2014) modified the CDM model by including an additional variable i.e., exporting and investigated the SS and LBE hypotheses on Swedish firms. This study has followed the empirical strategy of Viroj and Tavassoli (2014) by using micro level data on 29 countries. This empirical strategy corrects the selectivity, simultaneity and endogeneity issues and estimates the SS and LBE hypotheses. Four equations have been formulated as follows;

$$I_{input} = \alpha_1 + \alpha_1 X_1 + e_1 \quad (1)$$

$$I_{output} = \beta_2 + \beta_2 I_{input} + \beta_{IMR} IMR + \beta_2 X_2 + e_2 \quad (2)$$

$$TFP = \gamma_3 + \gamma_3 I_{output} + \gamma_3 exp_3 + \gamma_3 X_3 + e_3 \quad (3)$$

$$exp = \delta_4 + \delta_4 TFP + \delta_4 X_4 + e_4 \quad (4)$$

Equation-1 investigates the firm decision to invest in innovation input (I_{input}). This discrete variable shows the combine effect of innovation inputs if firm's engage either in R&D, marketing and organizational innovation, while X are explanatory variables firm size, age (are logged), obstacles to innovation[3] and foreign owned firms (dummy coded 1 if firm's is foreign owned, otherwise 0). Equation-2 considers the dependent variable as product innovation sales per employee (I_{output}). In addition, the predicted value of innovation input has been used as regressor and lagged one period for several reasons. First, to connect equation-1 with equation-2 as part of the system of equations and second, predicted value of innovation input is used as an instrumental variable to eliminate the potential endogeneity and reverse causality with innovation output variable (see *e.g.,* Viroj and Tavassoli, 2014). To correct the selection bias, inverse Mills ratio (IMR) is used (see Heckman, 1979). The problem of selection bias arises when innovative or exporting firms are not selected randomly from a population or selected according to specific criteria i.e., usually occurs in surveys because of self-selection rules: some respondents refuse to answer specific questions. Equation-3 shows the determinants of total factor productivity (TFP). The predicted value of innovation output (lagged one period) is used from the previous equation as an independent variable. Further, export sale per employee (*exp*) is included to estimate the learning-by-exporting hypothesis. For estimating the self-selection hypothesis, equation-4 has been developed. In addition, firm earlier export experience (lagged one period) has been added as an explanatory variable (X_4), because this strategy would represent the firms' past export experience on the firm's decision to export next year. Overall, this empirical model is estimated in two stages. In the first stage: the selection equation i.e., innovation input and innovation output equation have been estimated jointly, while in the second stage, the three equations (2)-(4) have been estimated simultaneously using 3 stage-least-square (3SLS).

Table 2 provide information related to the selectivity bias using the simultaneously Heckman selection model. The selection equation and the equation of interest are jointly estimated by maximum likelihood (see Hill et al. 2007). This model jointly estimates the two equations by using manximum likelihood method. Column 2 is the selection equation that determines the

[3] Several researchers (e.g., Reddy, 2007) examined the negative impact of long term obstacles (access to finance, skills shortage etc) on the firms' performance. This study has used 8 major obstacles (finance, competition, trade regulation, political instability, skills shortage etc) and examined their association with firm innovation; productivity and export performance. Principal component factor analysis is used to extract the core information from these variables and Kaiser-Meyer-Olkin test value which is 0.82 validates the factor model (See Appendix A3).

variable of interest which is innovation input (as dependent variable). Foreign owned firms are more likely to invest in innovation activities compared to domestic firms because of their technological superiority and have better human capital. Similarly, large and older firms are more likely to invest in innovation due to their economies of scale. In comarison, obstacles reduce the firm's decision to invest in innovation activities. In column 3 the dependent variable is innovative product sale per employee. The predicted value of innovation input from the previous period showed positive association to innovation output. This indicates that past innovation input has a significant impact on the current innovation output. The inverted Mills ratio is statistically insignificant and indicates that no selectivity bias is present in the least squares.

