

The role of entrepreneurial ecosystem in the presence of productive firms in CEE regions

Balázs Páger (in collaboration with Prof. László Szerb)

Junior research fellow, Centre for Economic and Regional Studies HAS

16th Annual Conference of Hungarian Regional Science Association

18–19 October 2018, Kecskemét



Content

- Source of entrepreneurial opportunities
- Role of Context – System view of entrepreneurship
- Entrepreneurial ecosystems
- High-growth oriented firms
- Dataset and methodology
- Results
- Conclusion

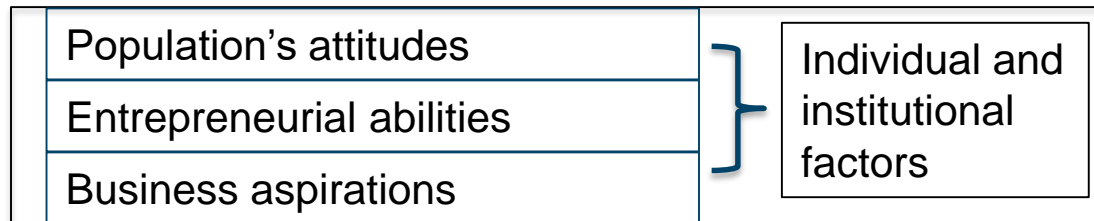
Source of entrepreneurial opportunities

- Discovery an entrepreneurial opportunity – Kirznerian entrepreneurship
- Create an entrepreneurial opportunity – Schumpeterian entrepreneurship
- Role of knowledge and R&D in creating new, productive firms: Knowledge spillover theory of entrepreneurship (Audretsch 1995; Acs–Varga 2005; Audretsch–Lehmann 2005; Acs et al. 2013)
- A big part of entrepreneurship literature argue that knowledge serves as a source of entrepreneurial opportunities as entrepreneurs commercialize knowledge
- Entrepreneurs as the missing link in converting knowledge into economically relevant knowledge (Audretsch–Keilbach 2004; Acs et al. 2009; Braunerhjelm et al. 2010)
- The role of context in knowledge spillover theory of entrepreneurship (Acs et al. 2009; Acs–Audretsch 2010; Autio et al. 2014)
 - Industry and technology; Organizations; Institutions and policy; Social; Temporal; Spatial

Role of context – System view of entrepreneurship

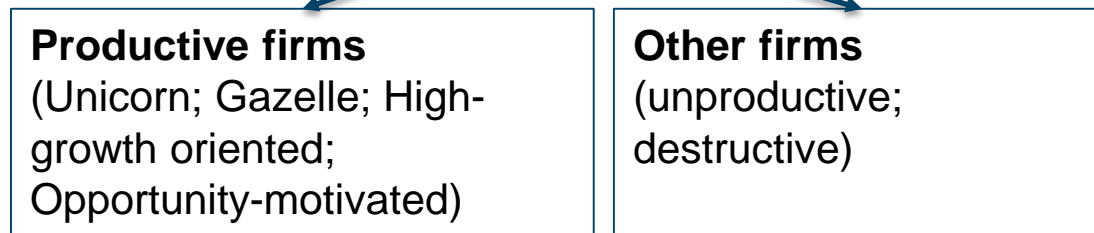
- “A System of Entrepreneurship (SE) is the dynamic, institutionally embedded interaction between entrepreneurial attitudes, ability, and aspirations, by individuals, which drives the allocation of resources through the creation and operation of new ventures” (Acs et al. 2014, p. 119)
- The entrepreneurial activity can be viewed as an output of the entrepreneurship ecosystem and it provides the framework for individuals to recognize and exploit profitable opportunities
- The ultimate outcome of the ecosystem is value creation that can be captured by productivity enhancement, economic growth or well-being improvement (Stam 2015; Stam and Spigel 2017)
- Productive, high growth entrepreneurial activities vary across regions as the conditions of individual and institutional factors within entrepreneurship ecosystems are different (Szerb et al. 2017a)

