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*Measuring entrepreneurship and optimizing  
entrepreneurship policy efforts in the European Union  
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**László Szerb, Éva Komlósi, Balázs Páger**

Regional Innovation and Entrepreneurship  
Research Center

**Regional Innovation and  
Entrepreneurship Research Center**  
Faculty of Business and Economics  
University of Pécs

H-7622, Pécs Rákóczi str. 80.

Phone: +36-72-501-599/23121

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# Measuring entrepreneurship and optimizing entrepreneurship policy efforts in the European Union countries

## László Szerb

University Professor and Director, Department of Management Sciences, Faculty of Business and Economics, University of Pécs, Hungary.

E-mail: [szerb@tkk.pte.hu](mailto:szerb@tkk.pte.hu)

## Éva Komlósi

Research fellow, MTA-PTE Innovation and Economic Growth Research Group, University of Pécs, Hungary

E-mail: [komlosieva@tkk.pte.hu](mailto:komlosieva@tkk.pte.hu)

## Balázs Páger,

Junior research fellow, Institute for Regional Studies Centre for Economic and Regional Studies Hungarian Academy of Sciences

E-mail: [pagerb@rkk.hu](mailto:pagerb@rkk.hu)

**Abstract:** In this paper we provide a brief review of how entrepreneurship policies have evolved and what implied conceptions of entrepreneurship underlie attempts to measure the phenomenon. We propose that a major shortcoming in policy thinking is the insufficient recognition that entrepreneurship, at a country level, is a systemic phenomenon and should be approached as such. To address this gap, we propose the concept of National Systems of Entrepreneurship that recognizes the systemic character of country-level entrepreneurship, and also recognizes that, although embedded in a country-level context, entrepreneurial processes are fundamentally driven by individuals. We then explain how the Global Entrepreneurship Index methodology is designed to profile National Systems of Entrepreneurship. We apply the Penalty for Bottleneck (PFB) methodology to examine the entrepreneurial performance of the European Union (EU). Comparing the EU and US entrepreneurship scores, Europe is seemingly lagging behind the US. According to the GEI scores, the EU countries reveal considerable differences in their entrepreneurial performance. Moreover, EU member countries prevail even larger differences over the 14 pillars of entrepreneurship. In addition to highlighting bottleneck factors, the index also provides rough indications on how much a country should seek to alleviate a given bottleneck. While there are numerous ways to improve entrepreneurship in the EU and its member states, we analyze only one simple situation. An important implication of the analysis is that uniform policy does not work, and the EU member states should apply different policy mixes to reach the same improvement in the GEDI points.

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## Introduction

Policies to support entrepreneurship have evolved over the past 30-odd years, from encouraging the entry and operation of small- and medium-sized firms (SMEs) towards more qualitatively nuanced (in terms of the quality of entrepreneurial entries addressed), refined, and more accurately targeted policies. All of these policies are based, at best, on limited consideration of what entrepreneurship actually means as a country-level phenomenon and what the possible implications might be for the design and implementation of policies to support entrepreneurship. In this introduction first, we provide a brief review of how entrepreneurship policies have evolved and what implied conceptions of entrepreneurship underlie attempts to measure the phenomenon.

Albeit the role of entrepreneurship in economic development is progressively becoming clearer, the understanding of policies to develop the potential of entrepreneurship remains immature. This argument is largely explained by the *discrepancy between the definition and the measure of entrepreneurship*. While the *complex and multidimensional character* of entrepreneurship is extensively recognized (Verheul et al. 2001; Capello and Lenzi 2016), major measures of entrepreneurship are still thwarting. Over the past decades, significant progress has been made in propelling the measurement of entrepreneurship. Despite these progresses, there is a significant divide between *quantity type indices of entrepreneurial activity* and measures based on the *quality aspects of entrepreneurship*. Quantity type (or output) indicators track the incidence of business ownership (new firms) or self-employment entries within populations. In these measures, entrepreneurship is conceived of as the creation of a new business organization or an entry into self-employment. Examples of such output indicators include the Global Entrepreneurship Monitor's (GEM) Total Entrepreneurial Activity (TEA) index (Reynolds et al., 2005); the OECD-Eurostat's Entrepreneurship Indicators (e.g., Lunati, Meyer zu Schlochtern, & Sargsayan, 2010; OECD-Eurostat, 2007); World Bank's Entrepreneurship Survey (World Bank, 2011); and the Flash Eurobarometer survey (Gallup, 2009). Another indicator of entrepreneurship is the Kauffman Index of Entrepreneurial Activity (KIEA) which measures the adult non-business owner population who start a new business (Fairlie, 2012). Examples of indices measuring population-level attitudes include the Eurobarometer survey (Gallup, 2009); the World Values Survey, GEM, and the International Social Survey (ISSP, 1997). The use of the attitude related measures to proxy entrepreneurship is particularly problematic because it is not clear what is the mechanism from moving the vaguely defined attitudes to business startups (Acs et al 2014).

Nevertheless, these still frequently used start-up, ownership and business density rates are problematic because these uni-dimensional indices do not consider only one, the quality aspects of entrepreneurship (Acs and Szerb 2011; Shane 2009). Mann and Shideler (2015) emphasize that the problem with density type indices is that policy makers with their programs targeting economic growth may only increase the number of firms rather than catalyze the creative destruction process. Lenihan (2011) also demonstrates that traditional one-dimensional indicators (such as jobs created or retained) are too narrow metrics to measure the impact of firm policy interventions, because these proxies focus exclusively merely on private firm impact, rather than broader socioeconomic impacts. Thurik et al. (2013) mention a shift in entrepreneurial policy which is related to the paradigm shift from

managed economy to the entrepreneurial economy. According to their view, such policy has to be created that focus on dynamic capitalism in which entrepreneurship plays a key role, instead of promoting more new firms. In their paper Guzman and Stern (2016) focus both on the role of entrepreneurial quantity and quality. The authors calculated measures on an annual basis for the fifteen states of the United States for the period from 1988-2014. They created three composite indices to measure both changes in entrepreneurial potential and ecosystem: the *Entrepreneurial Quality Index* (EQI, measuring the average quality level among a group of start-ups within a given cohort), the *Regional Entrepreneurship Cohort Potential Index* (RECPI, measuring the growth potential of firms founded within a given region and time period) and the *Regional Entrepreneurship Acceleration Index* (REAI, measuring the performance of a region over time in realizing the potential of firms founded there). According to their key finding, they observed a three to four-fold drop in the US entrepreneurial ecosystem performance while observing very little drop in overall entrepreneurial potential.

The target of entrepreneurship policy became one of the debated questions in the last decades whether promotion of entrepreneurial activity and firms in general makes entrepreneurship policy successful. Fritsch and Schroeter (2009) in their empirical research pointed out that the marginal effect of new business formation on regional employment effect can decline with the increase of the number of start-up and that the marginal effect can become even negative. Therefore, they conclude that policy efforts should promote the high-quality startups in order to create economic growth. Vivarelli (2012) noticed that policy-makers have to consider on the heterogeneity of entrepreneurs, and their motivation on foundation a new firm. Furthermore, entrepreneurial policies have to support firm entries that activities are based on a technological renewal and economic growth, primarily. Stam et al. (2007) found that high-growth entrepreneurs have higher influence on economic growth than entrepreneurial activity in general. Mason and Brown (2013) stressed also the heterogeneity of high-growth firm. They claim that entrepreneurial policies have to support also the start-ups and not only high-growth firms by applying better targeted policy interventions towards high-potential new firms. It also refers on the debate in the literature which firms have to be promoted if the entrepreneurship policy would not support the firms in general. It is also debated

However, one thing is clear that the quality of entrepreneurship cannot be measured by the number of firms or merely by the distinctive characteristics of entrepreneur. Meanwhile a shift of entrepreneurship policy in thinking seems to have occurred from direct intervention increasing the number of firms towards creating a more *supportive environment or climate, namely an adequate ecosystem for entrepreneurs*. The entrepreneurial ecosystem approach thus examines the entrepreneurial individual instead (not the company itself), as well as emphasizes the role of the entrepreneurship context.