Table 2: Heckman Selection Model, regression with sample selection (two step estimation)

(1)	(2)	(3)
Variables	Selection Equation Innovation Input	Innovative product sales per employee (logged)
$lagged.Innovation\ Input_{predicted}$	-	0.0478***
		(0.0079)
Foreign Owned	0.3385***	0.0006
	(0.0125)	(0.0107)
Log size	0.1292***	-0.0033
	(0.0099)	(0.0044)
Log age	0.0766***	0.0081**
	(0.0212)	(0.0032)
Obstacle	-0.3385***	-0.0057
	(0.0125)	(0.0114)
Inverse Mills Ratio (λ)	-	-0.0233
		(0.0499)
Constant	-1.0886***	0.1448**
	(0.0573)	(0.0775)
Observations (I_{input})	11,590	-
Observations (I_{output}).	-	3746

Robust standard errors are in parentheses. ****p<0.01,**p<0.05,*p<0.1*

Table 3 reports the results of 3SLS using three equations (2)-(4). This method shows maximum efficiency advantage over 2SLS by considering the correlations of the unobserved factors between equations. This estimation procedure examines the SS and LBE hypotheses. Innovation input positively influences the firm's innovation output (see Column 2), while in the next column innovation output present statistical relationship with productivity (TFP). This outcome indicates that innovation has a positive impact on the firms' productivity. To investigate the SS hypothesis, 1% increase in productivity would likely to increase the exports by 48% (see Column 4). This suggests that productivity significantly improve the firms' export performance and accepted the SS hypothesis. This finding is in line with the

empirical studies of Cassiman and Golovoko (2007); Lopez (2009) and Caldera (2010). In order to estimate the LBE hypothesis, 1% increases in export intensity the innovation output is rise by 0.8%, while productivity is rise by 88% due to 1% increase in exports (see columns 2 & 3). Overall, this outcome indicates that exporting positively influence the firms' innovation output and productivity. This outcome has accepted the LBE hypothesis. To conclude, this empirical paper has supported the SS and LBE hypotheses for 29 countries using firm level data. In other words, the paper has answered the research question that is-reverse causality exists between innovation, productivity and exporting. Moreover, this empirical study corrected the selectivity and simultaneity biases. Similarly, past export experience has a positive impact on the firms' next year export intensity. This suggests that prior export experience significantly improve the firms' current export decision (see Column 4). In other words, this finding has supported the sunk cost hypothesis (hysteresis effect) which states that firms' previous export performance would more likely to increase the next year export performance.

Firms' size, age and innovation output relationship suggests that small and younger firms have a positive impact on the innovation output. In comparison, large and older firms are more likely to export than small and younger firms because large and older firms have sufficient resources (both financial and physical) to meet the sunk costs of entry into the international markets, while small and younger firms can be innovative or productive but prefer to stay in domestic markets due to less resources to face international competition. Similarly, foreign owned firms are more innovative, productive and export oriented than domestic firms' due to their technological and skills superiority over local firms. Lastly, obstacles negatively affect the innovative, productivity and export performance of these firms. This outcome implies that removing barriers to trade may accelerate the global trade between these countries. In the next sub section 3.4 the data is split into Eurasian and CEE firms and examine the affect of innovation indicators separately on exporting. Previous studies used few innovation indicators whether product or process innovation, but this research study used multiple proxies of innovation.

Table 3: Simultaneous equations with 3 stage least square (3SLS)			
Columns. 1	2	3	4
Variables	Innovative Output	TFP	Export Intensity
Innovation input (lagged) (predicted)	0.0464*** (0.0075)	-	-
Innovative Output (log)	-	2.4668*** (0.3931)	-
TFP (log)	-	-	0.4847* (0.2633)
Export Intensity (log)	0.0083*** (0.0029)	0.8818*** (0.3156)	-
Export Intensity (lagged)		-	0.0492*** (0.0163)
Log size	-0.0170*** (0.0061)	-0.5965 (0.6451)	2.5424*** (0.2905)
Log age	-0.0138*** (0.0046)	-1.1126*** (0.5454)	1.3917*** (0.2133)
Foreign owned	0.0381** (0.0153)	1.9784** (0.7146)	1.2684*** (0.5023)
Obstacles	-0.0101*** (0.0033)	-0.8335** (0.3514)	-1.0502*** (0.1244)
Constant	0.1943*** (0.0135)	1.4609*** (0.5823)	1.6474*** (0.4632)
R^2	0.112	0.130	0.102
Observations.	6655	6655	6655

Robust standard errors are in parentheses. ***p<0.01,**p<0.05,*p<0.1.

