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National factor effects on firm competitiveness and innovation

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Abstract

Purpose – The purpose of this article is to investigate how national-level characteristics such as country wealth, a floating exchange rate and European Union (EU) membership influence firm-level perceptions of competition and firm-level innovation. Greater understanding of these relationships can promote more effective policymaking as well as add to the existing academic conversation regarding national factors and firm competitiveness.

Design/methodology/approach – The authors' data consist of a panel of 27 countries in Central and Eastern Europe and Central Asia from 2002 to 2009 with a total of nearly 27,000 firms from the World Bank Enterprise Survey. The authors utilize a multinomial logistic regression to estimate firm-level perceptions of both domestic and foreign competition upon decisions to introduce new products and manage new product costs. The authors then estimate the probability of innovation (introduction of a new product/service, obtaining international quality certification) using a logistic regression. The marginal effects of the key explanatory variables for country wealth, floating exchange rate and EU membership are calculated.

Findings – While EU membership heightens perceptions of competition, firms in the EU are less likely to introduce new products or services. On the other hand, a firm in an EU member country is more likely to obtain international quality certification than one that is not. Both country wealth and a floating exchange correlate with enhanced perceptions of competition and innovation as expected.

Originality/value – The first finding regarding heightened perceptions of competition yet lower likelihood of introduction of new products/services among EU firms is surprising. Beyond adding to the empirical store of knowledge regarding the relationship of national factors to firm competitiveness, it suggests that more needs to be done with regard to innovation policy. The authors offer a general recommendation to employ more public–private partnerships for innovation among small and medium enterprises, as this has been effective in other parts of the world.

Keywords Innovation, SMEs, Economic development, European union, Competitiveness, Exchange rate regime

Paper type Research paper

Introduction

The past 25 years have seen dramatic changes in the economic and social characteristics of the transition countries of Central and Eastern Europe and their near neighbors in Western Asia. The movement from a command to a capitalist economy, after brief but serious initial shocks, brought on increased productivity, more competitive output and markets and growth periods fueled by new, usually foreign sourced, investments and along with increased exports. Over time that initial thrust was tempered. The past 10 years have been

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characterized by slower growth overall but a relatively heterogeneous pattern with strong growth in some countries and weaker growth in others. Understanding the sources of the competitive strength that leads to stronger growth is necessary if economic growth is to return to the broader area of Central and Eastern European (CEE).

The topic of competitiveness often is presented from a national viewpoint. The World Economic Forum (WEF) publishes "The Global Competitiveness Report" annually, and the IMD World Competitiveness Center (2014) publishes its "World Competitiveness Yearbook" yearly as well. These studies take a macroeconomic viewpoint, focusing on the country and its economy as a whole. An alternative, and the approach used in this paper, is to focus more on the decisions made at the level of the firm. Specifically, we focus on the reactions of business decision-makers to perceived challenges from customers and competitors, given two national variables, European Union (EU) membership status and exchange rate regime.

According to Michael Porter:

> Companies achieve competitive advantage through acts of innovation. They approach innovation in its broadest sense, including both new technologies and new ways of doing things […] Innovation can be manifested in a new product design, a new production process, a new marketing approach, or a new way of conducting training (Porter, 1990).

The motivation for innovation may be internally generated and a product of the organizational culture. However, for most firms, a significant portion of such motivation is external, the product of actions by customers, competitors and suppliers.

In this paper, we consider the role of competitors in motivating firms in 26 CEE countries and their Central Asian neighbors to develop new products or take actions to reduce production costs. We compare subjective responses regarding competitive pressure on managerial decisions to actual outcomes of new product introduction and international quality certification for three key factors:

(1) Country wealth;

(2) the national exchange rate regime; and

(3) EU status.

Of these factors, EU status enjoys the strongest correlation with the subjective measures, but has mixed results regarding actual outcomes. Country wealth demonstrates more overall impact than the exchange rate regime. These findings add to our existing knowledge of the relationship between national competitiveness and firm performance in this region, and constitute the chief contribution of the paper. We assess not only the statistical significance but also the marginal effect of these factors on competition and innovation.

We begin with a literature review on global competitiveness, innovation and the potential influences of economic development, exchange rates and EU membership. Next, we describe the data and the methodology. Results follow the methodology section, and discussion of the results concludes the paper.

Literature review

Global competitiveness and economic development

As Porter (1990) said:

> Innovative actions are necessary to enhance a firm's competitive advantage. The innovations need not be new products or even new technologies; they cover the range of business

> operations, from the composition and procurement of basic inputs to meeting the needs of the ultimate consumer.

Gilbert asserts (2006, p. 168):

> […] competition is more likely to provide greater incentives for product innovations (as well as process innovations) if competition in the old product is intense. This lowers the pre-innovation profit for a competitor and increases its incentive to invest.

However, as the World Economic Forum (2014, pp. 9-10) points out, effective competitive actions depend on the level or stage of economic development. Their Global Competitiveness Index (GCI) illustrates three levels based upon 12 pillars, which illustrate national competitiveness. We describe these briefly.

Stage 1: The Basic Requirements Subindex, has four foundational pillars: institutions, infrastructure, macroeconomic environment and health and primary education. In this stage, according to the WEF, an economy is factor-driven. Much like the simple economy of Ricardo's Comparative Advantage, firms in such economies tend to compete based on their relatively abundant undeveloped factors. As WEF points out, firms in such economies rely on "well-functioning public and private institutions, a well-developed infrastructure, a stable macroeconomic environment, and a healthy workforce that has received at least a basic education" (WEP 1,014, p. 10).

