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Inward FDI and entrepreneurship rate: Empirical evidence on selected effects of FDI in Visegrad countries[1]

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Abstract

The main objective of the article is to verify the impact of inward FDI on domestic entrepreneurship in four Visegrad countries in the years 2000-2012. The reliable sources of data were used, among them statistical data of Eurostat, and UNDP. The relationship between FDI and entrepreneurship can be confirmed as basing on the OLS regression there is a statistically significant positive correlation between the stock FDI and the entrepreneurship rate, however the impact of FDI was different in different analysed countries – the strongest in Slovakia, while the weakest in Hungary.

Keywords: FDI, V4 countries, internationalisation, entrepreneurship.
JEL classification: C33, F21, F23, L26.

Introduction

Foreign direct investment (FDI) has been investigated by many scholars for decades. Literature offers numerous concepts, models and theories explaining FDI inflows and outflows. The most popular classification of these theories divides them into three groups [Kilic, Bayar, Arica 2014, pp. 8-15], namely macro-

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level theories, micro-level theories as well as the development theories, which combine both macro- and micro-aspects. Trąpczyński [2015] notices that the FDI-related theoretical concepts at the level of host countries are diversified and multifaceted, including such topics as location determinants [Wach, Wojciechowski 2014, pp. 157-170; 2016; Wojciechowski 2013, pp. 7-22] or effects of FDI for home and host countries [Marona, Bieniek 2013, pp. 333-350].

The main purpose of this article is to explore the impact of inward FDI on entrepreneurship in V4 countries. The reliable sources of data were used, among them statistical data of Eurostat and the UNDP. All calculations and estimation were conducted in R-Studio® and JMulti® computer professional software.

1. Theoretical background

The impact of FDI on economic growth has been a topical issue for several decades [Beugelsdijk, Smeets, Zwinkels 2008, pp. 452-472]. Empirical evidence on the relationship between FDI and economic growth is still inconclusive, and this topic is often undertaken by researchers. Recent studies suggest that the presence of FDI could under appropriate conditions positively or negatively impact economy of host country. It depends on structure of FDI inflow, types of investment, technological gap, productivity and many other determinants. Most researchers perform analyses at the macroeconomic level without taking into account industry or even microeconomic conditions which could foster or limit positive spillover effects. Hanousek, Kocenda and Maurel [2010] prepared a review of empirical investigations into the analysis on impact of FDI on productivity, spillover effects in European emerging markets. Once study results revealed differential economic impacts between horizontal FDI (market seeking) and vertical FDI (efficiency seeking) [Beugelsdijk, Smeets, Zwinkels 2008, pp. 461].

Literature includes numerous examples of the use of quantitative methods in the context of these relationships. The prior research results indicate a two-way Granger causality in the sense of the size of FDI and GDP [Chloe 2003, pp. 55-57]. The analyses carried out using panel models allow to investigate that the impact of FDI on the growth of GDP depends on the economic conditions of the host country [Bengoa, Sanchez-Robles 2003, pp. 529-545]. The recent research using cointegrated autoregressive models for the Polish economy suggest a positive impact of FDI on GDP, unemployment and foreign trade [Marona, Bieniek 2013, p. 340; Balcerzak, Żurek 2010, p. 20]. The problem of the impact of FDI on the economy requires further in-depth research because results of numerous of studies on the impact of FDI on the economy are inconsistent (Table 1).