Several studies try to identify those factors determining (allowing or restricting) the level of entrepreneurship and offer different theoretical perspectives and frameworks to organize a broad range of determinants explains the level of high-quality entrepreneurship, including economic, social and cultural institutions (OECD 2008; Sternberg 2009; Feld 2012; Isenberg 2011, WEF 2013, Annoni and Dijkstra 2013; Stam 2015). Freytag and Noseleit (2009) found that the better institutions a country has, the entrepreneurs' acceptance towards them higher is.

The difference in acceptance among entrepreneurs and non-entrepreneurs decreased as the country had institutions with higher quality. They draw the attention that small differences may also influence the institutional acceptance. Rodríguez-Pose (2013) in his paper also discuss about the importance of institutions regarding European regional economic development. He notes that the EU needs to create institutional-based regional developments strategies that are specifically tailor-made to the different local environments across European regions. However, the author also pointed out the difficulties for establishing the right mix of formal and informal institutions.

Verheul et al. (2001) in their theoretical framework distinguish the demand and supply side of entrepreneurship. Here the demand side refers to the opportunities for entrepreneurship. According to the authors' view the diversity in consumer demand is important, because the greater this diversity, the more room is created for entrepreneurs. In the model the supply side of entrepreneurship encompass different things: industrial structure (sector structure, networking), also influenced by technological developments, government regulations, demographic composition, culture, formal institutions. In their model beside environmental factors the authors consider the effect of the individual risk-reward profile "represents the process of weighing alternative types of employment and is based on opportunities (environmental characteristics), resources, ability, personality traits and preferences (individual characteristics)" (Verheul et al., 2001, 9.). Audretsch and Belitski (2016) define the efficient entrepreneurial ecosystem as a complex system of interactions among individuals within the institutional, socioeconomic and informational context. They emphasize a holistic policy approach concerning the entrepreneurial ecosystem. Acs et al. (2016a) draw the attention that the public policy question regarding entrepreneurial policy is "Does the environment allow the entrepreneur to complete the production function and fill in the missing input markets?". According to their view, the public policy interventions should promote the creation of an enabling environment. The Dutch entrepreneurial ecosystem may serve as an European example, in which four main framework conditions of the entrepreneurial ecosystem could be identified: change of formal institutions in order to support labor mobility; strengthen public demand for entrepreneurs by financing new knowledge creation and application; promoting a culture of entrepreneurship; developing physical infrastructure to upgrade knowledge circulations and networks (Stam, 2014). Dilli and Elert (2016) analyzed the present entrepreneurial climate across 21 EU member states and identified institutions that are potentially relevant to this climate. They highlighted the presence of varieties of entrepreneurial regimes in Europe regarding the climate. Identify a number of potentially relevant entrepreneurship indicators as well as potentially relevant formal and informal institutions their findings also suggest that there is no one-size-fits-all approach to create an entrepreneurial society in Europe.

The phenomenon of entrepreneurship has been extensively studied at both the individual and contextual levels but they do not provide insight into how individuals interact with their systemic contexts, *the complex recursive relationships between the two levels have not received much attention*. In this paper we propose that a major shortcoming in policy thinking is the insufficient recognition that entrepreneurship, at a country level, is a systemic phenomenon and should be approached as such. To address this gap, we propose the concept of National Systems of Entrepreneurship that recognizes the systemic character of country-

level entrepreneurship, and also, recognizes that although embedded in a country-level context, entrepreneurial processes are fundamentally driven by individuals (Acs et al. 2014). We then explain how the GEI methodology is designed to profile National Systems of Entrepreneurship. Finally, using the European Union member countries, we illustrate how the GEI method enables policy-makers to develop a better understanding of the systemic characteristics of country-level entrepreneurship and identify priority areas for national and EU level of entrepreneurship policy. This study is a significantly amended version of a previous paper about the measure and examination of entrepreneurship policy in the EU countries of Szerb et al (2013). Changes include methodology, the time frame and there has been a considerable alteration of the institutional variables that has resulted a more sophisticated structure of the National System of Entrepreneurship. The evaluation of the results changed accordingly to follow these alterations.

### **Entrepreneurship measurement and the Global Entrepreneurship Index (GEI) perspective**

Based on the inconsistencies about the definition, the measurement, and the policy domain of entrepreneurship, Acs & Szerb (2011, 2012) and Acs et al (2014) developed the Global Entrepreneurship Index (GEI) that serves to measure country level entrepreneurship.<sup>1</sup> The GEI takes into account that

- entrepreneurship is a multifaceted phenomenon that requires a complex measure;
- instead of a quantity approach a proper measure should consider the quality aspects of entrepreneurship;
- both the individual efforts/capabilities and the environmental/institutional aspects of entrepreneurship are important;
- the different aspects/components of the entrepreneurship constitute a system where the interrelation of the elements is vital;
- entrepreneurship policy should be formulated from a system perspective by providing a tailor-made policy mix that fits to a particular country's entrepreneurial profile rather than providing a one size fits to all universal suggestions.

GEI defines country level entrepreneurship as the National System of Entrepreneurship that „...*is the dynamic, institutionally embedded interaction between entrepreneurial attitudes, abilities, and aspirations, by individuals, which drives the allocation of resources through the creation and operation of new ventures*” (Acs et al 2014, p.479). GEI proposes five levels of index building as the GEI super-index measuring entrepreneurship at the country level, the three sub-index (attitudes, abilities and aspirations), 14 pillars, 28 variables and 49 indicators. All pillars contain an individual and an institutional variable component. Viewing from the system perspective, GEI takes into account the connection between the

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<sup>1</sup>The GEI formerly was named as GEDI, Global Entrepreneurship and Development Index.

individual and the institutional factors as interacting variables. More recently, the institutional components of the GEI have been reviewed and changed. In this paper we present the amended, new version of GEI as presented in Figure 1.

**Figure 1: The structure of the Global Entrepreneurship Index (GEI)**

GLOBAL ENTREPRENEURSHIP INDEX	Sub-indexes	Pillars	Variables*	
	ATTITUDES SUB-INDEX	OPPORTUNITY PERCEPTION	OPPORTUNITY	<i>OPPORTUNITY</i>
			FREEDOM AND PROPERTY	<b>FREEDOM AND PROPERTY</b>
		STARTUP SKILLS	SKILL	<i>SKILL</i>
			EDUCATION	<b>EDUCATION</b>
		RISK PERCEPTION	RISK ACCEPTANCE	<i>RISK ACCEPTANCE</i>
	COUNTRY RISK	<b>COUNTRY RISK</b>		
	NETWORKING	KNOWENT	<i>KNOWENT</i>	
	CONNECTIVITY	<b>CONNECTIVITY</b>		
	CULTURAL SUPPORT	CARSTAT	<i>CARSTAT</i>	
CORRUPTION	<b>CORRUPTION</b>			
ABILITIES SUB-INDEX	OPPORTUNITY STARTUP	TEAOPPORT	<i>TEAOPPORT</i>	
		TAXGOVERN	<b>TAXGOVERN</b>	
	TECHNOLOGY ABSORPTION	TECHSECT	<i>TECHSECT</i>	
		TECHABSORP	<b>TECHABSORP</b>	
	HUMAN CAPITAL	HIGHEDUC	<i>HIGHEDUC</i>	
LABOR MARKET	<b>LABOR MARKET</b>			
COMPETITION	COMPET	<i>COMPET</i>		
COMPREGULATION	<b>COMPREGULATION</b>			
ASPIRATION SUB-INDEX	PRODUCT INNOVATION	NEWP	<i>NEWP</i>	
		TECHTRANSFER	<b>TECHTRANSFER</b>	
	PROCESS INNOVATION	NEWT	<i>NEWT</i>	
		SCIENCE	<b>SCIENCE</b>	
	HIGH GROWTH	GAZELLE	<i>GAZELLE</i>	
FINANCE AND STRATEGY	<b>FINANCE AND STRATEGY</b>			
INTERNATIONALIZATION	EXPORT	<i>EXPORT</i>		
ECONOMIC COMPLEXITY	<b>ECONOMIC COMPLEXITY</b>			
RISK CAPITAL	INFINV	<i>INFINV</i>		
DEPTH OF CAPITAL MARKET	<b>DEPTH OF CAPITAL MARKET</b>			

\*Individual variables are colored with white background while institutional ones with grey background.