The model of entrepreneurial ecosystem

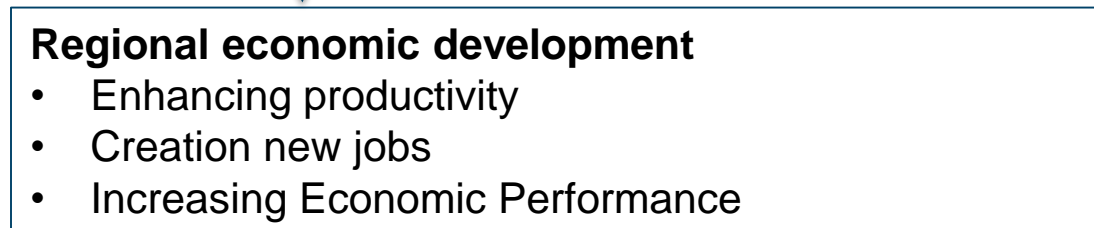


Entrepreneurial ecosystem

(based on Acs et al. 2014; Stam 2015; Stam and Spigel 2017; Szerb et al. 2017)



Entrepreneurship output



Entrepreneurship outcome

Aim of the study and research question

Aim of the study

- Discover the role of entrepreneurial opportunities (derived from knowledge stock) and the context (entrepreneurial ecosystem) in the concentration of productive (high-growth oriented) firms
- The detailed results of REDI analyses: different performance of CEE regions compared to Western Europe in terms of entrepreneurial ecosystem and entrepreneurship outcome/activity (Szerb et al. 2014, 2017b)
- Investigating differences from the view of entrepreneurial ecosystem of CEE regions

Research questions

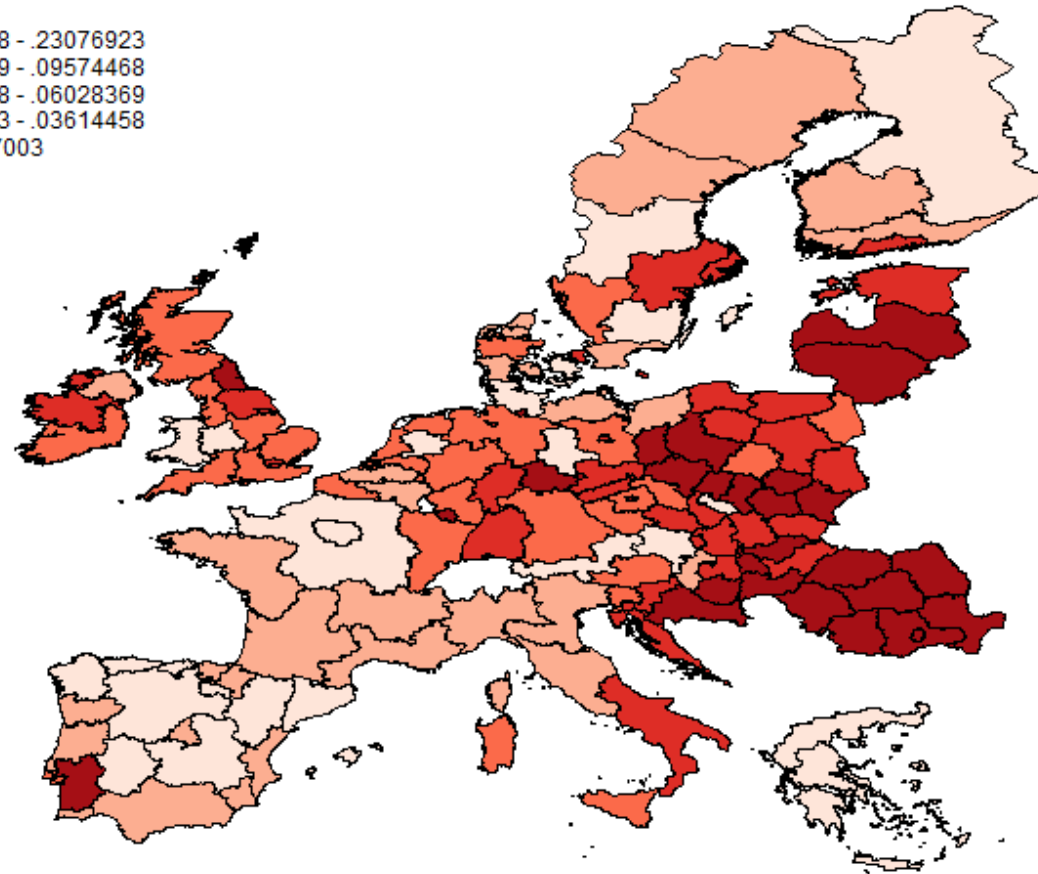
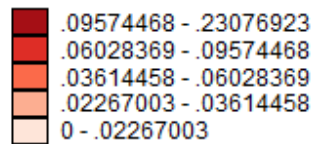
- Do the knowledge stock and highly qualified human capital (as possible sources of entrepreneurial opportunities) influence the presence of high-growth oriented firms?
- Does the role of knowledge stock and highly qualified human capital differ across regions as the „quality” of entrepreneurial ecosystem is varying?