Table 1. A Review of the selected empirical research results on FDI effects on host economy in CEECs

No.	Authors	Aims of study	Data	Methods
1	Ayyagari & Kostova [2010]	Analyses of the impact of FDI on local entrepreneurship	1994-2000: Czech Republic	Regression
2	Balcerzak & Żurek [2010]	Analysis of the impact of FDI on the Polish economy	1995-2010: Poland	VAR
3	Hanousek, Kocenda & Maurel [2010]	Analysis on impact of FDI on productivity, spillover effects in European emerging markets	Review of empirical research: 27 emerging European countries	
4	Iwasaki, Csizmadia, Illessy, Mako & Szanyi [2011]	Analysis on impact of FDI on, spillover effects by focusing on the multi-layered structure of industrial classifications	2002-2005: Hungary	Panel data models
5	Oztruk & Acaravci [2012]	Causality results reveal that there is causal relationship between FDI, export and economic growth in four out of ten countries considered.	1994-2008: Bulgaria, V4, Estonia, Latvia, Lithuania, Romania, Slovenia	ARDL model, Granger causality, cointegration tests
6	Eastrin & Uvalic [2013]	Analysis on impact of FDI on structural changes and key economic issues	1990-2011: Balkan countries, SEE and V4	Panel data models
7	Fidrmuc, Klein, Price & Wörgötter [2013]	FDI as a factor that facilitate recovery after strong but short recession in 2009	2000-2011: Slovakia	Trend analysis regression
8	Marona & Bieniek [2013]	The paper discusses the influence of foreign direct investment on the economic situation of Poland with a special attention to: GDP, export, import, research and development, expenditure and unemployment	1996-2010: Poland	VECM, Granger causality
9	Danakol, Estrin, Reynolds, Weitzel [2013]	Analyses of the impact of FDI on local entrepreneurship	2000-2010: 70 GEM countries	OLS, Regression
10	Albulescu and Tămăşilăa [2014]	Analyses of the impact of FDI on local entrepreneurship	2005-2011: 16 European countries	Regression
11	Zysk & Śmiech [2014]	Impact of FDI on trade (export, import)	1990-2011: V4	Gravity model
12	Pawłowska & Wojciechowski [2015]	Impact of FDI on selected macroeconomic indicators	2000-2012: V4	OLS, VAR, VECM,

From the perspective of international business, FDI is the most advanced entry mode into international markets [Marona, Bieniek 2013, p. 340; Balcerzak, Żurek 2010, p. 20], being a sign of international entrepreneurship [Daszkiewicz, Wach 2014]. The literature suggests that FDI could either stimulate or inhibit local entrepreneurship [Danahol et al. 2013], which is understood widely as doing business by any entities, mainly private ones, in the local environment. Let us focus on this and elaborate more in detail. We assume that inward FDI may affect private entrepreneurship in the host economy by stimulating cooperation between multinational corporations and local firms. Ayyagari and Kostova

[2010] found that in the Czech Republic FDI has an unambiguous positive impact on entry rates of domestic firms through both intra-industry (horizontal) and inter-industry (vertical) spillovers. Albulescu and Tămăşilăa [2014] showed that the impact of FDI on the overall entrepreneurial activity is relatively poor, however, the findings are more conclusive if analysed separately between necessity and opportunity entrepreneurs (using GEM data for necessity-based and opportunity-based entrepreneurship). They used the intentions of the potential entrepreneurs, what made the research quite interesting, nevertheless it would be good to check whether there is such a relationship between the inward FDI and the actual entrepreneurship rare measured as the number of registered firms per 1000 inhabitants.

2. Research methodology

The main objective of the article is to verify the impact of inward FDI on domestic entrepreneurship in four V4 countries in the years 2000-2012. The secondary objective of this article is to analyse the effects of inward FDI on economic situation in V4 countries. In the empirical part of this article it was decided to test following hypothesis:

H: Inward FDI impacts positively the private entrepreneurship in the host economy measured by the entrepreneurship rate in Visegrad countries.

In this paper we analysed the stock inward FDI into V4 countries from other EU-15 countries in the years 2000-2012. FDI can be researched in two ways as inflows and outflows as well as outward and inward stocks. We selected stock inward data, in order to reduce missing data due to minus flows logarithm, and this solution is also widely applied in various empirical research [Nakamura, Olsson, Lönnborg 2012]. Subasat and Bellos [Subasat, Bellos 2013] in their gravity model analysis "use FDI stocks because stocks are more stable than flows" as they underline. It is debatable which measure of GDP (in current prices, in constant prices or in purchasing power parity) is the most adequate for gravity models, nevertheless we decided to use GDP per capita.