Stage 2: The Efficiency Enhancers Subindex, is for countries that have moved beyond competition based on factor endowments. These more developed countries have already developed more efficient methods of production along with higher quality and differentiated products. In this stage, competitiveness is driven by these pillars: higher education and training, efficiency in the goods market, efficiency in the labor markets, developed financial markets, technological readiness and involvement and market size.

Stage 3: Innovation and Sophistication Factors Subindex, is that stage where competition is primarily driven by continuous process and product innovation. Competition is driven by the use of sophisticated production and distribution practices along with innovation both in process and in product.

Among the set of countries considered for this study, only one, the Kyrgyz Republic, remains in Stage 1, the factor-driven stage of economic development. Eleven are either in or transitioning into Stage 2, the efficiency-driven stage. Eleven are transitioning into or in Stage 3, the innovation-driven stage. This implies firms considered in this study will be more likely to increase competitively through changes in productive efficiency, enhanced quality or new and differentiated products. Table I, Countries by Subindex, presents the ranked countries of this study by developmental level, according to the GCI (Table II).

Membership in the Organization for Economic Co-operation and Development (OECD) is equivalent to being designated a prosperous country. Table I, Countries in the EU or OECD, lists the six CEE countries that are members of the OECD. All six are either in Stage 3 of the GCI or in transition between Stage 2 and Stage 3. These firms are most likely to compete through innovations in products, competing with new products, certifications or possibly technological upgrades or improvements.

Given the relationship between stage of economic development and competition and innovation, we propose the following hypotheses:

H1. Firms in OECD countries are more likely to feel competitive pressure.

H2. Firms in OECD countries are more likely to innovate.

EU members	EU candidates	OECD members
Czech Republic	Croatia	Czech Republic
Estonia	Macedonia FYR	Estonia
Hungary	Serbia	Hungary
Poland		Poland
Slovak Republic		Slovak Republic
Slovenia		Slovenia
Bulgaria		
Latvia		
Lithuania		
Romania		

Note: FYR = Former Yugoslav Republic (of)
Source: Obtained from Europa-EU Web site and OECD Web site

Table I.
Countries in the EU or OECD

Basic requirements Factor-driven	Transition	Efficiency enhancers efficiency-driven	Transition	Innovation/sophistication Innovation-driven
Kyrgyz Republic	Armenia	Albania	Croatia	Czech Republic
	Azerbaijan	Bosnia and Herzegovina	Estonia	Slovenia
	Moldova	Bulgaria	Hungary	
		Georgia	Kazakhstan	
		Macedonia, FYR	Latvia	
		Romania	Lithuania	
		Serbia	Poland	
		Ukraine	Russia Federation	
			Slovak Republic	

Source: Constructed by the authors based upon Table II, World Economic Forum (2014, p. 11)

Table II.
Countries by Subindex

Innovation and the competitive environment

Rivals, both domestic and foreign, can be a powerful motivation for change. To the extent that a firm competes with its rivals based on price, innovations that lead to lower costs of production and allow for reductions in the selling price increase that firm's competitiveness. For those firms still in Stage 2, the efficiency driven stage, one expects decisions about production costs would be strongly motivated by the actions or expected actions of domestic or foreign rivals. Those firms in transition to or already in Stage 3, the innovation-driven stage, also would be motivated to seek out efficient production changes; however, one can argue they might be even more strongly motivated to take innovative actions through new or significantly upgraded products. The data allow us to examine these questions.

Firms located in countries in Stage 2, in transition to and in Stage 3, generate and maintain their competitive advantage through innovation. Their collective efforts determine economic growth in their country and region. Environmental conditions that lead to increased innovation and improvements may be evaluated through the factors of

the GCI or through Porter's Four Factors. While Porter focused on domestic rivals, for many firms, their foreign rivals play just as important a role. Here, we focus on two economic environmental factors, the exchange rate regime of the home country and EU membership. We address the impact these have on motivations and actions to innovate.

Influence of the exchange rate. Research supports the argument that as economies become more open to trade, the rate of growth increases. (Sacks and Warner, 1995; Wacziang and Welch, 2003). MacDonald (1994, p. 712) "Found increases in import competition led to large increases in labor product growth in highly concentrated industries".

A motivation for our work is addressing how a country's exchange rate regime affects competition and firms' incentive to innovate. Although the IMF has ten exchange-rate regime classifications, the crucial distinction for the purposes of our analysis is fixed vs floating. We differentiate between them with the view that floating exchange rates signal more openness and, hence, more competition and innovation.

One argument for fixed rates is they reduce the volatility of exchange rates. They also add a transaction cost between importer and exporter. Floating rates provide automatic adjustments between economics, but they do experience frequent changes, and have a transaction costs, as well. They also may lead to trade limiting policies applied by governments attempting to maintain the fixed rate. Drabek and Brada (1998, p. 1) considered six Central and Eastern European transition economies with fixed rates. In all cases, there was "[…] pressure on the government to increase trade barriers and each country examined has had to resort to various means of restricting imports". In addition, floating rates expose producers and customers to potential price risk. The exchange rate is the link between prices in the two countries. Floating rates are usually associated with economies more open to trade, those willing to allow greater financial and commercial integration while following domestic policies directed toward domestic goals.

Chinn and Ito (2008) have constructed an openness index based on four factors, one of which is current account transactions (A more open economy has a lower current account surplus or a greater deficit.). We ran a correlation between the Chinn–Ito openness index (KAOPEN) and floating rates. Even though the correlation was positive supporting our argument, it was not statistically significant.