How, then, to define the basic building block of entrepreneurial attitudes, abilities, and aspirations? Entrepreneurial attitudes reflect the people's attitudes toward entrepreneurship. It involves opportunity recognition, startup skills, risk perception, networking, and cultural supports of entrepreneurs. Institutional embeddings are expressed as the property rights and economic freedom, the quality of the education, the riskiness of the country, the connectivity potential, and the prevalence of corruption.

Entrepreneurial abilities include some important characteristics of the entrepreneur that determine the extent to which new startups will have potential for growth, such as motivation based on opportunity as opposed to necessity, the potential technology-intensity of the startup, the entrepreneur's level of education, and the level of competition. These individual factors coincide with the proper institutional factors of taxation and the efficiency of government operation (Taxgovern), technology adsorption capability, the freedom of the labor market and

the extent of staff training (Labor Market), and the dominance of powerful business groups as well as the effectiveness of antimonopoly regulation (Compregulation).

Entrepreneurial aspiration refers to the distinctive, qualitative, strategy-related nature of entrepreneurial activity. The individual and institutional factors of product and process innovation such as technology transfer, the applied research potential of science, high growth expectations, venture capital availability and strategy sophistication (Finance and Strategy), internationalization and the availability of risk financing constitute entrepreneurial aspirations (Acs et al 2014). The full, short description of the pillars is in Table 1. For more details and description of the variables see Appendix 1A and 1B.

**Table 1: The description of the GEI index pillars**

<b>Pillar name</b>	<b>Description</b>
Opportunity Perception	Opportunity Perception refers to the entrepreneurial opportunity perception potential of the population and weights this against the freedom of the country and property rights
Start-up Skills	Start-up Skill captures the perception of start-up skills in the population and weights this aspect with the quality of education
Risk Acceptance	Risk Acceptance captures the inhibiting effect of fear of failure of the population on entrepreneurial action combined with a measure of the country's risk.
Networking	This pillar combines two aspects of Networking: (1) a proxy of the ability of potential and active entrepreneurs to access and mobilize opportunities and resources and (2) the ease of access to reach each other.
Cultural Support	The Cultural Support pillar combines how positively a given country's inhabitants view entrepreneurs in terms of status and career choice and how the level of corruption in that country affects this view.
Opportunity Startup	The Opportunity Startup pillar captures the prevalence of individuals who pursue potentially better quality opportunity-driven start-ups (as opposed to necessity-driven start-ups) weighted with the combined effect of taxation and government quality of services.
Technology Absorption	The Technology Absorption pillar reflects the technology-intensity of a country's start-up activity combined with a country's capacity for firm-level technology absorption.
Human Capital	The Human Capital pillar captures the quality of entrepreneurs as weighing the percentage of start-ups founded by individuals with higher than secondary education with a qualitative measure of the propensity of firms in a given country to train their staff combined with the freedom of the labor market.
Competition	The Competition pillar measures the level of the product or market uniqueness of start-ups combined with the market power of existing businesses and business groups as well as with the effectiveness of competitive regulation.
Product Innovation	The Product Innovation pillar captures the tendency of entrepreneurial firms to create new products weighted by the technology transfer capacity of a country.
Process Innovation	The Process Innovation pillar captures the use of new technologies by start-ups combined with the Gross Domestic Expenditure on Research and Development (GERD) and the potential of a country to conduct applied research.
High Growth	The High Growth pillar is a combined measure of (1) the percentage of high-growth businesses that intend to employ at least ten people and plan to grow more than 50 percent in five years (2) the availability of venture capital and (3) business strategy sophistication.
Internationalization	The Internationalization pillar captures the degree to which a country's entrepreneurs are internationalized, as measured by businesses' exporting potential weighted by the level of economic complexity of the country.
Risk Capital	The Risk Capital pillar combines two measures of finance: informal investment in start-ups and a measure of the depth of the capital market. Availability of risk capital is to fulfill growth aspirations.

Source: Own creation



An important note that the GEI three sub-indexes of attitudes, abilities and aspiration, their 14 pillars, 28 variables and 49 indicators only partially capture the National System of Entrepreneurship that limits its general use for policy purposes. While the holistic view of entrepreneurship has had a long history (Audretsch and Belitski 2016, Hofer and Bygrave 1992, Park 2005) the identification and the interrelation of the elements of the system of entrepreneurship is less elaborated. For example, the recent development in the entrepreneurship ecosystem literature (Isenberg 2011, Mason & Brown 2014, Stam 2015, Stangler & Bell-Masterson 2015) focus on identifying the elements of the system but neglects to examine the connection amongst these elements. As reflecting to this gap, Acs et al (2014) developed the Penalty for Bottleneck (PFB) methodology that views the 14 pillars of entrepreneurship in interaction with one another. Following Miller's configuration theory (Miller 1986, 1996), we assert that entrepreneurial performance is more a function of the harmonization of the pillars than it is of the strength of individual pillars themselves. Thus, optimal entrepreneurial performance requires that the normalized and adjusted values of the 14 pillars be equal.

An important characteristic of the PFB methodology is the identification of the weakest link in the system of entrepreneurship (Goldratt 1994, Tol & Yohe 2006). practically it means that the lowest-value pillar constitutes a bottleneck in the system impeding all the other better performing pillars. As a consequence, the better performing pillars should be penalized because of the distortion. The size of the penalty depends on the magnitude of the bottleneck: The larger the difference between a particular pillar and the bottleneck pillar the larger the penalty is. The PFB methodology is summarized in the following equation by assuming an exponential penalty function of Casado Tarabusi and Palazzi (2012):

$$h_{(i),j} = \min y_{(i),j} + (1 - e^{-(y_{(i),j} - \min y_{(i),j})}) \quad (1)$$

where  $h_{i,j}$  is the modified, after penalty value of the entrepreneurship feature  $j$  of country  $i$   
 $y_{i,j}$  is the normalized value of the original entrepreneurship feature  $j$  of country  $i$   
 $\min y_{i,j}$  is the minimum, normalized value of the original entrepreneurship feature  $j$  of country  $i$   
 $i = 1, 2, \dots, m$  (the number of countries)  
 $j = 1, 2, \dots, n$  (the number of entrepreneurial features)

The pillars are the basic building blocks of the sub-index: entrepreneurial attitudes, entrepreneurial abilities, and entrepreneurial aspirations. The value of a sub-index for any country is the arithmetic average of its PFB-adjusted pillars for that sub-index multiplied by a 100. The maximum value of the sub-indices is 100 and the potential minimum is 0, both of which reflect the relative position of a country in a particular sub-index.

$$ATT_i = 100 \sum_{j=1}^5 h_j \quad (2a)$$

$$ABT_i = 100 \sum_{j=6}^9 h_j \quad (2b)$$

$$ASP_i = 100 \sum_{j=10}^{14} h_j \quad (2c)$$

The super-index, the Global Entrepreneurship Index, is simply the average of the three sub-indices. Since 100 represents the theoretically available limit the GEI points can also be interpreted as a measure of efficiency of the entrepreneurship resources

$$GEI_i = \frac{1}{3} (ATT_i + ABT_i + ASP_i) \quad (3)$$

where  $i = 1, 2, \dots, n$  = the number of countries

For the detailed description of the methodology we refer to Acs et al 2016, chapter 5.

There are some important policy related consequences of the PFB methodology. First, the different pillars cannot be fully substituted with each other. In other words, the performance of the better performing pillar just only partially compensates for the bad performance of the bottleneck pillar. Second, the whole GEI index can be improved the most by increasing the bottleneck pillar. The magnitude of the enhancement depends on the relative size of the bottleneck as compared to the other pillars. Third, for policy makers it means that the enhancement of the worst performing bottleneck pillar is the most important priority for entrepreneurship policy.