Dataset, dependent variable

- GEM Regional Dataset (orig. 2007–2014) → *Firm owners who report their expectation on job growth within the next 5 years*
- Pooled (cross-sectional) data for 2011–2014 on 24 EU countries (146 regions)
- GEI and REDI investigations identified a firm as „high-growth firm”, if the number of newly created jobs *increases at least 10 persons in absolute values, and 50 percentage in relative values* within the next 5 years (Szerb et al., 2014, 2017 for REDI investigations)
- This definition contains only an expectations of firm owners' concerning their future job growth
- In order to apply a more exact measure on productive firms, the original definition has been extended by firms' business activities (new product, technology application, export-orientation) were included as weights
- Dependent variable: the modified rate of high-growth oriented firms within all firms from a certain region that have been involved in the dataset

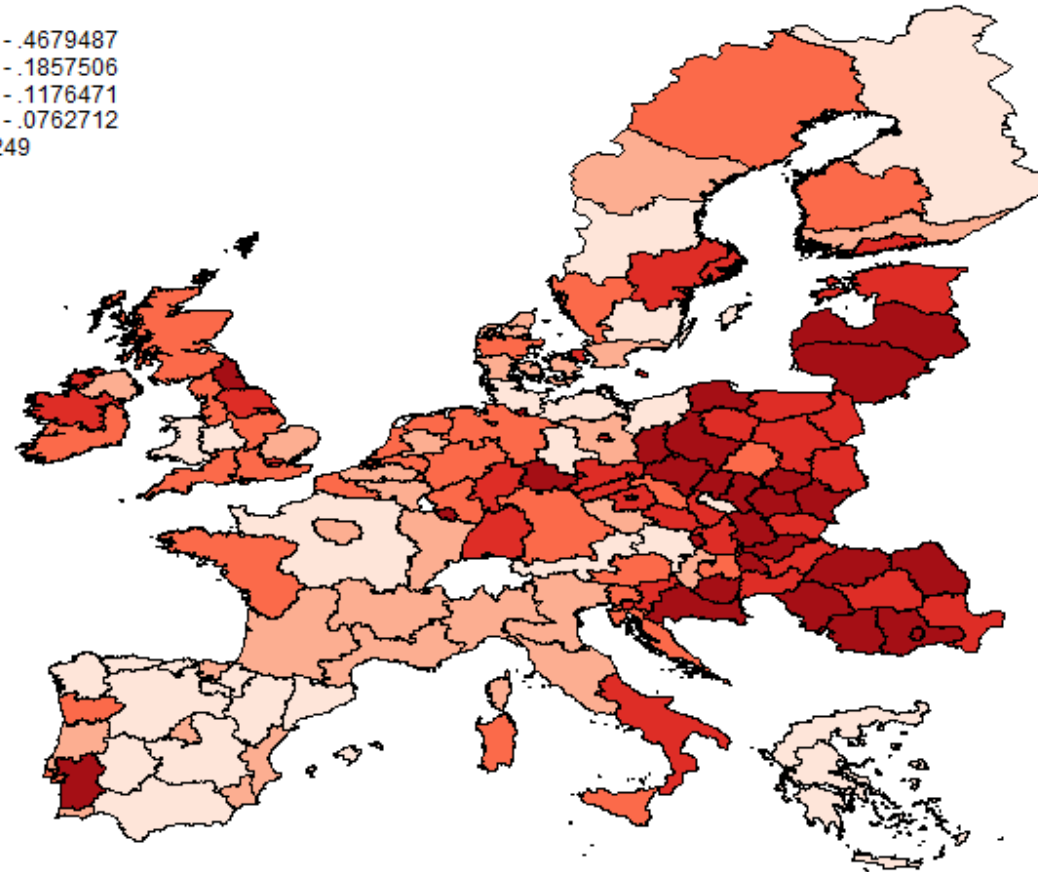
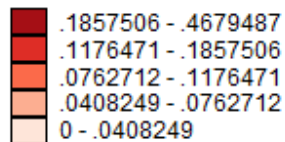
Rate of High-growth oriented firms