3.4. Eurasian and CEE: Innovation-by-Exporting Hypothesis

This sub section has analyzed the innovation by exporting hypothesis by splitting the micro level data on Eurasian and CEE firms. These two major economic blocs have strong historical, cultural and trade linkages. For example, CEE countries such as Bulgaria, Czech Republic, Estonia, Hungry and Poland etc (EU members) and Eurasian economies such as Albania, Armenia, Belarus, Turkey, Tajakistan and Russia have economic integration with each other as well as with the rest part of the world.[4] One the one hand, Turkey is member of custom union (trade links with Western Europe) and also has economic ties with Eurasian economies such as Uzbekistan, Tajikistan and Azerbaijan (see Ageliki and Ioannis, 2015, Seker, 2005). On the other hand, Russia is a major supplier of hydro-carbon related products to the European countries and an active member of Eurasian economies. Consequently, economic growth is impressive in both Eurasian and CEE economies in recent years with positive trends in human capital, employment rate including rising real wages, increasing literacy rate and experienced decreasing in infant mortality rates (see Sprout and Murphy, 2006). Economic reforms are the major agenda for Eurasian and CEE countries to focus on trade liberalization and better integration into the world economy. It is worth to mention that,

[4] The selection of Eurasian economies is based upon their geographical proximity and it is assumed that the closely located countries have more economic integration than at countries with distant locations.

CEE economies have achieved a strategic position from democracy and international trade (Bertarelli and Lodi, 2015) and foreign capital (FDI) is one of the major sources of productivity growth and technological diffusion for CEE economies (Bijsterbosch and Kolasa, 2010).

In spite of the trade links between Eurasian and CEE economies, Radosevic and Kravtsova (2012) provided empirical evidence related to the low innovation and productivity performance of CEE countries. They argued that inefficiencies exist within the broader national innovation system of CEE countries. One the one hand, CEE economies are struggling in terms of conversion of their R&D output into productivity due to low absorptive capacity (low education and vocational training systems). On the other hand, global financial and economic crisis in 2008-2009 which hit harder the CEE economies because CEE economies went through negative GDP growth rate (-14%) and experienced massive imbalances in current and public accounts (huge deficits); drop in real wages with double digit unemployment rate (15%) (Kattel, 2010). Kattel (2010) study suggested that CEE economies need to establish effective industrial and innovation policies to enhance their domestic competitiveness through improving productivity and exports. In short, this empirical study investigates the innovation-by-exporting hypothesis for Eurasian and CEE firms. The estimation results would help policy makers to focus on improving the trade links between these two economic blocs in terms of innovation and exporting performance.

3.4.1. Innovation by Exporting – 2SLS

In the past, innovation-by-exporting hypothesis is investigated by numerous researchers (e.g., Caldera, 2010; Monreal-Perez et al. 2011; Damijan et al. 2010; Lachenmaier and Wobmann, 2006; Crepon et al. 1998) and identified the endogenous link between innovation and exporting using 2SLS method. A recent study by Imbriani et al. (2014) used multiple proxies of innovation such as technological (product and process) and non-technological (marketing and organizational innovation). They examined the positive association between innovation and exporting by using a micro level data on Italian manufacturing SMEs. However, this study is failed to address the endogenous link between innovation and exporting. While, this study is focused on the endogenous relationship between innovation and exporting using multiple proxies of innovation such as product and process innovation, R&D, marketing and organizational innovation. Each proxy of innovation is estimated separately with exporting by using instrumental variable approach (2SLS). This strategy provides deeper analysis of the

endogenous relation between innovation and exporting. For estimation, probit models have been used to examine the Eurasian and CEE firms' innovation and exporting performance. In equation (a), innovation is endogenous variable, so using OLS method would result in biased and inconsistent estimators. Thus, this study has used two instrumental variables which are denoted by 'z' in equation (b). Here z represents formal training of permanent employees and business support for innovation as instrumental variables in the model. The two important characteristics of a valid instrument are that it should be strongly related to endogenous explanatory variable – innovation in this case, while at the same time it must be uncorrelated to the error term of the exports equation. Thus, training and business support are reasonably exogenous to the error term and does not have direct effect on exports but could have indirect effect through innovation. These two equations are estimated jointly through 2SLS method.