Various methods of econometric modelling were applied in this study, including (i) the OLS regressions, (ii) Granger causality analysis, (iii) stationary analysis such as ADF and KPSS, (iv) cointegration test – Johansen test and (v) vector error correction model (VECM).

$FDIstock_{ij,t}$ as the dependent variable was selected as a factor whose presence potentially affects the selected macroeconomic categories in the host coun-

tries, including the entrepreneurship ratio expresses the number of active businesses per thousand inhabitants (Table 2).

Table 2. List of variables used in the study

Variable	Explanation	Unit	Source of data
$FDIstock_{i,t}$	stock FDI in *i*-V4' in *t*-period	million EUR	EUROSTAT (bop_fdi_pos)
$FDIflow_{i,t}$	FDI flow in *i*-V4' in *t*-period	million EUR	EUROSTAT (tec00107)
$GDPhost_{i,t}$	nominal GDP in *i*-V4' country in *t*-period	million EUR	EUROSTAT (nama_aux_gph)
$GDPhost\ rate_{i,t}$	rate of nominal GDP in *i*- V4in *t*-period	% rate	EUROSTAT (nama_aux_gph)
$UNEMP_{i,t}$	annual average total unemployment rate based on monthly seasonally adjusted data in to *i*-V4in *t*-period	% rate	EUROSTAT (une_rt_m)
$R\&D_{i,t}$	total intramural R&D expenditure (GERD) by sectors of performance in GDP in *i*-V4in *t*-period	% rate	EUROSTAT (tsc00031)
$LABPROD_{i,t}$	real labour productivity per hour worked in euro in *i*-V4in *t*-period	EUR/h	EUROSTAT (nama_aux_lp)
$EXP_{i,t}$	value of export of goods and services from *i*-V4in *t*-period	million EUR	EUROSTAT (tet00003)
$IMP_{i,t}$	value of import of goods and services to *i*-V4in *t*-period	million EUR	EUROSTAT (tet00004)
$HDI_{i,t}$	HDI index in *i*-V4' in *t*-period	index (1-100)	Human Development Reports UNDP
$ENT_{i,t}$	number of active enterprises in thousand/1000 inhabitants in *i*-V4' in *t*-period	index (1-100)	EUROSTAT (bd_9n, bd_9n.rev2)

Source: Based on the data of Eurostat [2015] and the UNDP [2016].

3. Results and discussion

The results of OLS regression can bring new perspectives and interpretations of the effects of FDI on economies of V4 countries (Table 3). Cumulative FDI is positively correlated with nominal GDP per capita and the share of the R&D in GDP, as well as labour productivity and exports in total, and exports to other V4 countries. Cumulative FDI correlates negatively with the unemployment rate. We found a statistically significant positive correlation between the stock FDI and HDI as well as entrepreneurship ratio. It should be noted that the impact of FDI on individual categories was different in different analysed countries. The impact of FDI on GDP per capita was the highest in Slovakia (0.2514) and the lowest in Poland (0.03272). The impact of FDI on exports ranged from 0.8810 in Poland to 1.2859 in Slovakia.

The value of FDI flows in a given year seemed to have no statistically significant impact on macroeconomic variables considered in this study. Only in the case of Poland, a statistically significant positive relationship between FDI inflow in *t* year and the change in GDP in the same year was found.