Firms headquartered in floating rate countries face both transaction and operating exposure. They should be more likely to consider their "international footprint", the national locations of customers, competitors and suppliers than firms headquartered in fixed rate countries. (Froot and Stein, 1993). None of this is to say their exposure is actually greater, as we recognize exchange rates that do not change may actually face more exchange rate risk as Shapiro (2003, p. 382) points out, "[…] a firm may face more exchange risk if nominal exchange rated do not change". However, due to the high level of day-to-day exposure, it is expected that firms in economies with floating rates will be more aware of the actions and potential reactions of both domestic and foreign rivals. Price risk is high, and it is magnified through exchange rate changes. As a consequence of increased openness, we posit the following:

H3. Firms in floating exchange rate regimes are more likely to feel competitive pressure.

H4. Firms in floating exchange rate regimes are more likely to innovate.

Influence of EU membership. EU membership or even applicant status, almost guarantees a country has achieved Stage 2 in the GCI classification. Reference to Table I, Countries by Subindex, supports this. Almost all of the EU countries are either in

transition to Stage 3, and two are already at that level. Firms in these countries are beyond the level where competition in conducted based on the factors of production. These enterprises must innovate and upgrade either through their productive practices by product differentiation. New products or significant innovation in functionality or quality can reduce the substitutability of competitors' products. Production cost innovations allow firms to meet and beat competitors' prices.

There is an effect beyond country wealth, and that is the impact of economic union membership. To be located in the EU common market subjects a firm to far-reaching competition. In principle, there are no barriers to trade among the members, so all of the companies located within the EU face a number of foreign competitors on almost equal terms. There is also (ideally) a harmonization of rules and statutes, so that regulatory burden should be approximately equal among firms in a given industry. Transparency about the competitive and regulatory environment is a principal objective of economic union; thus, it is expected that the managers will be aware and likely to react to the competitive threat of their foreign and domestic rivals:

H5. Firms located in EU countries are more likely to feel competitive pressure.

H6. Firms located in EU countries are more likely to innovate.

Empirical analysis

Data

The World Bank Enterprise Surveys panel data for Central Europe for 2002 to 2009 are the source data for the analysis. Surveys of firms from 27 countries in Central and Eastern Europe constitute the panel; the surveys were administered in 2002, 2005, 2007 (some countries) and 2009. The sample is an unbalanced panel, as some firms were added over time to the original core group from 2007.

Table III displays the distribution of firms by year and country. Nearly 23 per cent of the sample is from 2002, 34 per cent from 2005 and 36 per cent from 2009; only 7 per cent is from 2007. The sample is fairly evenly distributed across the countries, with the notable exception of Montenegro having only 0.57 per cent representation of the total. Russia (7.84 per cent), Poland (7.17 per cent), Ukraine (7.09 per cent) and Bulgaria (6.89 per cent) have the highest level of representation among the countries.

The distribution of firms by size and country appears on Table IV. Employment tables define firm size, with firms having less than 20 employees labeled as small in the World Bank data. Firms with headcount between 20 and 99 are medium-sized and firms with 100 or more employees are large. By these standards, approximately 46 per cent of the sample are small firms, 31 per cent are medium enterprises and 23 per cent are large companies.

Table V presents the distribution of firms by size and industry. The World Bank data identifies 19 separate industrial sectors. There are five sectors that each account for 10 per cent or more of the sample: retail (15.53 per cent), food (13.98 per cent), wholesale (12.93 per cent), other services (10.33 per cent) and construction (10.01 per cent). The smallest segments are other (0.15 per cent), electronics (0.74 per cent) and plastics and rubber (0.92 per cent).

Descriptive statistics and definitions of the variables appear on Table VI. The first four dependent variables have a range of 1 to 4 scored as follows: 1: Not Important, 2: Slightly Important, 3: Fairly Important and 4: Very Important[1]. As described in the

Country	No. of firms 2002	2005	2007	2009	Total	(%)
Albania	170	204	304	54	732	2.72
Belarus	250	325	0	273	848	3.15
Georgia	174	200	0	373	747	2.78
Tajikistan	176	200	0	360	736	2.73
Ukraine	463	594	0	851	1,908	7.09
Uzbekistan	260	300	0	366	926	3.44
Russia	506	601	0	1,004	2,111	7.84
Poland	500	975	0	455	1,930	7.17
Romania	255	600	0	541	1,396	5.19
Serbia	230	282	0	388	900	3.34
Kazakhstan	250	585	0	544	1,379	5.12
Moldova	174	350	0	363	887	3.30
Bosnia	182	200	0	361	743	2.76
Azerbaijan	170	350	0	380	900	3.34
Macedonia FYR	170	200	0	366	736	2.73
Armenia	171	351	0	374	896	3.33
Kyrgyz Republic	173	202	0	235	610	2.27
Estonia	170	219	0	273	662	2.46
Czech Republic	268	343	0	250	861	3.20
Hungary	250	610	0	291	1,151	4.28
Latvia	176	205	0	271	652	2.42
Lithuania	200	205	0	276	681	2.53
Slovak Republic	170	220	0	275	665	2.47
Slovenia	188	223	0	276	687	2.55
Bulgaria	250	300	1,015	288	1,853	6.89
Croatia	187	236	633	104	1,160	4.31
Montenegro	20	18	0	116	154	0.57
Total	6,153	9,098	1,952	9,708	26,911	
%	22.86	33.81	7.25	36.07		

Table III.
Distribution of firms by year and country

methods section below, the second answer is the base case. Survey respondents were asked about the effect on decisions to develop new products or to manage production costs from both domestic and foreign competition; they then answered with the level of importance detailed above. The mean values for the "Domestic" variables are 2.7 and 2.6, whereas for their "Foreign" counterparts they are 1.9 and 1.8, respectively. Unfortunately, precise definitions of "domestic" and "foreign" are not found in the questionnaire, but we interpret the former to be rivals from the home national market and the latter to be outside of this.