High-growth oriented firms



Modified rate of High-growth oriented firms

Modified high-growth rate



Independent variables, specification

Explanatory variables

- Patents PCT patent applications per million inhabitants (fractional count; by inventor and priority year) – level (OECD - Patstat)
- Human Capital – measured within the active population
 - HRST – Human resource with tertiary education (ISCED 5a, 5b or 6) or employed in science and technology (ISCO-08 COM 2 or 3 classes)
 - HRSTC – Human resource with tertiary education and employed in science and technology
 - HRSTE – Human resource with tertiary education
 - HRSTO – Human resource employed in science and technology
 - SE – Scientists and engineers (science and engineering professionals; health professionals; information and communication technology professionals)
- Quality of Entrepreneurial Ecosystem
 - Clusters created according to the REDI 2017 Sub-index scores

Further control variables

- GDP per capita PPS – Average value for 2011-2014
- Popdens – Regional population density (average, 2011-2014; Eurostat)
- U45 – The rate of younger population within total population (average, 2011-2014; Eurostat)
- GERD –Gross Expenditure on R&D in the percentage of GDP (avg. 2011-2014; Eurostat)
- Selfemp – The average self-employment rate (average 2011-2014; EU)
- Country dummies

Descriptive statistics

Variable	Observations	Mean	Std.Dev.	Min	Max
hgm1	146	0.117	0.091	0.000	0.468
pat	146	288.139	668.199	2.280	4727.283
hrstpa	146	0.393	0.093	0.172	0.637
hrstcpa	146	0.184	0.053	0.087	0.339
hrstepa	146	0.290	0.086	0.125	0.541
hrstopa	146	0.287	0.078	0.137	0.487
sepa	146	0.062	0.022	0.024	0.129
gdp	146	24692	9491	8825	57000
popdens	146	335.392	849.514	3.350	7274.400
totgerd	146	0.015	0.010	0.001	0.048
u45	146	0.395	0.032	0.314	0.483
selfemp	146	0.147	0.057	0.059	0.399
capital	146	0.144	0.352	0	1
clu6s	146	4.062	1.546	1	6