$$Exports_{i,j} = \beta_0 + \beta_1 Innov_{i,j} + \beta_2 \log TFP_{(t-1)i,j} + \beta_3 FO_{i,j} + \beta_4 Obstacles_{i,j} + \beta_5 logSize_{i,j} + \beta_6 logAge_{i,j} + \beta_7 Sector_{i,j} + \epsilon_{i,j} \qquad (a) \qquad (1st\ stage)$$

$$Innov_{i,j} = \gamma_0 + \gamma_1 z_{i,j} + \gamma_2 logTFP_{(t-1)i,j} + \gamma_3 FO_{i,j} + \gamma_4 Obstacles_{i,j} + \gamma_5 logSize_{i,j} + \gamma_6 logAge_{i,j} + \gamma_7 Sector_{i,j} + e_{i,j} \qquad (b) \qquad (2nd\ stage)$$

In aforementioned models, exports is a dummy variable and subscripts *i, j* show number of observations and the type of industry. Similarly, innovation (*Innov*) is a dummy variable and codified 1 if firms are engage in product/process innovation, R&D and organizational innovation. Marketing innovation is merged with organizational innovation because marketing innovation is a process of organizational innovation activities. Earlier empirical studies (*e.g.,* Banri and Ayumy, 2013; Halpern and Murakozy, 2012) have neglected to use multiple proxies of innovation and this research study would fill that narrow research gap. The total factor productivity (TFP) has been lagged for one period because it is assumed that earlier productivity positively influences the firm's decision to export and innovation in current year. Lagging TFP for one period also overcome the potential endogeneity between exporting and innovation (see *e.g.,* Sharma and Mishra, 2012). Lopez (2009) argued that highly productive firms self select into the export markets so that exporters can afford the sunk costs of entry into foreign markets. Similarly, before exporting, firms' require to increase productivity in order to invest in innovation because exporters need to sell high quality products abroad. In addition, it is assumed that foreign owned firms (FO) are more

likely to export and innovate due to their technological superiority over domestic firms. Age, firms' size and obstacles are continuous variables. For sectoral comparison, an additional dummy variable is introduced and it is codified 1 if firm belong to manufacturing sector otherwise 0. Further, this study has split the micro level data into two economic blocs i.e., Eurasian and CEE (see Appendix A2). Before regression analysis, Table 4 shows the mean values of CEE and Eurasin economies in terms of exporting and innovation. It is observed that Eurasian economies have higher mean values compared to CEE countries. Overall, the mean values for innovation and exporting is high for manufacturing sector (see Table 4). Overall, Table 4 results suggest that Eurasian countries are dominant in terms of innovation activities and export performance.

Table 4: Summary statistics of mean values

	CEE	Eurasia	Manufacturing	Services
	$\overline{x}$	$\overline{x}$	$\overline{x}$	$\overline{x}$
R&D (1676)	28.28	71.72	57.82	42.18
Product Innovation (3821)	30.23	69.77	50.09	49.91
Process Innovation (3119)	27.12	72.88	50.88	49.12
Organizational Innovation (4654)	27.50	72.50	41.04	58.96
Exports (2973)	37.84	62.16	64.82	35.18

Number of observations is in parentheses.

Furthermore, Table 5 presents the test of association between innovation and exporting variables. Of the total 3821 product innovation firms, approximately 29% are involved in exporting. The chi-square test value shows the statistical link between product innovation and exporting. Nearly 27% of 3119 process innovators are engaged in exporting, while chi-square test present the statistical relationship between process innovation and exporting. Overall, Table 5 results provide the statistical evidence regarding the relationship between innovation and exporting. This suggests that firms that are engaged in innovation are more likely to export than non innovators.