The higher share of FDI stock to GDP, the higher the nominal GDP per capita (the highest in the Czech Republic, the lowest in Hungary). A strong statistically significant negative relationship between stock FDI and the unemployment rate was found in Poland and Slovakia. It is necessary to remember that during the analysed period, the unemployment rate increased significantly, and we might assume that the regression is sham. Furthermore, significant correlations between stock FDI and the R&D/GDP as well as labour productivity were found. The impact of FDI/GDP on labour productivity was the strongest in the Czech Republic, while the weakest in Hungary. In Poland and Slovakia, the strength of this relationship was relatively high. We found a significant positive relationship between FDI stock and exports in all countries, and imports in three out of four countries, except for Poland. FDI/GDP affects HDI the strongest in Poland, while the least in the Czech Republic. It is worthy to note that the increases in FDI/GDP was accompanied by an increase in the entrepreneurship ratio (the strongest in Slovakia, the weakest in Hungary).

The higher stock FDI per capita, the higher on average nominal GDP per capita, however it affected the most in Poland and the least in Hungary. The increase in FDI per capita was accompanied by a decline in the unemployment rate, and what is more, in Poland a decline was the greatest. The higher stock FDI per capita, the higher R&D/GDP as well as the higher labour productivity. The impact of stock FDI on export was found in all V4 countries and on import in three of them, excluding Poland. The growth of stock FDI was accompanied by the gradual improvement in HDI (strong positive correlation) and by the increase in the entrepreneurship index.

Table 3. Selected OLS regressions explaining FDI intensity impact on the host economy