The next two dependent variables, New Product Services and Quality Certificate, are categorical variables scoring a 1 if the respondent answered in the affirmative and 0 otherwise if his/her firm introduced a new product or service in the past five years for the first variable and if his/her firm obtained international quality certifications such as ISO 9000 for the second variable. These two variables are objective, whereas the first four are subjective. The juxtaposition of these two groups of dependent variables will allow us to say something regarding the perceptions of the competitive environment vs actual facts/

Country	No. of firms Small <20 Employees	Medium 20-99 Employees	Large 100+ Employees	Total
Albania	410	244	78	732
Belarus	365	285	198	848
Georgia	396	235	116	747
Tajikistan	313	285	138	736
Ukraine	874	605	429	1,908
Uzbekistan	435	281	210	926
Russia	761	697	653	2,111
Poland	1,098	487	345	1,930
Romania	547	466	383	1,396
Serbia	413	225	262	900
Kazakhstan	529	520	330	1,379
Moldova	377	312	198	887
Bosnia	338	226	179	743
Azerbaijan	411	312	177	900
Macedonia FYR	369	221	146	736
Armenia	498	263	135	896
Kyrgyz Republic	260	230	120	610
Estonia	325	195	142	662
Czech Republic	456	211	194	861
Hungary	551	356	244	1,151
Latvia	328	162	162	652
Lithuania	310	210	161	681
Slovak Republic	312	187	166	665
Slovenia	362	163	162	687
Bulgaria	831	636	386	1,853
Croatia	533	338	289	1,160
Montenegro	81	45	28	154
Total	12,483	8,397	6,031	26,911
%	46.39	31.20	22.41	

Table IV.
Distribution of firms by size and country

outcomes related to that competition. In other words, executives and managers may claim that competition is important, but are they responding with innovative products/services or upgrading quality? These two dependent variables proxy the actual innovation undertaken.

There are several key explanatory variables. "Float" indicates that the firm resides in a country with a floating exchange rate regime; 37.5 per cent of the firms in our sample have this characteristic. The openness of the currency regime should associate with open markets in general and hence competition. "EU" takes a value of 1 if the country is a member of the EU. Being an EU member may enhance competition via the reduction of trade, investment and regulatory barriers across markets. It may be that competition is a function of country wealth; more developed countries enjoy more competition. The variable "OECD" proxies development; it scores a 1 if the firm hails from an OECD nation. Twenty-two per cent of the observations are located in high-income nations.

Sector	Small <20	Medium 20-99	No. of firms Large 100+	Total	% of total
Other manufacturing	649	570	431	1,650	6.13
Food	1,235	1,296	1,231	3,762	13.98
Textiles	108	131	122	361	1.34
Garments	492	401	307	1,200	4.46
Chemicals	91	136	112	339	1.26
Plastics and rubber	79	104	65	248	0.92
Mineral products	91	120	133	344	1.28
Basic metals	36	40	66	142	0.53
Fabricated metals	513	426	235	1,174	4.36
Machinery/equipment	285	325	345	955	3.55
Electronics	63	65	71	199	0.74
Construction	912	1,060	721	2,693	10.01
Other services	1,770	660	349	2,779	10.33
Wholesale	2,142	911	426	3,479	12.93
Retail	2,409	1,170	600	4,179	15.53
Hotels/restaurants	727	383	205	1,315	4.89
Transportation	653	473	556	1,682	6.25
Information technology	215	106	49	370	1.37
Other	13	20	7	40	0.15
Total	12,483	8,397	6,031	26,911	100.00

Table V.
Distribution of firms by size and industry

Firm-level controls include firm size, survey year, gender of owners, firm age and the legal status of the firm. The details regarding firm size have already been noted. The year 2009 accounts for 36 per cent of the observations, while 2005 has nearly 34 per cent. In the sample, around 24 per cent of the firms have at least one female owner. Approximately, 30 per cent of the firms have been going concerns for less than 8 years, while another 38 per cent have been in existence between 8 and 15 years. Nearly 39 per cent identify as private, limited-liability corporations and 26 per cent are sole proprietorships. There are industry categorical variables for each of the 19 sectors which are omitted from the table for brevity.

Methods

We undertake two separate analyses in line with the types of dependent variables we are using. For the first set, where the response has multiple possible outcomes (1-4) to be estimated, the multinomial logistic (logit) model is appropriate (Woolridge, 2002). The equation is as follows:

$$\Pr(y = 1, 2, 3, or\ 4) = \alpha_1 Float_i + \alpha_2 EU_i + \alpha_3 OECD_i + \alpha_4 \sum_{1}^{14} Firm\ Controls_i + \alpha_5 \sum_{1}^{19} Industry\ Controls_i + Constnt + \varepsilon_i \quad (1)$$