Table 5: Test of Association between innovation and exporting

	Exports (%)		
Innovation	Yes	No	*Chi-square*
Product Innovation (3821)	28.87	71.13	340.6056***
Process Innovation (3119)	27.32	72.68	188.5960***
R&D (1676)	38.90	61.10	501.7224***
Organizational Innovation (4654)	24.99	75.01	170.1584***

Number of observations that are engaged in innovation is in parentheses). **** indicates 0.01 significance level

3.4.2. 2SLS Results

Table 6 reports the probit estimation results of equations (a)-(b) using 2SLS method for Eurasian countries.[5] Regarding the innovation and exporting link, all innovation indicators whether product or process innovation, R&D and organizational innovation show statistical association with exporting, at 1% significance level. This outcome suggests that innovation drives firms' exporting and supported the innovation-by-exporting hypothesis. This finding is consistent with the Jose and Alvaro (2012) empirical study. Similarly, total factor productivity (lagged one period) presents positive association with exporting. This implies that firms require prior high productivity to export into the international markets. This result is in line with empirical findings of Sharma and Mishra (2012) and Cassiman et al. (2010). In other words, earlier productive firms are more likely to export because past productivity firms can cover the sunk costs of entry into the foreign markets.

Similarly, foreign owned firms are more likely to export than domestic firms due to their technological and skills superiority and have better contacts in the international markets. Obstacles show negative relationship with exporting. This outcome indicates that trade regulations, political instability and the lack of skilled labour force etc are more likely to reduce the export performance of Eurasian firms. Large sized and older firms are more likely to export than small or younger firms due to their economies of scale (experience in technology) (see Imbriani et al. 2014). In addition, manufacturing sector is more likely to undertake innovation activities. Furthermore, Table 6 shows the statistical association between IVs and innovation (as dependents) (see bottom part of the Table 6). This indicates that firms' employees with formal training and business support positively affect the innovation activities of Eurasian firms. Past productivity positively affects the innovation activities. This suggests that high level of past productivity would encourage firms to undertake innovation activities such as product and process innovation, R&D and organizational innovation in the current year. Similarly, foreign owned firms are more likely to undertake innovation activities than domestic firms. The remaining results are almost in consistent with the first stage results. To summarize, for Eurasian firms' innovation variables significantly improve the export performance and supported the innovation-by-exporting hypothesis.

[5] Correlation matrix is calculated to examine the multicollinearity issue. Only one variables innovative product sales showed high correlation value (>0.8) and it is dropped from the analysis (see Appendix A4).

Table 6: Probit models (Innovation as Endogenous - 2SLS) – Eurasian Economies				
Exports as Dependent-Dummy	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Product Innovation (PI)	1.4101***	.	.	.
	(0.2366)			
Process Innovation (PCI)	.	0.6660***	.	.
		(0.1044)		
R&D	.	.	1.1510***	.
			(0.1695)	
Organizational Innovation (OI)	.	.	.	0.7683***
				(0.1058)
log TFP_{t-1}	0.0516***	0.0498***	0.0428***	0.0537***
	(0.0068)	(0.0068)	(0.0070)	(0.0072)
Foreign owned	0.3230***	0.2359***	0.4128***	0.4260***
	(0.0914)	(0.0068)	(0.0853)	(0.0820)
Obstacle	-0.0349	-0.0723**	-0.0985***	-0.0763**
	(0.0392)	(0.0331)	(0.0304)	(0.0327)
log Size	0.2317***	0.2359***	0.2255***	0.2570***
	(0.0259)	(0.0231)	(0.0257)	(0.0197)
log Age	0.1207***	0.1340***	0.1426***	0.1434***
	(0.0327)	(0.0316)	(0.0320)	(0.0317)
Sector-dummy	0.4146***	0.4118***	0.4510***	0.5930***
	(0.0632)	(0.0598)	(0.0581)	(0.0427)
Constant	-1.2812***	-1.2717***	-1.3417***	-1.3556***
	(0.1490)	(0.1431)	(0.1412)	(0.1340)
		Two Stage Least Squares (2SLS)		
Innovation as Dependents-Dummy	***PI***	***PCI***	***R&D***	***OI***
Training-IV	0.1238***	0.1379***	0.1066***	0.2012***
	(0.0058)	(0.0111)	(0.0089)	(0.0124)
Business Support-IV	0.3593***	0.5480***	0.3153***	0.4723***
	(0.0176)	(0.0148)	(0.0124)	(0.0179)
log TFP_{t-1}	0.0082***	0.0082***	0.0008	0.0134***
	(0.0019)	(0.0018)	(0.0014)	(0.0020)
Foreign owned	0.0888***	0.0194	0.0360**	0.0494*
	(0.0247)	(0.0231)	(0.0183)	(0.0257)
Obstacle	-0.0883***	-0.0683***	-0.0403***	-0.1003***
	(0.0058)	(0.0054)	(0.0043)	(0.0060)
log Size	0.0131***	0.0103**	0.0207***	0.0056
	(0.0091)	(0.0044)	(0.0035)	(0.0049)
log Age	0.0149*	0.0063	0.0029	0.0057
	(0.0091)	(0.0085)	(0.0067)	(0.0095)
Sector-dummy	0.0784***	0.0900**	0.0598***	-0.0140
	(0.0112)	(0.0104)	(0.0083)	(0.0117)
Constant	-0.0179	-0.0324	-0.0136	-0.0269
	(0.0361)	(0.0338)	(0.0269)	(0.0379)
Wald Test (Exogeneity)-$\chi 2$	13.81***	18.25***	10.91***	15.53***
Observations	5723	5723	5723	5723