Independent variable	Dependent variable	Poland				Czech Republic				Slovakia				Hungary			
		beta (X)	R2	F-stat p	DW	beta (X)	R2	F-stat p	DW	beta (X)	R2	F-stat p	DW	beta (X)	R2	F-stat p	DW
Total Inward Stock FDI in each V4-country from all World	Nominal GDP per capita (in EUR)	**0.03720**	92%	0.000	2.036	**0.1118**	95%	0.000	1.621	**0.2514**	99%	0.000	1.229	**0.0932**	83%	0.000	1.638
	GDP at market prices y/y	**0.00000**	1%	0.776	1.379	−0.0001	22%	0.102	1.462	0.0000	0%	0.893	1.564	**−0.0001**	37%	0.026	1.793
	Unemployment rate by sex and age groups − annual average, total	**−0.00010**	73%	0.000	0.764	**0.0000**	39%	0.023	1.099	**−0.0002**	70%	0.000	0.642	**0.0001**	72%	0.000	0.634
	Total intramural R&D expenditure (GERD) as %GDP	**0.00000**	64%	0.001	0.447	**0.0000**	69%	0.000	0.693	0.0000	3%	0.556	0.435	**0.0000**	58%	0.002	0.552
	Real labour productivity per hour worked	**0.00002**	94%	0.000	1.042	**0.0000**	90%	0.000	0.613	**0.0001**	97%	0.000	1.194	**0.0001**	88%	0.000	0.970
	Exports of goods and services (in million EUR)	**0.88100**	96%	0.000	2.455	**0.9513**	95%	0.000	1.765	**1.2859**	95%	0.000	1.197	**1.1039**	89%	0.000	2.249
	Imports of goods and services (in million EUR)	0.50297	25%	0.082	2.418	**0.8390**	94%	0.000	1.966	**1.2229**	96%	0.000	1.540	**0.9389**	86%	0.000	2.502
	HDI [Human Development Reports, hdr.undp.org]	**0.00000**	93%	0.000	1.680	**3.0007**	79%	0.000	0.647	**0.0000**	79%	0.000	0.411	**0.0000**	88%	0.000	1.464
	Number of active enterprises per 1000 inhabitants	**0.00008**	96%	0.000	1.518	**0.0002**	61%	0.002	0.555	**0.0009**	93%	0.000	1.244	**0.0002**	55%	0.004	1.443
Total Inward Flow FDI in each V4-country from all World	Nominal GDP per capita (EUR)	0.15570	12%	0.250	0.454	−0.2378	4%	0.516	0.232	−0.7181	5%	0.478	0.220	0.2116	10%	0.301	0.262
	GDP at market prices y/y	**0.00034**	60%	0.002	1.880	0.0003	7%	0.375	1.303	0.0012	12%	0.236	1.777	0.0000	0%	0.908	1.232
	Unemployment rate by sex and age groups − annual average, total	−0.00057	24%	0.089	0.492	0.0000	0%	0.874	0.747	0.0001	0%	0.909	0.296	0.0002	6%	0.433	0.269
	Total intramural R&D expenditure (GERD) as %GDP	0.00000	1%	0.741	0.227	0.0000	0%	0.936	0.261	0.0000	1%	0.764	0.445	0.0000	13%	0.226	0.420
	Real labour productivity per hour worked	0.00007	8%	0.358	0.208	−0.0001	4%	0.538	0.179	−0.0002	2%	−0.070	0.171	0.0001	14%	0.207	0.177
	Exports of goods and services (in million EUR) r	3.70811	13%	0.235	0.328	−1.2289	1%	0.696	0.205	−1.8253	1%	0.732	0.213	2.9693	15%	0.199	0.274
	Imports of goods and services (in million EUR)	−0.16584	0%	0.963	1.987	−1.1136	2%	0.690	0.239	−1.4450	1%	0.775	0.214	2.5787	15%	0.196	0.336
	HDI	0.00000	12%	0.240	0.379	0.0000	3%	0.576	0.273	0.0000	15%	0.192	0.458	0.0000	4%	0.491	0.213
	Number of active enterprises per 1000 inhabitants	0.00025	7%	0.372	0.183	−0.0010	11%	0.277	0.335	−0.0027	5%	0.486	0.284	0.0001	0%	0.868	0.457
Total Inward Stock FDI in each V4-country from all World / each V4-country nominal current prices GDP	Nominal GDP per capita (in EUR)	**18347**	76%	0.000	1.891	**32540**	83%	0.000	2.248	**23968**	77%	0.000	0.474	**10930**	41%	0.018	1.126
	GDP at market prices y/y	3.08296	2%	0.617	1.420	−17.4369	25%	0.084	1.400	4.3654	2%	0.621	1.591	**−22.1415**	49%	0.008	1.756
	Unemployment rate by sex and age groups - annual average, total	**−41.85400**	61%	0.002	0.883	−6.9190	26%	0.073	1.231	**−20.5619**	64%	0.001	0.777	**17.9208**	72%	0.000	1.338
	Total intramural R&D expenditure (GERD) as %GDP	**0.82604**	50%	0.007	0.424	**1.9825**	68%	0.001	0.953	−0.0424	0%	0.866	0.422	**1.0409**	62%	0.001	0.872
	Real labour productivity per hour worked	**11.46370**	90%	0.000	2.180	**14.371**	82%	0.000	1.363	**11.6572**	88%	0.000	0.880	**6.9517**	51%	0.006	0.881
	Exports of goods and services (in million EUR)	**448649**	85%	0.000	2.256	**280015**	84%	0.000	2.463	**120901**	71%	0.000	0.615	**150821**	60%	0.002	1.767
	Imports of goods and services (in million EUR)	277822	26%	0.075	2.478	**245533**	83%	0.000	2.491	**116232**	74%	0.000	0.696	**122312**	53%	0.005	1.703
	HDI	**0.19171**	84%	0.000	1.931	**0.0903**	74%	0.000	1.119	**0.1236**	47%	0.010	0.265	**0.1234**	61%	0.002	1.411
	Number of active enterprises in t/1000 pop	**40.37410**	86%	0.000	1.931	**68.547**	60%	0.002	0.809	**88.1813**	69%	0.000	0.457	**30.8353**	31%	0.050	1.342
Total Inward Stock FDI in each V4-country from all World per capita	Nominal GDP per capita (in EUR)	**1.43377**	92%	0.000	2.079	**1.187**	96%	0.000	1.812	**1.3561**	99%	0.000	1.197	**0.9168**	83%	0.000	1.601
	GDP at market prices y/y	0.00013	0.8%	0.767	1.380	−0.0006	21%	0.111	1.449	0.0001	0%	0.887	1.564	**−0.0011**	38%	0.026	1.797
	Unemployment rate by sex and age groups - annual average, total	**−0.00327**	73%	0.000	0.780	**−0.0003**	40%	0.021	1.111	**−0.0011**	70%	0.000	0.645	**0.0011**	73%	0.000	0.648
	Total intramural R&D expenditure (GERD) as %GDP	**0.00007**	63%	0.001	0.443	**0.0001**	68%	0.001	0.678	0.0000	3%	0.565	0.435	**0.0001**	59%	0.002	0.561
	Real labour productivity per hour worked	**0.00083**	94%	0.000	1.052	**0.0005**	91%	0.000	0.658	**0.0006**	97%	0.000	1.211	**0.0005**	88%	0.000	0.929
	Exports of goods and services (in million EUR)	**33.83640**	96%	0.000	2.475	**10.0748**	95%	0.000	1.786	**6.9319**	95%	0.000	1.180	**10.8914**	89%	0.000	2.284
	Imports of goods and services (in million EUR)	19.51240	25%	0.078	2.421	**8.8866**	94%	0.000	1.989	**6.5942**	96%	0.000	1.521	**9.2539**	87%	0.000	2.498
	HDI	**0.00001**	93%	0.000	1.761	**0.0000**	80%	0.000	0.669	**0.0000**	79%	0.766	0.409	**0.0000**	88%	0.000	1.481
	Number of active enterprises per 1000 inhabitants	**0.00301**	96%	0.000	1.546	**0.0023**	60%	0.560	0.547	**0.0051**	93%	0.000	1.219	**0.0025**	55%	0.004	1.450