### **Measuring and comparing the level of entrepreneurship in the European Union member states**

We have data for 26 out of the 28 EU member countries except Cyprus and Malta. The individual data are from the 2011 and 2015 cycles of the Global Entrepreneurship Monitor Adult Population Survey (APS). There are various sources of the applied institutional data representing the same years as the individual data (Appendix 1A, 1B). In order to decrease measurement error and maximize the number of investigated countries we use the average of the 2011-2015 five years time period (Table 2).

**Table 2: The examined European Union countries and years of data availability**

Country	Years	Country	Years
Austria	2012, 2014	Italy	2012-2015
Belgium	2011-2015	Latvia	2011-2013, 2015
Bulgaria	2015	Lithuania	2011-2014
Croatia	2011-2015	Luxembourg	2013-2015
Czech Republic	2011, 2013	Netherlands	2011-2015
Denmark	2011, 2012, 2014	Poland	2011-2015
Estonia	2012-2015	Portugal	2011-2015
Finland	2011-2015	Romania	2011-2015
France	2011-2014	Slovakia	2011-2015
Germany	2011-2015	Slovenia	2011-2015
Greece	2011-2015	Spain	2011-2015
Hungary	2011-2015	Sweden	2011-2015
Ireland	2011-2015	United Kingdom	2011-2015

While we have data for altogether 93 countries in the 2011-2015 time period we focus mainly on the 26 EU member countries. Table 3 presents the overall GEI scores ranking, of all the 93

countries. The EU member countries rank from the 2<sup>nd</sup> to the 70<sup>th</sup> place. The entrepreneurial performance of the EU member countries varies significantly from 77,2 to 22,7: The difference between the second ranked Sweden to the 70<sup>th</sup> Bulgaria is more than threefold. However, there are only two EU countries, Sweden and Denmark, in the top five. Anglo-Saxon countries, the US, Australia, Canada, UK and the Nordic countries dominate the first places of index ranking. There are ten EU countries situated in the first fifteen places: Sweden, Canada, Switzerland, Denmark, Australia, United Kingdom, Netherlands, Ireland, Finland, France, Belgium, Germany, Austria. While the difference between the number one US and the second Sweden is only 4,6%, it is 13% between the US and the seventh ranked UK and it is 21,6% between the US and the fourteenth ranked Austria. In the four Southern European countries, Portugal, Spain, Italy, and Greece, entrepreneurial performance is below that which would be expected by their level of economic development. In particular, Italy and Greece position below many developing EU and non-EU countries is disappointing.

**Table 3: The Global Entrepreneurship Index Rank of the 93 Countries, 2011-2015**

Rank	Country	GDP*	GEI	Rank	Country	GDP	GEI	Rank	Country	GDP	GEI
1	United States	50756	80,9	32	Turkey	17634	43,8	63	Trinidad & Tobago	29155	24,5
2	Sweden	43927	77,2	33	Czech Republic	28075	43,5	64	Philippines	6796	23,9
3	Canada	41846	76,5	34	Bolivia	5934	21,6	65	Argentina	17636	23,7
4	Switzerland	54387	76,3	35	Slovakia	25659	42,3	66	El Salvador	7515	23,5
5	Denmark	42428	76,2	36	Latvia	20080	41,2	67	Belize	8215	23,1
6	Australia	42103	74,5	37	Hungary	22624	40,6	68	Ghana	3668	23,0
7	United Kingdom	36806	70,5	38	Tunisia	10232	38,9	69	Egypt	9807	22,7
8	Netherlands	45733	69,7	39	Colombia	11621	38,7	70	Bulgaria	16022	22,7
9	Ireland	44234	68,6	40	Uruguay	18123	36,6	71	Algeria	12626	22,5
10	Finland	39318	67,6	41	Italy	34605	36,5	72	Vietnam	5043	22,2
11	France	37112	65,8	42	Malaysia	21930	36,5	73	Nigeria	5207	22,1
12	Belgium	40913	64,8	43	Greece	26097	35,7	74	Indonesia	9278	21,2
13	Germany	42868	63,9	44	China	10822	35,1	75	Brazil	14416	21,0
14	Austria	44308	63,5	45	Romania	17731	34,6	76	Iran	15812	20,9
15	Taiwan	38122	63,1	46	Botswana	14779	34,2	77	Jamaica	8499	20,6
16	Norway	62907	60,1	47	Barbados	15247	33,7	78	Zambia	3678	20,6
17	Chile	20687	59,1	48	South Africa	11967	33,5	79	Ecuador	10333	20,6
18	Israel	30617	59,0	49	Croatia	20033	32,2	80	Bosnia and Herzegovina	9232	20,0
19	Luxembourg	79718	58,7	50	Costa Rica	13431	31,1	81	Senegal	2198	19,7
20	Qatar	127562	57,6	51	Kazakhstan	21089	30,1	82	Guatemala	6953	17,9
21	Estonia	24852	55,2	52	Namibia	8995	29,8	83	Suriname	15556	17,8
22	Singapore	74314	52,2	53	Lebanon	16777	29,6	84	Ethiopia	1 427	17,8
23	Slovenia	28180	51,8	54	Macedonia	11519	28,9	85	Libya	23032	17,2
24	United Arab Emirates	57380	49,7	55	Peru	10719	28,5	86	Malawi	740	16,5
25	Korea	31890	49,4	56	Thailand	13495	28,1	87	Pakistan	4261	16,0
26	Japan	34872	49,2	57	Panama	16836	27,4	88	Cameroon	2810	14,7
27	Portugal	26171	46,0	58	Mexico	15958	27,0	89	Uganda	1345	13,8
28	Spain	32132	45,7	59	India	5220	25,9	90	Angola	7271	13,8
29	Poland	22390	45,1	60	Morocco	6958	25,7	91	Venezuela	16537	13,0
30	Lithuania	22713	44,2	61	Russia	22795	24,8	92	Burkina Faso	1530	11,9

31	Puerto Rico	31426	44,0	62	Georgia	6946	24,6	Faso	93	Bangladesh	2459	11,6
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Legend: \*: GDP per capita in international \$ World bank, average over the 2011-2015 time period

Grey: European Union member states

The best new member state Estonia is the 21<sup>st</sup> ranked with a solid performance of 55,2 GEI points. Slovenia, Poland, and Lithuania have relatively high GEI points as compared to their development. The Czech Republic, Slovakia and Hungary also perform acceptably. The three lowest developed EU member countries, Romania, Croatia and Bulgaria are the bottom of the EU GEDI rank.

By comparing the EU to the US, the superiority of the US is clear: The EU average GEI is 56,6 while the US is 80,9, a 31% difference! Dividing the EU-member countries into the Old (pre-2004 members) and the New (the countries that joined in 2004 and 2007), there is a significant difference in the entrepreneurial performance: The Old members' GEI average is 60,7 while the New member states' GEI average is only 41,2.

### **The entrepreneurial strengths and weaknesses of the European Union member states**

For analysing the entrepreneurial strengths and weakness of the EU countries, we need to decompose the GEI index. While it is possible to investigate entrepreneurship related to the three sub-indexes and the GEI scores, here we focus on the analysis of the 14 pillars. Table 4 shows the 14 pillar, the three sub-index and the GEI values for each of the 26 European Union member states and the US, as a benchmarking country.

The pillar scores in Table 4 are calculated as the normalized and adjusted points of the pillars including all the 93 countries where the worst country receives the lowest score and the best country receives a point 1. The colours demonstrate the relative position of the particular country with respect to the representative pillar from the disadvantageous dark green position to the favourable light green situation. More light grey cells indicate a favourable position of the EU countries. While the overall pillar scores of the EU averages are relatively balanced, EU member countries seem to score high in the aspiration related pillars of Internationalization, Process Innovation and Risk Capital and of ability related pillars of Opportunity Startup and Technology Absorption. EU countries score relatively low in the attitudes related pillars like Networking, Opportunity Perception, Risk Acceptance and Cultural Support.