***,p<0.01;**,p<0.05;*,p<0.10 significance levels. Robust standard errors are in parentheses.

Additionally, Table 7 provides information on the endogenous link between innovation and exporting for CEE firms. Firms that are engaged in product/process innovation, R&D and organizational innovation are more likely to export than non innovators. This finding indicates that 1% increase in product, process, R&D and organizational innovation, the exports is rise by 48%, 27%, 70% and 35%. However, the coefficients values are lower compared to Eurasian firms. Overall, CEE countries rely on capital transfers from Western

European countries (e.g., Germany, France) which are the major source of technological innovation for CEE firms (see Radosevic and Kravtsova, 2012).

Previous year TFP (lagged one period) positively influences the next year exporting. This outcome suggests that prior high productivity significantly improve the firm's next year exporting because it covers the sunk costs of entry into the international market. Similarly, foreign owned are more likely to export than domestic firms due to high innovation and human skills capacity than domestic firms. In comparison, obstacles show no statistical relationship with exporting. This result may imply that CEE firms face no obstacle while exporting to the nearest European markets. In addition, the positive relationship between size and exporting show that large firms' are more likely to export than small firms due to their economies of scale. Manufacturing firms are more likely to export because of their investment in technologies.

Furthermore, Table 6 presents the two stage results of equation (b). Instruments such as training and business support show positive association with innovation proxies (as dependent variables). Firms with high productivity in the previous period are more likely to undertake innovation activities. In comparison, obstacles such as access to credit, trade regulations, political instability negatively influence the innovation activities of CEE firms. Large firms are more likely to engage in innovation activities (i.e., product/process, R&D and organizational innovation) than small firms because of their low production cost. Lastly, manufacturing sector has positive relationship with product/process innovation, R&D and organizational innovation. Overall, the results of Table 7 are in line with the previous finding from Table 6 findings. To summarize, this study has identified that innovation activities drives exporting in both Eurasian and CEE firms using micro level data.