Source: Own calculations in JMulti.

Secondly, we decided to investigate static and dynamic relations between pairs of variables (FDI stock, flow, FDI/GDP or FDI per capita as causing variable and selected macroeconomic variables), taking into consideration particular V4 countries, in two ways – using (i) Granger-sense causality and (ii) ordinal correlations.

The Granger causality test was used to investigate the predictive causality only. Although the Granger definition of causality indicates the possibility for determining whether one time series is useful in forecasting another (due to achieve lower mean error of forecasts), nevertheless it allows to analyse relationships with distributed lag in time influence. The test results (Table 4) are generally consistent with the expectations and examples from the literature (as discussed in the literature review section).

Table 4. Granger causality analysis for selected macroeconomic indicators for V4 countries for the years 2000-2012

$\%\Delta X \rightarrow \%\Delta Y$ basing on VAR(1) model	GDP per capita nominal	GDP at market prices y/y	Unem-ploy-ment rate	R&D/ GDP	Real labour productivity per hour worked	Exports of goods and services (in million EUR) r	Imports of goods and services (in million EUR) r	HDI	ENT
Poland									
FDI stock	**0.010**	0.677	0.298	**0.090**	0.695	**0.024**	0.493	0.155	0.704
FDI flow	0.365	0.997	0.258	0.520	0.851	**0.025**	**0.025**	**0.027**	**0.001**
FDI stock/GDP	**0.006**	0.205	0.472	0.210	**0.068**	**0.011**	0.960	0.151	0.296
FDI stock / Population	0.186	0.605	0.296	0.079	0.692	0.028	0.504	0.153	0.729
Czech Republic									
FDI stock	**0.016**	0.667	0.120	0.378	0.974	0.467	0.355	0.584	0.204
FDI flow	0.518	0.511	0.427	0.876	0.474	0.479	0.429	0.441	0.518
FDI stock/GDP	**0.008**	0.105	**0.045**	0.227	0.772	**0.087**	**0.067**	0.242	0.698
FDI stock / Population	**0.009**	0.604	**0.094**	0.342	0.925	0.442	0.331	0.554	0.327
Slovakia									
FDI stock	0.498	**0.041**	0.247	0.250	0.178	**0.079**	0.127	0.438	0.998
FDI flow	0.951	0.142	0.322	0.713	0.964	0.968	0.837	0.677	0.860
FDI stock / GDP	0.858	0.695	0.763	0.173	0.522	0.520	0.499	**0.056**	**0.076**
FDI stock / Population	0.507	**0.039**	0.252	0.243	0.183	**0.079**	0.127	0.438	0.990
Hungary									
FDI stock	0.112	0.229	0.867	0.470	0.821	**0.093**	0.127	0.132	0.992
FDI flow	0.825	0.357	0.878	**0.044**	0.605	0.495	0.487	0.849	0.130
FDI stock/GDP	0.165	0.313	0.965	0.553	0.882	**0.067**	0.149	0.233	0.470
FDI stock / Population	0.113	0.232	0.866	0.470	0.824	**0.092**	0.126	0.130	0.982