Comparing the Old member states, the New member states, and the US, the US outperforms the Old EU member states in twelve out of the 14 pillars. The Old EU member countries are better than the US only in Networking and Opportunity Startup. The dominance of the US is clear by comparing the New EU member states to the US; the US outperforms the Old EU member states in each of the fourteen pillars. The whole EU is considerably behind the US, that is perhaps a reason behind the increasing differences between the US and the EU. Comparing the Old and the New EU member states, New member states are better than the Old ones only in two pillars (High Growth and Internationalization). Out of the remaining twelve pillars, the differences are the largest in Opportunity Perception and Competition.

**Table 4: The normalized score values of the 14 pillar, the three sub-indices and the GEI scores of entrepreneurship in the European Union member countries and the US**

Country	1	2	3	4	5	6	7	8	9	10	11	12	13	14	ATT	ABT	ASP	GEI
Austria	0,78	0,86	0,69	0,60	0,61	0,82	0,91	0,53	0,81	0,75	0,71	0,33	0,84	0,59	64,0	67,7	58,6	63,5
Belgium	0,70	0,67	0,60	0,43	0,59	0,64	0,62	0,82	0,82	0,70	0,88	0,52	0,84	0,72	57,9	68,2	68,4	64,8
Denmark	1,00	0,63	0,73	0,70	0,94	1,00	1,00	1,00	1,00	1,00	0,75	0,60	0,43	1,00	73,3	86,4	68,9	76,2
Finland	1,00	0,96	0,79	1,00	0,96	0,93	0,66	0,39	0,50	0,84	0,94	0,60	0,57	0,51	81,0	57,7	64,1	67,6
France	0,56	0,44	0,67	0,75	0,69	0,64	1,00	0,55	0,71	0,83	0,89	0,59	0,71	0,71	59,9	67,4	69,9	65,8
Germany	0,74	0,50	0,59	0,41	0,80	0,75	0,85	0,41	0,88	0,67	0,81	0,62	0,77	0,72	58,1	66,5	67,2	63,9
Greece	0,18	0,77	0,22	0,34	0,26	0,48	0,52	0,44	0,33	0,28	0,47	0,14	0,50	0,63	31,4	39,7	36,0	35,7
Ireland	0,62	0,85	0,72	0,41	0,71	0,88	0,87	0,92	0,84	0,72	0,69	0,70	0,76	0,57	62,4	78,4	65,1	68,6
Italy	0,28	0,32	0,39	0,22	0,32	0,36	0,54	0,17	0,31	0,87	0,67	0,18	0,52	0,59	29,7	32,3	47,5	36,5
Luxembourg	0,75	0,16	0,56	0,76	0,65	1,00	0,98	0,57	0,95	1,00	0,63	0,49	1,00	0,84	48,3	66,0	61,7	58,7
Netherlands	0,79	0,87	0,81	0,77	1,00	0,99	0,68	0,45	0,87	0,72	0,72	0,50	0,58	0,73	77,6	69,1	62,5	69,7
Portugal	0,37	0,61	0,58	0,35	0,57	0,59	0,48	0,29	0,41	0,36	0,66	0,35	0,74	0,49	47,2	42,5	48,4	46,0
Spain	0,32	0,70	0,59	0,58	0,43	0,58	0,74	0,40	0,51	0,32	0,56	0,25	0,25	0,61	48,4	50,9	37,7	45,7
Sweden	1,00	0,61	0,79	0,80	0,90	0,96	1,00	0,61	0,79	0,74	0,94	0,59	0,77	0,68	78,8	80,2	72,7	77,2
United Kingdom	0,77	0,58	0,77	0,52	0,82	0,88	0,88	0,76	0,94	0,66	0,68	0,65	0,65	0,56	67,2	81,0	63,3	70,5
Old EU member states	0,66	0,63	0,63	0,57	0,68	0,77	0,78	0,55	0,71	0,70	0,73	0,47	0,66	0,66	59,0	63,6	59,5	60,7
Bulgaria	0,13	0,38	0,19	0,40	0,28	0,28	0,29	0,24	0,16	0,05	0,46	0,18	0,25	0,20	24,7	22,6	20,8	22,7
Croatia	0,17	0,43	0,10	0,24	0,25	0,41	0,54	0,21	0,34	0,18	0,49	0,45	0,86	0,48	22,5	33,4	40,8	32,2
Czech Republic	0,33	0,49	0,75	0,32	0,13	0,42	0,64	0,34	0,42	0,61	0,77	0,55	1,00	0,51	35,6	40,2	54,8	43,5
Estonia	0,81	0,63	0,61	0,53	0,53	0,56	0,61	0,48	0,61	0,56	0,70	0,57	0,71	0,33	57,9	53,8	54,0	55,2
Hungary	0,29	0,35	0,52	0,35	0,37	0,42	0,56	0,45	0,30	0,30	0,45	0,44	0,74	0,32	37,0	41,9	42,8	40,6
Latvia	0,37	0,55	0,17	0,35	0,33	0,54	0,58	0,50	0,41	0,40	0,28	0,73	0,69	0,45	33,2	45,5	44,8	41,2
Lithuania	0,41	0,50	0,24	0,40	0,40	0,47	0,54	0,69	0,29	0,33	0,45	0,59	0,73	0,57	37,8	45,9	48,9	44,2
Poland	0,35	0,67	0,37	0,34	0,48	0,35	0,37	0,42	0,39	0,66	0,38	0,49	0,81	0,54	43,0	38,1	54,1	45,1
Romania	0,30	0,39	0,18	0,16	0,35	0,22	0,41	0,43	0,31	0,31	0,33	0,61	0,73	0,58	26,8	32,2	44,8	34,6
Slovakia	0,25	0,37	0,66	0,34	0,28	0,36	0,53	0,36	0,26	0,40	0,46	0,54	0,96	0,69	36,4	36,7	53,8	42,3
Slovenia	0,29	0,84	0,77	0,36	0,47	0,60	0,77	0,42	0,43	0,52	0,73	0,40	0,85	0,44	49,9	51,7	53,9	51,8
New EU member states	0,34	0,51	0,41	0,34	0,35	0,42	0,53	0,41	0,36	0,39	0,50	0,50	0,76	0,47	36,8	40,2	46,7	41,2
European Union	0,51	0,59	0,51	0,47	0,52	0,61	0,69	0,50	0,54	0,55	0,70	0,52	0,71	0,61	51,9	57,6	60,3	56,6
United States	0,83	1,00	0,91	0,50	0,83	0,72	0,80	1,00	0,97	0,85	0,92	1,00	1,00	1,00	75,8	80,5	86,5	80,9

Legend: 1. Opportunity Perception (ATT), 2. Start-up Skills (ATT), 3. Risk Acceptance (ATT), 4. Networking (ATT), 5. Cultural Support (ATT), 6. Opportunity Startup (ABT), 7. Technology Absorption (ABT), 8. Human Capital (ABT), 9. Competition (ABT), 10. Product Innovation (ASP), 11. Process Innovation (ASP), 12. High Growth (ASP), 13. Internationalization (ASP), 14. Risk Capital (ASP)

### Improving entrepreneurship in the European Union: A simulation

In the previous section we described and analyzed the entrepreneurial performance of the European Union compared to its main competitor and benchmark country the United States. On the one hand, it is clear that the US outperforms the EU member countries. In this sense GEI just reinforces what other researchers have already found. However, the GEI analysis has pointed to the significant differences in the entrepreneurial performance across the EU member countries. There are considerable deviations among the Old member states and the New member states and among the Nordic countries and the Southern European countries. At the same time, the main administrative and decision-making bodies of the EU

have been trying to provide general, uniform policies and guidelines to its member states. According to the GEI, one size does not fit all, and we need tailor-made policies according to the specific needs of each country.