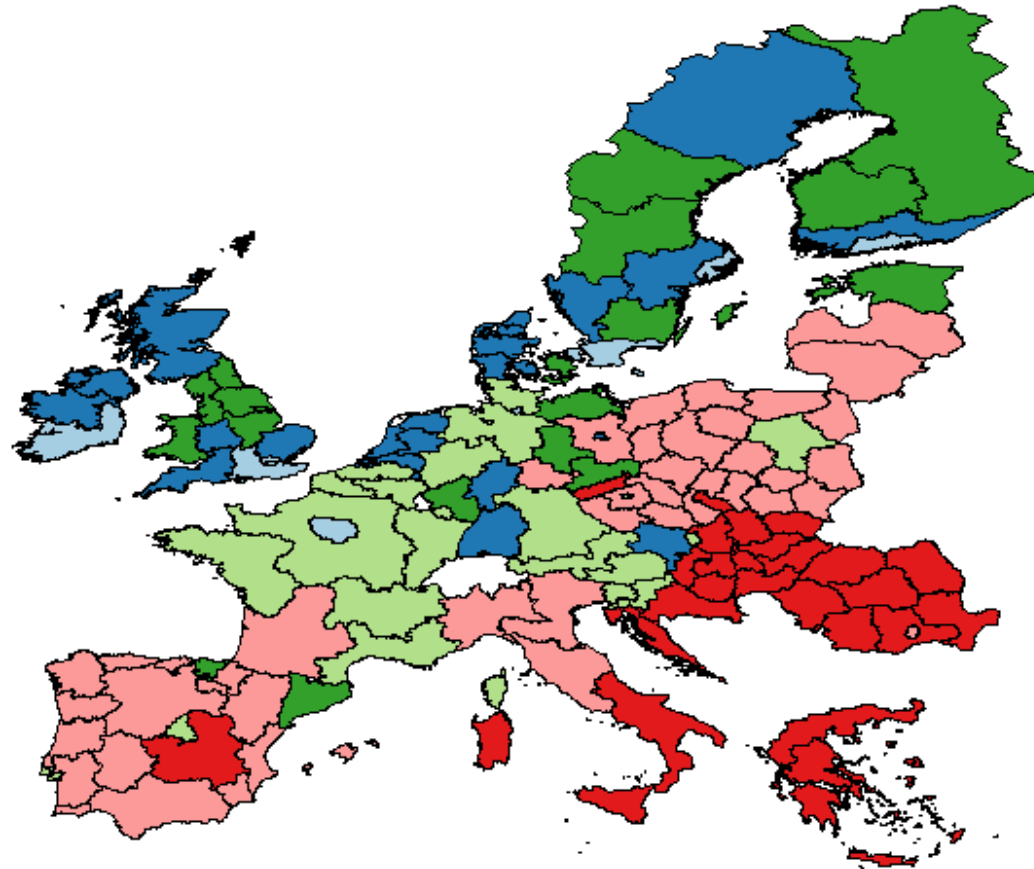
Structure of REDI Scores

Structure of the GEDI 3 Sub-indexes 14 Pillars		National and regional institution variables	Regional level individual variables
Entrepreneurial <i>Aspiration</i> Sub-index	Financing	FINANCIAL INSTITUTIONS	INFORMAL INVESTMENT
	Globalization	CONNECTIVITY	EXPORT
	High growth	CLUSTERING	GAZELLE
	Process innovation	TECHNOLOGY DEVELOPMENT	NEW TECHNOLOGY
	Product innovation	TECHNOLOGY TRANSFER	NEW PRODUCT
Entrepreneurial <i>Ability</i> Sub-index	Competition	BUSINESS STRATEGY	COMPETITORS
	Human capital	EDUCATION & TRAINING	EDUCATION LEVEL
	Technology sector	ABSORPTIVE CAPACITY	TECHNOLOGY LEVEL
	Opportunity start-up	BUSINESS ENVIRONMENT	OPPORTUNITY MOTIVATION
Entrepreneurial <i>Attitudes</i> Sub-index	Cultural support	OPEN SOCIETY	CARRIER STATUS
	Networking	SOCIAL CAPITAL	KN OW ENTREPRENEURS
	Risk acceptance	BUSINESS RISK	BUSINESS ACCEPTANCE
	Startup skills	QUALITY OF EDUCATION	SKILL PERCEPTION
	Opportunity perception	MARKET AGGLOMERATION	OPPORTUNITY RECOGNITION

Source: Szerb et al. (2017)

Clusters according to the REDI 2017 sub-index scores

Clusters according to REDI 2017 sub-index scores



OLS Results (without interaction)

DV.: loghgm11	m1	m2	m3	m4	m5	m6	m7	m8	m9	m10
logpat	-0.000 (0.01)	-0.003 (0.01)	-0.003 (0.01)	-0.003 (0.01)	0.000 (0.01)	-0.003 (0.01)	-0.004 (0.01)	-0.003 (0.01)	-0.007 (0.01)	-0.004 (0.01)
loghrstpa	-0.044 (0.04)	0.025 (0.04)								
loghrstcpa			0.034 (0.03)	0.037 (0.03)						
loghrstepa					-0.051** (0.02)	0.026 (0.03)				
loghrstopa							0.125*** (0.04)	0.036 (0.04)		
logsepa									0.074*** (0.02)	0.043 (0.03)
loggdpcap	-0.085*** (0.03)	-0.002 (0.03)	-0.091*** (0.03)	-0.004 (0.03)	-0.086*** (0.03)	-0.002 (0.03)	-0.097*** (0.03)	-0.005 (0.03)	-0.085*** (0.03)	-0.007 (0.03)
logpopdens	0.014** (0.01)	0.007 (0.01)	0.013** (0.01)	0.006 (0.01)	0.013* (0.01)	0.006 (0.01)	0.009 (0.01)	0.006 (0.01)	0.012* (0.01)	0.006 (0.01)
logtotgerd	-0.009 (0.01)	0.012 (0.01)	-0.014 (0.01)	0.009 (0.01)	-0.011 (0.01)	0.011 (0.01)	-0.024* (0.01)	0.011 (0.01)	-0.010 (0.01)	0.007 (0.01)
logselfemp	-0.066*** (0.02)	-0.007 (0.03)	-0.059*** (0.02)	-0.007 (0.03)	-0.061*** (0.02)	-0.008 (0.03)	-0.035* (0.02)	-0.005 (0.03)	-0.060*** (0.02)	-0.007 (0.03)
logu45	0.257*** (0.09)	0.201 (0.13)	0.232** (0.09)	0.207 (0.13)	0.283*** (0.09)	0.200 (0.13)	0.263*** (0.09)	0.210 (0.13)	0.199** (0.09)	0.211 (0.13)
capital=1 (ref.cat.=0)	0.014 (0.02)	-0.018 (0.02)	0.009 (0.02)	-0.021 (0.02)	0.017 (0.02)	-0.019 (0.02)	0.007 (0.02)	-0.018 (0.02)	0.007 (0.02)	-0.020 (0.02)
Cluster dummies (Clu6s as ref.cat.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies (HU as ref. cat.)	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Constant	0.906*** (0.32)	0.403 (0.39)	1.066*** (0.31)	0.464 (0.37)	0.918*** (0.31)	0.403 (0.37)	1.287*** (0.31)	0.464 (0.40)	1.179*** (0.31)	0.558 (0.38)
R-squared		0.326	0.640	0.327	0.643	0.342	0.641	0.379	0.641	0.364
AdjRsqr		0.260	0.521	0.260	0.525	0.277	0.522	0.318	0.522	0.302
N		146	146	146	146	146	146	146	146	146
F		4.912	5.377	4.925	5.452	5.283	5.396	6.193	5.407	5.823