Source: Own calculations in JMulti.

In the case of Poland, we found the dynamic relationships between short--term (stationary) variables. The results of testing indicate a cause and effect relationship in the sense of Granger as for changes in the size of the cumulative FDI

on the nominal GDP per capita and on the share of R&D in GDP as well as on exports. A similar relationship was found for changes in FDI flows to changes in export, import and HDI as well as the entrepreneurship index. Changes in the share of FDI stock to GDP are dynamically correlated with nominal GDP per capita and labor productivity as well as exports. Changes in FDI per capita turns into increases in export volumes.

In the case of the Czech Republic, there is Granger causality from changes in FDI stock, FDI stock / GDP and FDI stock per capita to changes in GDP per capita. Relative measures of FDI concentration (FDI per capita, FDI/GDP) in the economy were the Granger cause for unemployment as well as exports and imports.

In the case of Slovakia, changes in FDI stock as well as changes in FDI stock per capita were the Granger cause for economic growth and exports. Changes in the share of FDI stock to GDP were the Granger cause for changes in HDI and the entrepreneurship rate.

In the case of Hungary, we observed that changes in FDI stock, FDI stock / / GDP and FDI stock per capita were the cause of the change in exports. Furthermore, changes in FDI inflows were the Granger cause for the share of R&D in GDP.

Finally, using VECM analysis we identify a stable long-term relationship between *FDI* and *unemployment* as well as *FDI* and *GDP* (Table 5). The parameter γ shows what part of the increase in the *FDI* affects the growth of the second variable in model, and the parameter ECM shows how big is the part of the deviation from the path of long-term, affecting the growth of the variable (*FDI stock / GDP nominal*).

Table 5. Results for stationary and cointegration tests, VECM estimation and diagnostics tests in the years 2000-2012

Analyses		Variable	Poland	Czech Republic	Slovakia	Hungary
KPSS ("+" stationary; "–" non-stationary)		*lnFDI*	–	–	–	-
		lnGDP	–	–	–	-
		Δ%lnFDI	+	+	+	+
		Δ%lnGDP	+	+	+	+
Lags			2	2	2	1
Johansen Test [Trace] with const			–	–	+	+
model		*β1 [const]*	**6.994**	**−6.872**	**4.973**	**4.997**
ln_GDP~ln_FDI		*B2 [FDI]*	**0.485**	**1.528**	**0.578**	**0.586**
Stationary of ξt KPSS			+	–	+	+
EMC			**−0.808**	1.268	**−0.371**	**−0.369**
γ			−0.244	−0.876	0.079	−0.083

Note: bolded < 0.05.

Source: Own calculations in JMulti.