An important note is that the following simulation has a limited potential for interpreting as a policy recommendation, because it relies on important assumptions restraining its practical application. First, the applied 14 pillars of GEI only partially reflect the national system of entrepreneurship. Consequently, maximizing the GEI index of a particular country does not mean maximizing the whole NSE of a particular country. Second, we assume that all GEI pillars require roughly the same effort to improve by the same magnitude, which might well not be realistic. Third, we assume that the costs of the resources to improve the 14 pillars are about the same. In fact, these costs may vary significantly over pillars (Acs et al 2014). Fourth, we set aside the differences in country size by presuming that the same effort is necessary to improve the GEI over the 26 EU countries. Of course, the cost of an improvement of a pillar in larger country like Germany could be considerable higher than in a smaller country like Slovenia.

An important implication of the GEI analysis is the best way to increase the GEI is to reduce the differences between the pillars by enhancing the weakest GEI pillar. However, another pillar may become the weakest link constraining the performance in entrepreneurship. This system dynamics leads to the problem of “optimal” allocation of the additional resources. In other words, if a particular EU country were to allocate additional resources to improving its GEI Index performance, how should this additional effort be allocated to achieve an “optimal”<sup>2</sup> outcome? While optimality is relatively clear in the country level it is more complicated in the EU level. How should the efforts to increase entrepreneurship be divided among the member states? There are several possible scenarios. We mention only three and examine with simulation only one case. Let’s assume that we would like to increase the average GEDI index by 5, from the average of 56,6 to 61,6, closing the 31,3% gap to the US by 6,4%. The first possibility is to increase the GEDI by 5 in each country. The second possibility could be to try closing the more than threefold differences among the member states and allocating the resources to the least entrepreneurial countries. The third possibility is to try to optimize over the countries and allocate the additional resources in such a way as to increase the average EU GEI index point the most. Here, we are dealing with only the first, simplest case.

In the following, we simulate a situation in which each of the investigated EU member countries increase its allocation of entrepreneurship policy resources in an effort to gain a 5 point improvement in the GEI Index. As described earlier, the PFB method calculation implies that the greatest improvement can be achieved by alleviating the weakest performing pillar. Once the binding constraint has been eliminated then the further available resources should be distributed to improve the next most binding pillar. We iterated this procedure until an overall GEI Index performance of 5 in every country had been achieved. The result of the simulation is shown in Table 5.

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<sup>2</sup>‘Optimal’ in the sense of maximizing the GEI index value.

**Table 5: Simulation of 'optimal' policy allocation to increase the GEI score by 5 in the EU member countries**

Country		1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total Effort
Austria	A	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,16	0,00	0,00	0,16
	B	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	1,6%
Belgium	A	0,00	0,00	0,02	0,19	0,03	0,00	0,00	0,00	0,00	0,00	0,00	0,10	0,00	0,00	0,34
	B	0%	0%	6%	56%	9%	0%	0%	0%	0%	0%	0%	29%	0%	0%	3,6%
Denmark	A	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,15	0,00	0,15
	B	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	1,3%
Finland	A	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,15	0,03	0,00	0,00	0,00	0,00	0,02	0,20
	B	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,75	0,15	0,00	0,00	0,00	0,00	0,10	0,02
France	A	0,05	0,18	0,00	0,00	0,00	0,00	0,00	0,07	0,00	0,00	0,00	0,03	0,00	0,00	0,33
	B	15%	55%	0%	0%	0%	0%	0%	21%	0%	0%	0%	9%	0%	0%	3,4%
Germany	A	0,00	0,05	0,00	0,14	0,00	0,00	0,00	0,14	0,00	0,00	0,00	0,00	0,00	0,00	0,33
	B	0%	15%	0%	42%	0%	0%	0%	42%	0%	0%	0%	0%	0%	0%	3,5%
Greece	A	0,12	0,00	0,07	0,00	0,03	0,00	0,00	0,00	0,00	0,01	0,00	0,15	0,00	0,00	0,38
	B	32%	0%	18%	0%	8%	0%	0%	0%	0%	3%	0%	39%	0%	0%	6,8%
Ireland	A	0,00	0,00	0,00	0,18	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,19
	B	0%	0%	0%	95%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	1,8%
Italy	A	0,03	0,00	0,00	0,09	0,00	0,00	0,00	0,14	0,00	0,00	0,00	0,14	0,00	0,00	0,40
	B	8%	0%	0%	23%	0%	0%	0%	35%	0%	0%	0%	35%	0%	0%	7,0%
Luxembourg	A	0,00	0,11	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,11
	B	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1,1%
Netherlands	A	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,15	0,00	0,00	0,00	0,10	0,03	0,00	0,28
	B	0%	0%	0%	0%	0%	0%	0%	54%	0%	0%	0%	36%	11%	0%	2,7%
Portugal	A	0,06	0,00	0,00	0,08	0,00	0,00	0,00	0,14	0,03	0,07	0,00	0,08	0,00	0,00	0,46
	B	13%	0%	0%	17%	0%	0%	0%	30%	7%	15%	0%	17%	0%	0%	6,7%
Spain	A	0,07	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,08	0,00	0,14	0,14	0,00	0,43
	B	16%	0%	0%	0%	0%	0%	0%	0%	0%	19%	0%	33%	33%	0%	6,3%
Sweden	A	0,00	0,12	0,00	0,00	0,00	0,00	0,00	0,12	0,00	0,00	0,00	0,14	0,00	0,06	0,44
	B	0%	27%	0%	0%	0%	0%	0%	27%	0%	0%	0%	32%	0%	14%	3,9%
United Kingdom	A	0,00	0,10	0,00	0,16	0,00	0,00	0,00	0,00	0,00	0,02	0,00	0,02	0,03	0,12	0,45
	B	0%	22%	0%	36%	0%	0%	0%	0%	0%	4%	0%	4%	7%	27%	4,4%

**Table 5: Simulation of 'optimal' policy allocation to increase the GEI score by 5 in the EU member countries (continued)**

Country		1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total Effort
Bulgaria	A	0,10	0,00	0,04	0,00	0,00	0,00	0,00	0,00	0,07	0,17	0,00	0,05	0,00	0,03	0,46
	B	22%	0%	9%	0%	0%	0%	0%	0%	15%	37%	0%	11%	0%	7%	13,2%
Croatia	A	0,08	0,00	0,15	0,01	0,00	0,00	0,00	0,05	0,00	0,07	0,00	0,00	0,00	0,00	0,36
	B	22%	0%	42%	3%	0%	0%	0%	14%	0%	19%	0%	0%	0%	0%	7,0%
Czech Republic	A	0,00	0,00	0,00	0,00	0,16	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,16
	B	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2,2%
Estonia	A	0,00	0,00	0,00	0,02	0,01	0,00	0,00	0,06	0,00	0,00	0,00	0,00	0,00	0,21	0,30
	B	0%	0%	0%	7%	3%	0%	0%	20%	0%	0%	0%	0%	0%	70%	3,6%
Hungary	A	0,12	0,06	0,00	0,06	0,04	0,00	0,00	0,00	0,12	0,11	0,00	0,00	0,00	0,09	0,60
	B	20%	10%	0%	10%	7%	0%	0%	0%	20%	18%	0%	0%	0%	15%	10,3%
Latvia	A	0,00	0,00	0,18	0,00	0,03	0,00	0,00	0,00	0,00	0,00	0,07	0,00	0,00	0,00	0,28
	B	0%	0%	64%	0%	11%	0%	0%	0%	0%	0%	25%	0%	0%	0%	4,4%
Lithuania	A	0,00	0,00	0,17	0,01	0,00	0,00	0,00	0,00	0,12	0,07	0,00	0,00	0,00	0,00	0,37
	B	0%	0%	46%	3%	0%	0%	0%	0%	32%	19%	0%	0%	0%	0%	5,6%
Poland	A	0,10	0,00	0,07	0,10	0,00	0,09	0,07	0,03	0,05	0,00	0,07	0,00	0,00	0,00	0,58
	B	17%	0%	12%	17%	0%	16%	12%	5%	9%	0%	12%	0%	0%	0%	8,8%
Romania	A	0,02	0,00	0,13	0,16	0,00	0,10	0,00	0,00	0,01	0,01	0,00	0,00	0,00	0,00	0,43
	B	5%	0%	30%	37%	0%	23%	0%	0%	2%	2%	0%	0%	0%	0%	8,1%
Slovakia	A	0,13	0,01	0,00	0,05	0,11	0,02	0,00	0,03	0,12	0,00	0,00	0,00	0,00	0,00	0,47
	B	28%	2%	0%	11%	23%	4%	0%	6%	26%	0%	0%	0%	0%	0%	7,3%
Slovenia	A	0,16	0,00	0,00	0,09	0,00	0,00	0,00	0,03	0,02	0,00	0,00	0,05	0,00	0,00	0,35
	B	46%	0%	0%	26%	0%	0%	0%	9%	6%	0%	0%	14%	0%	0%	4,4%
European Union	A	0,08	0,01	0,08	0,12	0,07	0,00	0,00	0,10	0,05	0,04	0,00	0,08	0,00	0,00	0,63
	B	13%	2%	13%	19%	11%	0%	0%	16%	8%	6%	0%	13%	0%	0%	7,9%