Source: Author's edition; note: * p<0.1, ** p<0.05, *** p<0.0, s.e. in parentheses

OLS Results (patent interaction)

DV.: loghgm11	m1	m2	m3	m4	m5	m6	m7	m8	m9	m10
logpat	-0.006 (0.02)	0.005 (0.02)	-0.015 (0.01)	0.003 (0.02)	-0.003 (0.01)	0.005 (0.02)	-0.027** (0.01)	0.004 (0.02)	-0.017 (0.01)	-0.001 (0.02)
<i>clu6s=1 # logpat</i>	<i>-0.046 (0.03)</i>	<i>-0.026 (0.03)</i>	<i>-0.039 (0.03)</i>	<i>-0.022 (0.03)</i>	<i>-0.046 (0.03)</i>	<i>-0.025 (0.03)</i>	<i>-0.026 (0.03)</i>	<i>-0.023 (0.03)</i>	<i>-0.038 (0.03)</i>	<i>-0.018 (0.03)</i>
<i>clu6s=2 # logpat</i>	<i>0.021 (0.02)</i>	<i>-0.002 (0.02)</i>	<i>0.030 (0.02)</i>	<i>0.000 (0.02)</i>	<i>0.019 (0.02)</i>	<i>-0.002 (0.02)</i>	<i>0.042** (0.02)</i>	<i>-0.001 (0.02)</i>	<i>0.029 (0.02)</i>	<i>0.004 (0.02)</i>
<i>clu6s=3 # logpat</i>	<i>0.000 (0.02)</i>	<i>-0.019 (0.02)</i>	<i>0.007 (0.02)</i>	<i>-0.018 (0.02)</i>	<i>-0.001 (0.02)</i>	<i>-0.018 (0.02)</i>	<i>0.017 (0.02)</i>	<i>-0.019 (0.02)</i>	<i>0.001 (0.02)</i>	<i>-0.016 (0.02)</i>
<i>clu6s=4 # logpat</i>	<i>0.018 (0.02)</i>	<i>0.010 (0.02)</i>	<i>0.028 (0.02)</i>	<i>0.013 (0.02)</i>	<i>0.016 (0.02)</i>	<i>0.011 (0.02)</i>	<i>0.043** (0.02)</i>	<i>0.011 (0.02)</i>	<i>0.025 (0.02)</i>	<i>0.015 (0.02)</i>
<i>clu6s=5 # logpat</i>	<i>0.008 (0.02)</i>	<i>-0.001 (0.02)</i>	<i>0.017 (0.02)</i>	<i>0.001 (0.02)</i>	<i>0.005 (0.01)</i>	<i>-0.001 (0.02)</i>	<i>0.029** (0.01)</i>	<i>-0.000 (0.02)</i>	<i>0.017 (0.01)</i>	<i>0.004 (0.02)</i>
<i>clu6s=6 # logpat</i>	<i>Ref.cat.</i>	<i>Ref.cat.</i>	<i>Ref.cat.</i>	<i>Ref.cat.</i>	<i>Ref.cat.</i>	<i>Ref.cat.</i>	<i>Ref.cat.</i>	<i>Ref.cat.</i>	<i>Ref.cat.</i>	<i>Ref.cat.</i>
loghrstpa	-0.029 (0.04)	0.034 (0.05)								
loghrstcpa			0.047 (0.03)	0.043 (0.03)						
loghrstepa					-0.046* (0.02)	0.032 (0.04)				
loghrstopa							0.153*** (0.04)	0.046 (0.05)		
logsepa									0.082*** (0.02)	0.052* (0.03)
Country dummies	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Cluster dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.957*** (0.34)	0.501 (0.41)	1.132*** (0.32)	0.557 (0.39)	0.935*** (0.32)	0.487 (0.39)	1.407*** (0.31)	0.572 (0.42)	1.238*** (0.31)	0.687* (0.40)
R-squared		0.350	0.652	0.360	0.656	0.365	0.653	0.426	0.654	0.401
AdjRsqr		0.258	0.515	0.269	0.520	0.275	0.516	0.345	0.517	0.316
N		146	146	146	146	146	146	146	146	146
F		3.800	4.754	3.961	4.828	4.050	4.771	5.247	4.786	4.714