In the study we decided to see if the size of the cumulative FDI remains a long-term relation with the size of the GDP of the country expressed in million

euros. In the first verified hypothesized that stationarity natural logarithms of considered economic measures. Original variables were non-stationary I(1) and until their first differences were stationary I(0). Based on AIC information criterion, we selected delays for the VAR model of stationary variables. This amount was used subsequently to choose VECM model parameters. The Johansen test results reveal the prevalence cointegrating relationships between GDP and FDI stock in Poland, Slovakia and Hungary (negative ECM parameter). We noted that the return rate for the long-term relationship is larger in Poland (ECM parameter), and significantly lower for the other two (in the case of the Czech Republic is positive so error correction mechanism requiring negative ECM parameter does not exist). It should be noted that the power model explaining the relationship between GDP in current prices and the cumulative value of FDI, shows that Poland is a country in which the growth of FDI stock transfers into proportionately lower GDP growth than in the other two countries with the exception of the Czech Republic where such a long-term relationship, does not occur.

Conclusions

In the case of Poland and the Czech Republic, notable positive relationships between GDP and FDI stock per capita were found. In the Czech Republic and Slovakia, FDI intensity reported the strongest changes in the entrepreneurial activities. FDI/GDP ratio and FDI per capita is correlated strongly with the level of HDI, especially in Poland and Slovakia.

We decided to check the relationships between FDI stock, FDI flows, FDI/GDP and FDI per capita (on one hand) on the rate of entrepreneurship (on the other hand) defined as the number of people running businesses per 1,000 inhabitants. Based on the results, we can conclude with the following empirical conclusions:

1. For FDI stock values: The increase of the value of the cumulative FDI of 1 million EUR in the V4 countries led to an average growth of 0.00037 of the entrepreneurship rate (in other words, an increase of 1 billion EUR caused the growth of 0.37).
2. For FDI flow values: There are no dependencies in the considered models.
3. For FDI/GDI value: In relative terms, the results re more interesting. The increase in FDI/GDP by one percentage point leads to a growth of the entrepreneurship rate of 0.4 for Poland, of 0.88 for Slovakia, 0.68 for the Czech Republic and only 0.31 for Hungary, Generally, in the V4 countries, the increase of FDI / GDP by 1 percentage point led to an average increase of the

entrepreneurship rate of 0.57, but diversified among particular V4 countries as mentioned above (the highest for the Czech Republic and Slovakia, significantly lower for Poland and Hungary).

4. For FDI per capita value: The increase in FDI stock per capita by one unit contributed to the increase in the entrepreneurship rate by an average of 0.00322, while the strongest and obvious relationships take place in Poland (0.003) and Slovakia (0.005).
5. For Granger causality: FDI stock/GDP is the Granger cause for the rate of entrepreneurship in Slovakia, while FDI flow is the cause in Poland (i.e. past values of these categories of FDI are useful for forecasting of present value of the entrepreneurship rate, which somehow allows them to be regarded as the cause).
6. In case of Czech Republic dependence between FDI and GDP is the largest in sample in case of parameter value, however long-run relationship does not exist contrary to comparable in terms of country openness Slovakia. Nevertheless the case of Czech Republic demonstrate short run dependence between inward FDI and unemployment however this country was characterised by the lowest levels of unemployment in V4.

It is worth to conclude with the status of the verifying hypotheses. The hypothesis can be confirmed as basing on the OLS regression there is a statistically significant positive correlation between the stock FDI and the entrepreneurship rate, however the impact of FDI was different in different analysed countries – the strongest in Slovakia, while the weakest in Hungary. Considering 2000-2012 period, Czech Republic among others V4 countries was characterized by most advantageous economic situation taking into account the lowest and most stable rates of inflation and unemployment as well as public debt and highest GDP per capita. Nevertheless countries such as Slovakia and Poland demonstrated most dynamic rate of GDP growth connected with improvement in labour market. Examining economic indicators in V4 countries, the worst situation was observed in Hungary. Relative low rate of GDP growth accompanied by the lowest initial income level in 2000 occurred both with permanently higher inflation and debt rate negates somehow real convergence processes in this group of countries

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