Variable	Mean	SD	Definition
Dependent variables			
Domestic products	2.729	1.382	"Effect on decisions to develop new products: Pressure from domestic competitors"
Foreign products	1.900	1.753	"Effect on decisions to develop new products: Pressure from foreign competitors"
Domestic costs	2.636	1.575	"Effect on decisions on production costs: Pressure from domestic competitors"
Foreign costs	1.833	1.859	"Effect on decisions on production costs: Pressure from foreign competitors"
New product services	0.404	0.491	"Have you introduced a new product or service in the past three years"
Quality certificate	0.184	0.388	"Do you have an internationally recognized quality certification, e.g. ISO 9000?"
Explanatory variables			
Float	0.375	0.484	Categorical variable for floating exchange rate regime
EU	0.501	0.500	Categorical variable for EU membership
OECD	0.221	0.415	Categorical variable for OECD membership
Control variables			
Small	0.463	0.499	The firm employs fewer than 20 people
Medium	0.313	0.463	The firm employs 20-99 people
Large	0.224	0.417	The firm employs 100 people or more
Year 2002	0.229	0.419	Categorical variable for 2002
Year 2005	0.338	0.473	Categorical variable for 2005
Year 2009	0.361	0.480	Categorical variable for 2007
Female owner	0.236	0.425	The firm has at least one female owner
Firm age seven years	0.302	0.459	Firm age is under 8 years
Firm age 8 to 15 years	0.381	0.486	Firm age is 8-15 years
Publicly listed	0.068	0.252	Legal status: Firm is publicly listed
Private LLC	0.389	0.488	Legal status: Firm is a private limited liability corporation
SoleProp	0.263	0.441	Legal status: Firm is a sole proprietorship
Partnership	0.156	0.363	Legal status: Firm is a partnership
Limited partnership	0.037	0.189	Legal status: Firm is a limited liability partnership

Note: Industry categorical variables not shown for brevity; LLC = limited liability company

Table VI.
Descriptive statistics

where *i* signifies each firm-level observation. "Large" is omitted as a basis of comparison for firm size and year 2009 is omitted for survey year. "Other" is an omitted category both for legal status and for industrial sector.

For the second set of dependent variables, the possible outcomes are binary and so a logistic regression is appropriate (Woolridge, 2002). As the data are collected over time for the firms in the sample, we utilize a random-effects panel logistic model. The equation is similar to the first:

$$\Pr(y = 1) = \alpha_1 Float_i + \alpha_2 EU_i + \alpha_3 OECD_i + \alpha_4 \sum_{1}^{14} Firm\ Controls_i + \alpha_5 \sum_{1}^{19} Industry\ Controls_i + Constnt + \varepsilon_i \quad (2)$$

The panel is slightly unbalanced because of the small number of firms collected in 2007.

Prior to estimation, we examine our variables for collinearity. Table VII contains the correlation matrix of the main variables, which we review for correlations with an absolute value greater than 0.700. There is one pairwise correlation right at that threshold for Foreign Products and Foreign Costs. We expect similar findings for these two dependent variables. No other correlations above 0.700 exist among the explanatory variables, so collinearity does not appear to be a concern. Crucially, the EU and OECD variables correlate only around 0.5, so these variables are capturing different effects in our regression: country wealth vs economic union membership. The use of a Baltagi-Wu test (Levie and Autio, 2011; Baltagi and Wu, 1999) revealed no serial autocorrelation in the data. After estimation, we calculate the marginal effects for the key explanatory variables, holding the other variables constant at their mean values.

Results

Table VIII displays the results for the estimate of the perceived effect of domestic competition on decisions to develop new products. Float is positive and significant at 1 per cent for those respondents indicating that domestic competition is "Very Important". EU is negative and significant at 1 per cent for "Not Important" and positive and significant at 1 per cent for "Very Important"; these results are consistent. OECD is positive and significant at 5 per cent for "Not Important" and positive and significant at 1 per cent for both "Fairly Important" and "Very Important". This suggests a bifurcation of views among respondents in OECD countries regarding the role of domestic competition on new product development decisions. The likelihood-ratio chi-squared test is positive and significant at 1 per cent, indicating that the model fits the data well.

Our next step is to calculate the marginal effects for the key explanatory variables with statistical significance, which are not displayed for brevity. As all three key explanatory variables are categorical, the marginal effect indicates the change in likelihood of a given response if the variable goes from a 0 to a 1. For Float, the increase in likelihood that a respondent will think that domestic competition is "Very Important"

Table VII.
Correlation matrix

	1	2	3	4	5	6	7	8	9
Domestic products	1.000								
Foreign products	0.374	1.000							
Domestic costs	0.597	0.281	1.000						
Foreign costs	0.277	0.724	0.509	1.000					
New product services	0.044	0.088	0.024	0.061	1.000				
Quality certificate	−0.012	0.092	−0.008	0.077	0.138	1.000			
Float	0.083	0.101	0.107	0.123	−0.007	0.056	1.000		
EU	0.130	0.139	0.119	0.131	−0.062	0.105	0.388	1.000	
OECD	0.123	0.118	0.122	0.121	−0.018	0.064	0.565	0.532	1.000

Variables	(1) Not important	(2) Fairly important	(3) Very important
Float	0.084 (0.057)	0.028 (0.047)	0.134*** (0.048)
EU	−0.371*** (0.057)	0.032 (0.046)	0.328*** (0.048)
OECD	0.178** (0.079)	0.583*** (0.062)	0.581*** (0.062)
Small	−0.185*** (0.062)	−0.010 (0.053)	0.053 (0.055)
Medium	−0.203*** (0.061)	0.097* (0.052)	0.146*** (0.054)
Year 2002	0.115 (0.075)	0.372*** (0.062)	−0.075 (0.065)
Year 2005	−0.200*** (0.061)	0.126** (0.050)	0.188*** (0.051)
Female owner	0.008 (0.057)	0.069 (0.048)	0.096** (0.049)
Firm age seven years	0.007 (0.060)	−0.021 (0.050)	−0.017 (0.052)
Firm age 8 to 15 years	−0.074 (0.055)	−0.009 (0.046)	−0.039 (0.047)
Publicly listed	−0.397*** (0.109)	0.171* (0.097)	0.416*** (0.101)
Private LLC	−0.371*** (0.080)	0.287*** (0.072)	0.361*** (0.077)
SoleProp	−0.353*** (0.084)	0.273*** (0.075)	0.380*** (0.079)
Partnership	−0.268*** (0.089)	0.296*** (0.079)	0.465*** (0.083)
Limited partnership	−0.088 (0.859)	0.106 (0.699)	0.079 (0.943)
Constant	0.750 (0.826)	0.549 (0.675)	−1.432 (0.923)
Total observations			24,751
LR Chi-squared for the model			1856.850***