Source: Author's edition; note: * p<0.1, ** p<0.05, *** p<0.0, s.e. in parentheses

OLS Results (human capital interactions)

DV.: loghgm11	m1 (hrst)	m2 (hrst)	m3 (hrstc)	m4 (hrstc)	m5 (hrste)	m6 (hrste)	m7 (hrsto)	m8 (hrsto)	m9 (se)	m10 (se)
loghrstpa	-0.165*** (0.06)	-0.057 (0.08)								
loghrstcpa			-0.055 (0.06)	0.015 (0.06)						
loghrstepa					-0.118** (0.05)	-0.010 (0.06)				
loghrstopa							-0.023 (0.06)	-0.040 (0.07)		
logsepa									0.082* (0.05)	0.038 (0.04)
clu6s=1 # hum.cap	0.183 (0.26)	0.328 (0.24)	0.082 (0.16)	0.182 (0.16)	-0.104 (0.18)	0.003 (0.16)	0.256* (0.15)	0.487*** (0.19)	0.064 (0.17)	0.224 (0.15)
clu6s=2 # hum.cap	0.386* (0.20)	0.243 (0.19)	0.277** (0.14)	0.173 (0.14)	0.229* (0.12)	0.124 (0.13)	0.234* (0.13)	0.347** (0.16)	-0.007 (0.12)	0.112 (0.12)
clu6s=3 # hum.cap	0.181* (0.10)	0.155 (0.11)	0.053 (0.08)	0.049 (0.08)	0.084 (0.07)	0.076 (0.08)	0.136 (0.10)	0.127 (0.11)	-0.059 (0.06)	0.004 (0.06)
clu6s=4 # hum.cap	0.325 (0.22)	0.299 (0.20)	0.228 (0.16)	0.100 (0.15)	0.171 (0.10)	0.151 (0.11)	0.142 (0.15)	0.014 (0.15)	0.009 (0.10)	0.248** (0.10)
clu6s=5 # hum.cap	0.171** (0.08)	0.013 (0.11)	0.147** (0.07)	-0.042 (0.08)	0.072 (0.06)	-0.013 (0.07)	0.231*** (0.07)	0.035 (0.08)	0.021 (0.06)	-0.044 (0.06)
clu6s=6 # hum.cap	Ref.cat.	Ref.cat.	Ref.cat.	Ref.cat.	Ref.cat.	Ref.cat.	Ref.cat.	Ref.cat.	Ref.cat.	Ref.cat.
logpat	-0.000 (0.01)	-0.004 (0.01)	0.000 (0.01)	-0.005 (0.01)	0.001 (0.01)	-0.004 (0.01)	-0.001 (0.01)	-0.003 (0.01)	-0.005 (0.01)	-0.008 (0.01)
Country dummies	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Cluster dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.684** (0.33)	0.076 (0.44)	0.915*** (0.33)	0.191 (0.43)	0.689** (0.33)	0.226 (0.41)	1.085*** (0.31)	0.042 (0.44)	1.192*** (0.34)	0.354 (0.42)
R-squared	0.371	0.658	0.366	0.654	0.372	0.652	0.440	0.667	0.375	0.675
AdjRsqr	0.282	0.523	0.276	0.518	0.284	0.515	0.360	0.535	0.286	0.547
N	146	146	146	146	146	146	146	146	146	146
F	4.158	4.879	4.075	4.804	4.188	4.755	5.536	5.077	4.225	5.272

Conclusion, limitations

- Patents
 - Without interaction case: no significant results – concentration of patents do not impact on rate of high-growth oriented firms
 - Mostly insignificant results except when we include S&T employees as human capital; this case shows positive impact
- Human capital
 - Employment in science and technology has key role as it showed positive and significant results
 - The tertiary educated active population itself has less (or nothing) explanatory power
 - Interaction results: both science-technology employment and tertiary educated people have more positive impact in regions that ep.ecosystem showed higher quality compared to the baseline regions (group 6: lowest REDI scores)
- Limitations
 - High-growth orientation is only a proxy for productive firms
 - Self-reported answers of GEM survey
 - Clustering of regions according to the REDI sub-index scores
 - Modified measure of high-growth orientation

Thank you for your attention!