Table 7: Probit models (Innovation as Endogenous - 2SLS) – CEE Economies				
Exports as Dependent-Dummy	***Model 1***	***Model 2***	***Model 3***	***Model 4***
Product Innovation (PI)	0.4809**	.	.	.
	(0.2124)			
Process Innovation (PCI)	.	0.2761**	.	.
		(0.1332)		
R&D	.	.	0.7010**	.
			(0.3205)	
Organizational Innovation (OI)	.	.	.	0.3561**
				(0.1567)
log TFP_{t-1}	0.0352*	0.0351**	0.0303	0.0396***
	(0.0183)	(0.0179)	(0.0211)	(0.0158)
Foreign owned	0.5870***	0.5799***	0.5674***	0.5953***
	(0.0869)	(0.0895)	(0.0956)	(0.0885)
Obstacle	0.0537	0.0559	0.0402	0.0501
	(0.0422)	(0.0895)	(0.0290)	(0.0386)
log Size	0.2237***	0.2309***	0.2340***	0.2342***
	(0.0283)	(0.0254)	(0.0172)	(0.0205)
log Age	0.0403	0.0420	0.0472	0.0388
	(0.0505)	(0.0505)	(0.0290)	(0.0511)
Sector-dummy	0.9225***	0.9323***	0.8761***	1.0218***
	(0.1290)	(0.1174)	(0.2353)	(0.0606)
Constant	-1.3985***	-1.4408***	-1.5052***	-1.4623***
	(0.2485)	(0.2144)	(0.2095)	(0.2094)
	Two Stage Least Squares (2SLS)			
Innovation as Dependents-Dummy	***PI***	***PCI***	***R&D***	***OI***
Training-IV	0.0965***	0.0949***	0.0711***	0.1817***
	(0.0338)	(0.0182)	(0.0150)	(0.0200)
Business Support-IV	0.3418***	0.5988***	0.2297***	0.4492***
	(0.0269)	(0.0217)	(0.0203)	(0.0261)
ln TFP_{t-1}	0.0133***	0.0124***	0.0157***	0.0162***
	(0.0048)	(0.0043)	(0.0036)	(0.0047)
Foreign owned	0.0626*	0.0273	0.0146	0.0585*
	(0.0313)	(0.0282)	(0.0235)	(0.0310)
Obstacle	-0.0598***	-0.0634***	-0.0187***	0.0847***
	(0.0093)	(0.0084)	(0.0070)	(0.0092)
log Size	0.0022	0.0182**	0.0160***	0.0231***
	(0.0092)	(0.0083)	(0.0069)	(0.0091)
log Age	0.0068	0.0087	0.0160	-0.0002
	(0.0180)	(0.0162)	(0.0135)	(0.0178)
Sector-dummy	0.1304***	0.1210***	0.0898***	-0.0098
	(0.0205)	(0.0185)	(0.0154)	(0.0205)
Constant	-0.0342	-0.0757	-0.2395	-0.0302
	(0.0338)	(0.0662)	(0.0551)	(0.0727)
Wald Test (Exogeneity)-$\chi 2$	1.29	1.54	2.01	0.92
Observations	2323	2323	2323	2323

****,p<0.01;**,p<0.05;*,p<0.10 significance levels. Robust standard errors are in parentheses.*

4. Conclusion

This study has examined the self-selection and learning-by-exporting hypothesis for 29 countries using micro level data. Using the modified CDM (Crepon-Duguet-Mairesse) model, this empirical paper supported the SS and LBE hypotheses. Results showed that productivity significantly improve the firms' exports, while innovative product sales enhance the firm's productivity. Overall, the outcome supported the self-selection hypothesis. In comparison,

exports showed statistical link with productivity and accepted the learning-by-exporting hypothesis. Moreover, the CDM model also corrected the selectivity and simultaneity biases. To estimate the innovation by exporting hypothesis for Eurasian and CEE firms, the data was divided into two economic blocs based on their geographical proximity. Previous studies neglected to use multiple indicators of innovation and failed to examine the each proxy (product/process, R&D and organizational innovation) of innovation separate on exporting. Concerning the endogenous relationship between innovation and exporting, 2SLS method was used. Overall, findings suggested that firms that were engaged in product or process innovation, R&D and organizational innovation positively influence the firms' exporting for both Eurasian and CEE firms.

Empirical findings from this research study can be extended to other developing and developed economies which are extensively contribute to the global trade. Economic policies must target the economic integration between developing and developed countries. Through learning-by-exporting experience, firms in poor countries can learn about the technological and non technological innovation in the industrialized countries. Economic policies regarding openness to trade result in high productivity and innovation performance of domestic firms. Specifically, foreign direct investment could be a major source of innovation and productivity growth for local firms because foreign firms are superior in technology and in human capital. By establishing the forward and backward linkages with foreign firms, domestic firms can overcome the innovation, productivity and exporting constraints. The SS hypothesis also indicates that before exporting, firms require a certain minimum threshold of innovation investment and productivity growth and that is only possible when economic policies are specifically targeted to improve the absorptive capacity (innovation investment) of local firms. With low absorptive capacity, domestic firms cannot benefit from the positive externalities of foreign direct investment.