Notes: Standard errors in parentheses; the number of observations is the total; LR = likelihood ratio; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; base case is "Slightly Important", which is 2 on a 1-4 scale: 1-Not important; 4-Very important; industry controls are not shown for brevity

Table VIII. Multinomial logistic estimate of domestic competition on decisions to develop new products

is 2.0 per cent; respondents in countries with floating exchange rate regimes are 2 per cent more likely to think domestic competition is very important for new product development decisions that those in countries not having floating exchange rates. For EU, the likelihood that someone will think that domestic competition is "Not Important" will decline by 6.2 per cent, but the likelihood that an EU respondent will agree that domestic competition is very important will climb by 8.0 per cent vs non-EU respondents. The effects for OECD are −3.2, 6.1 and 5.0 per cent, respectively.

Table IX shows the findings from the regression of foreign competition on the decision to develop new products. Float is again positive and significant at 1 per cent for "Very Important". EU is negative and significant at 1 per cent for "Not Important" and positive and significant at 1 per cent for both "Fairly Important" and "Very Important". OECD is negative and significant at 1 per cent for "Not Important" but is otherwise insignificant. The marginal effect of Float is 2.2 per cent. For EU, the marginal effects are −12.7, 5.0 and 7.4 per cent, respectively. OECD has a marginal effect of −4.2 per cent.

We next turn to decisions about production costs. Table X presents the results concerning the effects of domestic competition on managing production costs. Float is positive and significant at 1 per cent for "Very Important". EU repeats the pattern of the previous table: negative and significant at 1 per cent then positive and significant at 1 per cent for the remaining two categories. OECD is also positive and significant at 1 per cent for both "Fairly Important" and "Very Important". The marginal effect of Float is 3.6 per cent. EU has marginal effects of −6.0 per cent for "Not Important", no effect (0 per cent) for "Fairly Important" and 8.0 per cent for

Variables	(1) Not important	(2) Fairly important	(3) Very important
Float	−0.036 (0.046)	0.071 (0.054)	0.182*** (0.057)
EU	−0.360*** (0.046)	0.264*** (0.054)	0.482*** (0.057)
OECD	−0.209*** (0.058)	0.015 (0.065)	0.005 (0.066)
Small	0.407*** (0.052)	−0.319*** (0.060)	−0.400*** (0.063)
Medium	0.218*** (0.052)	−0.173*** (0.058)	−0.163*** (0.060)
Year 2002	0.052 (0.060)	0.282*** (0.071)	0.092 (0.076)
Year 2005	0.038 (0.049)	0.147** (0.058)	0.216*** (0.060)
Female owner	0.252*** (0.047)	0.046 (0.057)	0.146** (0.058)
Firm age seven years	−0.004 (0.049)	−0.011 (0.058)	−0.160*** (0.061)
Firm age 8 to 15 years	0.020 (0.045)	−0.040 (0.052)	−0.125** (0.054)
Publicly listed	−0.370*** (0.095)	0.085 (0.111)	0.126 (0.116)
Private LLC	−0.339*** (0.072)	0.105 (0.086)	0.133 (0.091)
Sole prop	−0.241*** (0.074)	0.060 (0.090)	0.071 (0.096)
Partnership	−0.281*** (0.077)	0.117 (0.093)	0.185* (0.098)
Limited partnership	−0.040 (0.112)	0.077 (0.136)	0.023 (0.145)
Other Mfg	0.324 (0.919)	−1.082 (0.797)	−0.446 (0.875)
Constant	0.604 (0.920)	1.145 (0.799)	0.249 (0.877)
Total observations			24,315
LR Chi-squared for the model			3703.930***

Table IX.
Multinomial logistic estimate of foreign competition on decisions to develop new products

Notes: Standard errors in parentheses; the number of observations is the total; Mfg = manufacturing ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; base case is "Slightly Important", which is 2 on a 1-4 scale: 1-Not important, 4-Very important; industry controls are not shown for brevity

"Very Important". OECD has marginal effects of 4.6 per cent for "Fairly Important" and 4.4 per cent for "Very Important".

Table XI contains the findings for the effects of foreign competition on managing production costs. Here Float is negative and significant at 1 per cent for "Not Important", positive and significant at 10 per cent for "Fairly Important" and positive and significant at 10 per cent for "Very Important". EU is again consistent: negative and significant at 1 per cent for "Not Important" and positive and significant at 1 per cent for the other two categories. OECD is negative and significant at 5 per cent for "Not Important". Float has marginal effects of −5.0, 1.9 and 3.1 per cent, respectively. EU has marginal effects of −12.7, 4.7 and 7.9 per cent. The marginal impact of OECD is −2.6 per cent.

The story thus far appears to be that being a firm in an EU member nation correlates more strongly with impressions of competition on new product development and product costs than either a floating exchange regime or OECD membership. We observe a more consistent pattern of results with the EU variable, as well as more occurrences of statistical significance. Perhaps most important, the marginal effect of the EU variable is greater than either Float or OECD. The impact of EU ranges from −6.0 per cent to nearly −13 per cent when the effect is negative and around 8 per cent when the effect is positive. Float's impact is generally 2-3 per cent whereas OECD is 4-5 per cent in absolute terms.