Legend: A: Required increase in pillar; B: Percentage of total effort

Legend: 1. Opportunity Perception (ATT), 2. Start-up Skills (ATT), 3. Risk Acceptance (ATT), 4. Networking (ATT), 5. Cultural Support (ATT), 6. Opportunity Startup (ABT), 7. Technology Absorption (ABT), 8. Human Capital (ABT), 9. Competition (ABT), 10. Product Innovation (ASP), 11. Process Innovation (ASP), 12. High Growth (ASP), 13. Internationalization (ASP), 14. Risk Capital (ASP)



We can see that to improve the EU average GEDI index score by 5, an “optimal” effort allocation would call for a 19% improvement in the Networking pillar, a 16% in the Human Capital pillar, and a 13% in the Opportunity Recognition, Risk Acceptance and the High Growth pillars. Of the remaining effort, our simulation suggests that 8% should be allocated to Competition, 6% to Product Innovation, and 2% to Startup Skills.

However, looking at Table 5 it is apparent that the ‘optimal’ policy mix is different for the 26 EU member countries. There are not even two EU member countries having the same policy mix to improve the GEDI score by 5. Old EU member states seem to be relatively weak in High Growth, except Denmark, Finland, Germany, Ireland and Luxemburg. Human capital is also a weak pillar in many developed EU countries. New EU member states are particularly fragile in the attitude related pillars of Opportunity Perception and Risk Acceptance. These weaknesses perhaps are related to the heritage of the socialist system.

. Countries also differ in the amount of the required additional new resources: For Luxemburg there are only 0.11 (1,1%) new resources necessary while Hungary requires 0,60 (10,3%). All the other EU countries are between these two extremes. It is relatively easier to improve the GEI score if the country has only one weak pillar (Luxemburg, Austria, Denmark, Czech Republic) as compared to those countries that have a more balanced entrepreneurial profile and require more pillars to improve their GEI score: Poland needs to enhance eight pillars, Hungary, Slovakia seven pillars, Bulgaria, Slovakia, Romania and the UK six pillars. All these finding underlie the importance of differentiated entrepreneurship policy in the EU member states.

## **Summary and conclusion**

The main purpose of this paper is to present the potential public policy applicability of the Global Entrepreneurship Index approach for the European Union and its member countries. Based on the multidimensional view of entrepreneurship, we introduced the concept of the National System of Entrepreneurship. While previous entrepreneurship measures incorporated only individual data, the GEI combined individual data with contextual institutional factors. GEI also holds that the building blocks, called pillars, of the NSE interact with one another. The Penalty for Bottleneck methodology quantified the system view by stating that the performance of the NES is determined by the country’s worst performing pillar. In addition, the PFB also assumes the partial substitutability of the pillars of entrepreneurship. However, the exact size and magnitude of the substitution is not known.

We applied the GEI approach to examine the entrepreneurial performance of the European Union and 26 out of its 28 member countries. The outcome of the analysis is underlined by three factors. First, the EU has been lagging behind its main competitor, the US, in all aspects of entrepreneurship. Second, the relatively low level of entrepreneurship is one of the main reasons for the relative stagnation of the EU. The less entrepreneurial Southern European countries struggle and suffer the most. Third, the EU recognized its lagging position but these ambitious aims described in the 2000 Lisboa Agenda seem not to be fulfilled. On the contrary, the differences between the EU and the US have increased, calling for agenda new approach.

The EU member nations' example highlights the usefulness of the GEI method in analyzing the entrepreneurial profiles of countries from a system perspective. According to the GEI index, the EU countries differ considerably in their entrepreneurial performances. Moreover, even larger differences exist over the 14 pillars in the country levels. In addition to highlighting the most binding bottleneck factors of entrepreneurial performance, the GEI methodology also provides rough indications on how much a country should invest to alleviate a given bottleneck.

The unique feature of GEI's Penalty for Bottleneck methodology is that, it is possible to begin simulating alternative policy scenarios and their possible effects at the system level. While numerous potential policy mixes exist, we analysed only one situation in which the GEDI scores were improved by all the 26 EU member countries by 5, about 9%. This simplest simulation is based on four important binding assumptions that limit the practical applicability of the results. One of the most important implications of the analysis is that uniform policy does not work, and the EU member states should apply different policy mixes to reach the same improvement in the GEI. Despite that the GEI framework does not offer a panacea for policy makers, it does provide a useful learning device as a starting point for further policy analysis.

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## Appendices

### *Appendix 1A: The description of the individual variables used in the GEI*

<b>Individual variable</b>	<b>Description</b>
Opportunity Recognition	The percentage of the 18-64 aged population recognizing good conditions to start business next 6 months in area he/she lives,
Skill Perception	The percentage of the 18-64 aged population claiming to possess the required knowledge/skills to start business
Risk Acceptance	The percentage of the 18-64 aged population stating that the fear of failure would not prevent starting a business
Know Entrepreneurs	The percentage of the 18-64 aged population knowing someone who started a business in the past 2 years
Carrier	The percentage of the 18-64 aged population saying that people consider starting business as good carrier choice
Status	The percentage of the 18-64 aged population thinking that people attach high status to successful entrepreneurs
Career Status	The status and respect of entrepreneurs calculated as the average of Carrier and Status
Opportunity Motivation	Percentage of the TEA businesses initiated because of opportunity start-up motive
Technology Level	Percentage of the TEA businesses that are active in technology sectors (high or medium)
Educational Level	Percentage of the TEA businesses owner/managers having participated over secondary education
Competitors	Percentage of the TEA businesses started in those markets where not many businesses offer the same product
New Product	Percentage of the TEA businesses offering products that are new to at least some of the customers
New Tech	Percentage of the TEA businesses using new technology that is less than 5 years old average (including 1 year)
Gazelle	Percentage of the TEA businesses having high job expectation average (over 10 more employees and 50% in 5 years)
Export	Percentage of the TEA businesses where at least some customers are outside country (over 1%)
Informal Investment Mean	The mean amount of 3 year informal investment
Business Angel	The percentage of the 18-64 aged population who provided funds for new business in past 3 years excluding stocks & funds, average
Informal Investment	The amount of informal investment calculated as $INFINVMEAN * BUSANG$