This study has certain limitations. The use of cross section data on 29 countries may not capture the long terms effects using innovation, productivity and exporting variables. Past studies mainly used panel data and estimated the SS and LBE hypothesis. In future, a panel study would better investigate the economic relationships between innovation, productivity and exporting variables. Further, due to the lack of information on price indices for each country, this study has not deflated the financial information (TFP).

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Appendix A1. **Measuring Productivity**

This study has estimated total factor productivity (TFP) using firm level data on Eastern European countries. The model described by a Cobb-Douglas production function of the following form where all variables are used in natural logarithms:

$$y_{it} = \beta_o + \beta_1 l_{it} + \beta_2 m_{it} + \beta_3 k_{it} + \varepsilon_{it} \qquad (1)$$

Where y, l,m and k refer to the output, labour, intermediate inputs (materials, fuel and electricity costs) and capital (fixed assets). Hence, TFP in growth terms is defined as (dropping subscripts).

$$lnTFP = \hat{y} - \hat{\beta}_1 l - \hat{\beta}_2 m - \hat{\beta}_3 k \qquad (2)$$

Appendix A2.

Table A2: Sample size across the European and Non European Countries by exports & innovation

No.	Country Name	Observations	Exports (Yes)	Innovation (Yes)♣
1	Russia	4220	345	1927
2	Turkey	1344	490	422
3	Ukraine	1002	177	321
4	Kazakhstan	600	29	192
5	Poland¤	542	114	291
6	Romania¤	540	130	379
7	Uzbekistan	390	35	25
8	Azerbaijan	390	6	27
9	Albania	360	69	53
10	Belarus	360	90	235
11	Georgia	360	29	58
12	Serbia	360	116	195
13	Moldova	360	59	152
14	Bosnia Herzegovina	360	90	193
15	Macedonia	360	101	194
16	Armenia	360	33	86
17	Mongolia	360	29	190
18	Croatia¤	360	120	225
19	Tajikistan	359	47	138
20	Latvia¤	336	106	113
21	Hungary¤	310	60	115
22	Bulgaria¤	293	73	155
23	Estonia¤	273	107	102
24	Lithuania¤	270	98	107
25	Slovenia¤	270	141	148
26	Slovak Republic¤	268	60	90
27	Czech Republic¤	254	116	169
28	Kosovo	202	45	148
29	Montenegro	150	23	42
	Total	15,883	2973	6643

♣Indicates that country engaged at least in one innovation activity (*i.e.,* product, process, RD and OI)
¤ Represent the European Union (EU) member states and most of them are CEE economies. The rest of the countries are treated as Eurasian economies which are not the members of EU.

Appendix A3.

Table A3. Principal component factor analysis of obstacles

Obstacles	Factor Loadings
Access to finance	0.5896
Competition	0.4743
Trade regulations	0.5505
Taxation	0.6197
Political instability	0.6008
Inadequate skilled labour force	0.6298
Labour regulations	0.5938
Telecommunication	0.5446

Overall Kaiser-Meyer-Olkin measure of sampling adequacy is *0.8282.*

Appendix A4: Correlation matrix

A4:Correlation matrix of all variables

no	Variables	1	2	3	4	5	6	7	8	9	10	11
1	Exports-dummy	1										
2	TFP	0.05	1									
3	Size(log)	0.26	0.41	1								
4	Age(log)	0.13	0.07	0.25	1							
5	Foreign owned	0.15	0.10	0.14	-0.02	1						
6	Obstacles	0.13	0.01	0.07	0.05	0.01	1					
7	Product Innovation	0.16	0.08	0.11	0.06	0.07	0.21	1				
8	Process Innovation	0.12	0.10	0.12	0.05	0.04	0.20	0.41	1			
9	RD	0.20	0.09	0.15	0.06	0.05	0.14	0.33	0.33	1		
10	Org. Innovation	0.11	0.13	0.14	0.05	0.07	0.25	0.42	0.45	0.32	1	
11	Innovative sales♣	0.05	**0.80**	0.02	-0.03	0.04	-0.02	0.03	0.04	0.02	0.06	1

♣Innovative product sales (logged) are dropped in probit models due to multicollinearity issue.