Whereas the preceding four tables displayed perceptions, Table XII shows what is actually happening. There is a surprise: EU is negative and significant at 1 per cent for the introduction of new products/services in the past three years. Both Float and OECD

Variables	(1) Not important	(2) Fairly important	(3) Very important
Float	−0.027 (0.055)	0.026 (0.048)	0.184*** (0.049)
EU	−0.256*** (0.055)	0.095** (0.047)	0.390*** (0.049)
OECD	0.041 (0.076)	0.404*** (0.062)	0.423*** (0.062)
Small	−0.163*** (0.061)	−0.041 (0.054)	−0.016 (0.056)
Medium	−0.171*** (0.060)	0.062 (0.053)	0.107* (0.055)
Year 2002	0.079 (0.073)	0.129** (0.063)	−0.151** (0.066)
Year2005	−0.096 (0.059)	0.064 (0.051)	0.168*** (0.052)
Female owner	−0.011 (0.056)	−0.009 (0.048)	0.077 (0.049)
Firm age seven years	−0.026 (0.058)	−0.086* (0.051)	−0.097* (0.053)
Firm age 8 to 15 years	−0.117** (0.054)	−0.042 (0.046)	−0.123*** (0.048)
Publicly listed	−0.387*** (0.108)	0.108 (0.100)	0.223** (0.103)
Private LLC	−0.431*** (0.080)	0.155** (0.075)	0.184** (0.078)
SoleProp	−0.365*** (0.083)	0.162** (0.077)	0.219*** (0.081)
Partnership	−0.353*** (0.088)	0.212*** (0.081)	0.334*** (0.085)
Limited partnership	−0.155 (0.121)	−0.018 (0.113)	−0.187 (0.121)
Constant	0.282 (0.920)	0.762 (0.675)	−1.192 (0.923)
Total observations			24,555
			1957.060***

Notes: LR chi-squared for the model; standard errors in parentheses; the number of observations is the total; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; base case is "Slightly Important", which is 2 on a 1-4 scale: 1-Not important

Table X. Multinomial logistic estimate of domestic competition on managing production costs

are positive and significant at 1 per cent, the desired outcome. Float has a marginal effect of 2.53 per cent, meaning that the likelihood of introducing new products/services over the past 3 years is 2.53 per cent higher for firms residing in floating exchange rate regimes vs those not residing. In contrast, EU membership reduces the likelihood by 10.6 per cent. The marginal effect of OECD is 6.3 per cent.

The second column details the regression findings for obtaining internationally recognized quality certification. Here, all three key explanatory variables are positive and significant at 1 per cent. The marginal effect of Float is 3.1 per cent and of OECD is 2.3 per cent, whereas for EU, it is 5.9 per cent. This is more in line with the results obtained earlier.

Discussion

The purpose of this paper is to investigate the impact of economic development, exchange rate regime and EU membership on firms' recognition of competition and their actual innovations in the CEE and surrounding Central Asian republics. We organize a summary of our findings in the Table below to guide our conversation. The first four tables represent the subjective results of managerial perceptions while "Table XII N" is the actual outcome for introducing new products and services and "Table XII Q" is the actual outcome for obtaining international quality certification. We display the percentage statistical significance (p-value) or 0 for an insignificant result across the categories "Not Important", "Fairly Important" and "Very Important" in parentheses for the multinomial regressions (Table XIII).

Note that we expected country wealth, a floating exchange regime and EU membership to increase both the perception of competitive pressure as well as

Variables	(1) Not important	(2) Fairly important	(3) Very important
Float	−0.145*** (0.046)	0.095* (0.054)	0.215*** (0.058)
EU	−0.322*** (0.047)	0.279*** (0.055)	0.589*** (0.059)
OECD	−0.149** (0.059)	−0.039 (0.065)	0.027 (0.068)
Small	0.413*** (0.053)	−0.254*** (0.060)	−0.361*** (0.064)
Medium	0.227*** (0.052)	−0.184*** (0.058)	−0.147** (0.061)
year2002	0.113* (0.060)	0.198*** (0.071)	0.007 (0.078)
Year 2005	0.053 (0.049)	0.030 (0.058)	0.157** (0.062)
Female owner	0.223*** (0.047)	0.027 (0.057)	0.147** (0.059)
Firm age seven years	0.014 (0.049)	0.002 (0.058)	−0.161** (0.063)
Firm age 8 to 15 years	0.061 (0.045)	−0.011 (0.052)	−0.117** (0.055)
Publicly listed	−0.319*** (0.097)	0.210* (0.112)	0.179 (0.119)
Private LLC	−0.343*** (0.072)	0.100 (0.087)	0.072 (0.094)
SoleProp	−0.280*** (0.074)	0.061 (0.091)	0.015 (0.099)
Partnership	−0.232*** (0.078)	0.235** (0.094)	0.253** (0.101)
Limited partnership	−0.110 (0.109)	−0.097 (0.137)	−0.238 (0.149)
Constant	−0.254 (0.920)	0.773 (0.687)	−0.500 (0.830)
Total observations			24,166
LR chi-squared for the model			3970.000***

Table XI. Multinomial logistic estimate of foreign competition on managing production costs

Notes: Standard errors in parentheses; the number of observations is the total; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; base case is "Slightly Important", which is 2 on a 1-4 scale: 1-Not important; 4-Very important; industry controls are not shown for brevity

innovation as measured by new product introduction and quality enhancement. The strongest possible statistical response in support of these hypotheses would be (−1, 1, 1 per cent) for the multinomial logit regressions and 1 per cent for the panel logits, with the marginal effects giving an actual impact on the probability.