(Balázs Páger; Email: pagerb@rkk.hu; Twitter: @balazs_pager)



Correlation for original terms

	hg	hgm1	hgm2	pat	hrstpa	hrstepa	hrstopa	hrstcpa	sepa	gdp	popdens	totgerd	u45	selfemp	redi
hg	1														
hgm1	0.9867*	1													
hgm2	0.9902*	0.9989*	1												
pat	-0.0954	-0.0918	-0.0913	1											
hrstpa	-0.2307*	-0.2137*	-0.2125	0.3508*	1										
hrstepa	-0.2411*	-0.2251*	-0.2237*	0.1974	0.8776*	1									
hrstopa	-0.059	-0.0493	-0.0488	0.4039*	0.8573*	0.5331*	1								
hrstcpa	-0.073	-0.0626	-0.0616	0.2996*	0.9317*	0.8650*	0.8363*	1							
sepa	0.0033	0.0135	0.0111	0.3514*	0.8364*	0.7321*	0.7927*	0.8879*	1						
gdp	-0.2180*	-0.1969	-0.2003	0.4328*	0.7159*	0.5292*	0.7040*	0.6391*	0.6067*	1					
popdens	0.0655	0.0786	0.0774	0.0911	0.3873*	0.3772*	0.3232*	0.4080*	0.3281*	0.5434*	1				
totgerd	-0.2214*	-0.2115	-0.2118	0.4961*	0.6388*	0.4024*	0.7260*	0.6027*	0.5862*	0.6247*	0.1179	1			
u45	0.4117*	0.4142*	0.4122*	-0.1442	-0.1257	0.0424	-0.2287*	-0.0499	-0.0143	-0.0738	0.2913*	-0.3097*	1		
selfemp	0.0033	0.0021	-0.0025	-0.2318*	-0.4312*	-0.2133*	-0.5457*	-0.3946*	-0.3736*	-0.3415*	-0.0015	-0.4229*	0.2595*	1	
redi	-0.1889	-0.1675	-0.1709	0.4603*	0.7871*	0.5747*	0.7948*	0.7232*	0.7839*	0.7833*	0.3384*	0.7295*	-0.1686	-0.4555*	1

Correlation for log terms

	loghg1	loghgm11	loghgm21	logpat	loghrstpa	loghrstepa	loghrstopa	loghrstcpa	logsepa	loggdpa	logpopde ns	logtotgerd	logu45	logselfe mp	logredi
loghg1	1														
loghgm11	0.9870*	1													
loghgm21	0.9904*	0.9989*	1												
logpat	-0.3007*	-0.2763*	-0.2797*	1											
loghrstpa	-0.2792*	-0.2553*	-0.2542*	0.7285*	1										
loghrstepa	-0.2737*	-0.2539*	-0.2516*	0.5214*	0.8798*	1									
loghrstopa	-0.076	-0.0561	-0.0569	0.7292*	0.8505*	0.5409*	1								
loghrstcpa	-0.1139	-0.0955	-0.0945	0.6373*	0.9253*	0.8872*	0.8197*	1							
logsepa	-0.0108	0.0042	0.0018	0.6568*	0.7989*	0.7370*	0.7595*	0.8821*	1						
loggdpa	-0.3339*	-0.3066*	-0.3107*	0.7348*	0.7442*	0.5482*	0.7074*	0.6355*	0.5839*	1					
logpopdens	0.0988	0.1083	0.1084	0.3821*	0.3600*	0.2598*	0.3639*	0.3203*	0.3341*	0.4636*	1				
logtotgerd	-0.3570*	-0.3232*	-0.3233*	0.7792*	0.7085*	0.4841*	0.7338*	0.6189*	0.5371*	0.7143*	0.2337*	1			
logu45	0.4083*	0.4122*	0.4098*	-0.3341*	-0.1706	-0.013	-0.2690*	-0.12	-0.0804	-0.1948*	0.2690*	-0.3689*	1		
logselfemp	0.0176	0.0143	0.0094	-0.4406*	-0.4403*	-0.2295*	-0.5843*	-0.4259*	-0.3671*	-0.3850*	-0.0169*	-0.4419*	0.3176*	1	
logredi	-0.2188*	-0.1879	-0.1926	0.7681*	0.7732*	0.5776*	0.7761*	0.7032*	0.7409*	0.8093*	0.3715*	0.7255*	-0.2151*	-0.4373*	1