We begin with the clearest findings: both *H2* and *H4* are supported. There is merit to the idea that country wealth correlates with innovation, and this is not surprising. Also, firms located in countries with floating exchange regimes tend to introduce new products and services and to seek international quality certification. While this may not be surprising, there may be an empirical contribution here by linking national exchange rate regimes to firm-level innovation for this region of the world.

There is consistent support for both *H3* and *H5*, though more ambiguous for the former than the latter. For the subjective measures, a floating exchange rate regime correlates with the statement that competitive pressure is "Very Important", but there is no significance for the other categories in the first three tables. The effect of foreign pressure on managing production costs registers as negative at 1 per cent for "Not Important" as hoped, but is positive at only 10 per cent for "Fairly Important". The findings for *H5* are stronger, with the only deviation from the expected pattern being the lack of significance for the "Fairly Important" category on Table VIII. We can say with some confidence that the openness measured by EU membership and floating exchange rate regimes manifests itself in the perceptions of competition among firms in those environments. This too may be an empirical contribution.

Variables	(1) New product services	(2) Quality certificate
Float	0.116*** (0.042)	0.291*** (0.054)
EU	−0.484*** (0.041)	0.560*** (0.053)
OECD	0.288*** (0.054)	0.222*** (0.066)
Small	−0.817*** (0.050)	−1.973*** (0.079)
Medium	−0.297*** (0.046)	−0.923*** (0.059)
Year 2002	−0.129** (0.054)	−0.853*** (0.075)
Year 2005	−0.372*** (0.044)	−0.981*** (0.064)
Female owner	0.064 (0.041)	−0.042 (0.053)
Firm age seven years	−0.097** (0.044)	−0.083 (0.058)
Firm age 8 to 15 years	−0.023 (0.039)	0.033 (0.049)
Publicly listed	0.228*** (0.086)	0.401*** (0.104)
Private LLC	0.293*** (0.066)	0.304*** (0.085)
SoleProp	0.126* (0.068)	−0.095 (0.093)
Partnership	0.163** (0.071)	0.333*** (0.093)
Limited partnership	0.103 (0.102)	0.217* (0.131)
Constant	0.607 (0.595)	−1.184 (0.786)
Observations	26,911	26,911
Wald chi-squared	825.140***	966.07***

Notes: Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; industry controls not shown for brevity

Table XII. Panel logistic estimate of introduction of new products and obtaining international quality certificates

	Table 6	Table 7	Table 8	Table 9	Table 10 N	Table 10 Q
H1. OECD	(5%, 1%, 1%)	(−1%, 0,0)	(0, 1%, 1%)	(−1%, 0, 0)		
H2. OECD					1%	1%
H3. Float	(0, 0, 1%)	(0, 0, 1%)	(0, 0, 1%)	(−1%, 10%, 1%)		
H4. Float					1%	1%
H5. EU	(−1%, 0, 1%)	(−1%, 1%, 1%)	(−1%, 1%, 1%)	(−1%, 1%, 1%)		
H6. EU					−1%	1%

Table XIII. Summary of results

H1 is more complicated. The first striking result is that all three categories register as positive and significant, creating a contradiction among perceptions. Another finding of note is the inconsistency surrounding the "Not Important" category across the four tables. Tables VIII and X are otherwise broadly consistent with one another, as are Tables IX and XI, but this only leads to further questions. Firms in OECD countries apparently feel that domestic competition is "Very Important" for new product development and managing production costs, but they do not feel that way about foreign competition. These puzzles are grist for future avenues of research. It may be that a more nuanced industry analysis will reveal the answers. Suffice to say *H1* is at best partially supported.

The most interesting finding revolves around *H6* due to the split among actual outcomes. Firms in EU nations are likely to obtain international quality certification, but they are not likely to have introduced new products or services in the past three years. The former agrees with the strong results that EU firms perceive both domestic and foreign pressure, while the latter conflicts. This dichotomy is highlighted by the

marginal effects; being an EU member firm reduces the likelihood of introducing new products/services by nearly 11 per cent, while it increases the likelihood of earning an international quality certification by nearly 6 per cent. Again, this result is an empirical contribution to the extant literature regarding competition and institutional factors in this region, while deeper analysis may yet untie the knot.

Clearly, there are policy implications concerning the negative correlation between EU membership and the introduction of new products and services. The data set contains 14 countries that are both EU members and also located in Central and Eastern Europe; hence, each country needs policy advice particular to its needs. Despite this, some general recommendations are in order. A starting point for improving product innovation may be with public–private partnerships focused upon innovation within SMEs; this has been effective in other parts of the world (Abe *et al.*, 2012). In particular, government agencies could increase the cooperation between public research and development efforts and SMEs poised to commercialize them. In addition, more investment in human resources, particularly in science, technology, engineering and mathematics education, would be beneficial. Such efforts are known and underway in every EU country; it is a matter of increasing attention and resources and allocating them more effectively.

Our study has examined this relationship between country-level measures of market openness and firm-level perceptions of competition and actual innovation. Some of our findings are without controversy, such as that country wealth correlates with innovation. Other findings may be interesting, such as the positive correlation between exchange rate regime and innovation. The most benefit, however, may be in the findings that pose questions. We hope that our work will be a starting point for untangling the myriad factors influencing competition and innovation in the CEE and surrounding area.

Note

1. There is another category for "Don't Know", but only a half-per cent (0.5per cent) of firms answered this way.

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