**Appendix 1B: The description and source of the institutional variables used in the GEI**

<b>Institutional variable</b>	<b>Description</b>	<b>Source of data</b>	<b>Data availability</b>
Economic Freedom	“Business freedom is a quantitative measure of the ability to start, operate, and close a business that represents the overall burden of regulation, as well as the efficiency of government in the regulatory process. The business freedom score for each country is a number between 0 and 100, with 100 equaling the freest business environment. The score is based on 10 factors, all weighted equally, using data from the World Bank’s <i>Doing Business</i> study”. ( <a href="http://www.heritage.org/Index/pdf/Index09_Methodology.pdf">http://www.heritage.org/Index/pdf/Index09_Methodology.pdf</a> ). Data are collected from 2015.	Heritage Foundation/ World Bank	<a href="http://www.heritage.org/index/explore.aspx">http://www.heritage.org/index/explore.aspx</a>
Property Rights	“The property rights component is an assessment of the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state. It measures the degree to which a country’s laws protect private property rights and the degree to which its government enforces those laws. It also assesses the likelihood that private property will be expropriated and analyzes the independence of the judiciary, the existence of corruption within the judiciary, and the ability of individuals and businesses to enforce contracts.” ( <a href="http://www.heritage.org/index/property-rights">http://www.heritage.org/index/property-rights</a> )	Heritage Foundation/ World Bank	<a href="http://www.heritage.org/index/explore.aspx">http://www.heritage.org/index/explore.aspx</a>
Freedom and Property	Economic Freedom * Property Rights	Own calculation	
Tertiary Education	Gross enrolment ratio in tertiary education, 2015 or latest available data.	World Bank	<a href="http://data.worldbank.org/indicator/SE.TER.ENRR">http://data.worldbank.org/indicator/SE.TER.ENRR</a>
Quality of Education	Answers to the question: “In your country, how do you assess the quality of math and science education? [1 = extremely poor—among the worst in the world; 7 = excellent—among the best in the world]”		The Global Competitiveness Report 2015-2016, p. 377
Education	Tertiary Education * Quality of Education	Own calculation	
Country Risk	The country risk classifications are meant to reflect country risk. Under the Participants’ system, country risk is composed of transfer and convertibility risk (i.e. the risk a government imposes capital or exchange controls that prevent an entity from converting local currency into foreign currency and/or transferring funds to creditors located outside the country) and cases of force majeure (e.g. war, expropriation, revolution, civil disturbance, floods, earthquakes).	OECD	<a href="http://www.oecd.org/tad/xcred/crc.htm">http://www.oecd.org/tad/xcred/crc.htm</a>
Urbanization	Urbanization that is the percentage of the population living in urban areas, data are from the Population Division of the United Nations, 2010 estimate	United Nations	<a href="http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS">http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS</a>
Infrastructure	Pillar 2, Infrastructure and connectivity in the World Competitiveness Report: “... in addition to assessing the quality of the transport infrastructure, the pillar also measures the quality of domestic and international transport networks.”	World Economic Forum	The Global Competitiveness Report 2015-2016, p. 47
Connectivity	Urbanization * Infrastructure	Own calculation	
Corruption	The Corruption Perceptions Index (CPI) measures the perceived level of public-sector corruption in a country. “The CPI is a “survey of surveys”, based on 13 different expert and business surveys.” ( <a href="http://www.transparency.org/policy_research/surveys_indices/cpi/2009">http://www.transparency.org/policy_research/surveys_indices/cpi/2009</a> ) Overall performance is measured on a ten point Likert scale. Data are collected over the last 24 months.	Transparency International	<a href="http://files.transparency.org/content/download/702/3015/file/CPI2013_DataBundle.zip">http://files.transparency.org/content/download/702/3015/file/CPI2013_DataBundle.zip</a>
Taxation	Paying taxes scores, “...addresses the taxes and mandatory contributions that a medium-size company must pay or withhold in a given year, as well as measures the administrative burden in paying taxes.” ( <a href="http://www.doingbusiness.org/data/exploretopics/paying-taxes">http://www.doingbusiness.org/data/exploretopics/paying-taxes</a> )	World Bank	<a href="http://www.doingbusiness.org/data/distance-to-frontier">http://www.doingbusiness.org/data/distance-to-frontier</a>
Good Governance	The effectiveness of the government “the capacity of the government to effectively formulate and implement sound policies” ( <a href="http://info.worldbank.org/governance/wgi/#home">http://info.worldbank.org/governance/wgi/#home</a> )	World Bank	<a href="http://qog.pol.gu.se/data/datadownloads/qogbasicdata">http://qog.pol.gu.se/data/datadownloads/qogbasicdata</a>
Taxgovern	Measures the effectiveness of using the taxes by combining together the level of the tax by the quality of government services, Taxation* Good Governance	Own calculation	
Tech Absorption	Firm level technology absorption capability: “Companies in your country are (1 = not able to absorb new technology, 7 = aggressive in absorbing new technology)”.	World Economic Forum	The Global Competitiveness Report 2015-2016–. p. 379
Labor Freedom	Measures the freedom of the labor as “...that considers various aspects of the legal and regulatory framework of a country’s labor market, including regulations concerning minimum wages, laws inhibiting	Heritage Foundation	<a href="http://www.heritage.org/index/download">http://www.heritage.org/index/download</a>

	layoffs, severance requirements, and measurable regulatory restraints on hiring and hours worked.” ( <a href="http://www.heritage.org/index/labor-freedom">http://www.heritage.org/index/labor-freedom</a> )		
Staff Training	The extent of staff training: “To what extent do companies in your country invest in training and employee development? (1 = hardly at all; 7 = to a great extent)”.	World Economic Forum	The Global Competitiveness Report 2015-2016, p. 377
Labor Market	Labor Freedom * Staff Training		
Regulation	Effectiveness of anti-monopoly policy, answering to the question: “In your country, how effective are anti-monopoly policies at ensuring fair competition? [1 = not effective at all; 7 = extremely effective] “	World Economic Forum	The Global Competitiveness Report 2015-2016, p. 395
Market Dominance	Extent of market dominance: “Corporate activity in your country is (1 = dominated by a few business groups, 7 = spread among many firms)”.	World Economic Forum	The Global Competitiveness Report 2015-2016, p. 471
Compregulation	Regulation * Market Dominance		
Technology Transfer	These are the innovation index points from GCI: a complex measure of innovation including investment in research and development (R&D) by the private sector, the presence of high-quality scientific research institutions, the collaboration in research between universities and industry, and the protection of intellectual property.	World Economic Forum	The Global Competitiveness Report 2015-2016, p. 22
GERD	Gross domestic expenditure on Research & Development (GERD) as a percentage of GDP, year 2014 or latest available data Puerto Rico, Dominican Republic, and United Arab Emirates are estimated	UNESCO	<a href="http://stats.uis.unesco.org/unesco/TableViewer/tableView.aspx?ReportId=2656">http://stats.uis.unesco.org/unesco/TableViewer/tableView.aspx?ReportId=2656</a>
Scientific Institutions	Quality of scientific research institutions. Answering to the question: “In your country, how do you assess the quality of scientific research institutions? [1 = extremely poor—among the worst in the world; 7 = extremely good—among the best in the world] “	World Economic Forum	The Global Competitiveness Report 2015-2016, p. 381
Availability of Scientist	Availability of scientists and engineers. Answering to the question: “In your country, to what extent are scientists and engineers available? [1 = not at all; 7 = widely available] ”	World Economic Forum	The Global Competitiveness Report 2015-2016, p. 381
Science	GERD* Average of Scientific Institutions and Availability of Scientist	Own calculation	
Venture Capital	Venture capital availability. Answering to the question: “ In your country, how easy is it for start-up entrepreneurs with innovative but risky projects to obtain equity funding? [1 = extremely difficult; 7 = extremely easy]”	World Economic Forum	The Global Competitiveness Report 2015-2016, p. 379
Business Strategy	Refers to the ability of companies to pursue distinctive strategies, which involves differentiated positioning and innovative means of production and service delivery.	World Economic Forum	The Global Competitiveness Report 2015-2016, p. 22
Finance and Strategy	Venture Capital *Business Strategy	Own calculation	
Economic complexity	“The complexity of an economy is related to the multiplicity of useful knowledge embedded in it. Because individuals are limited in what they know, the only way societies can expand their knowledge base is by facilitating the interaction of individuals in increasingly complex networks in order to make products. We can measure economic complexity by the mix of these products that countries are able to make.” ( <a href="http://atlas.media.mit.edu/en/resources/economic_complexity/">http://atlas.media.mit.edu/en/resources/economic_complexity/</a> )	Observatory of Economic Complexity	<a href="http://atlas.media.mit.edu/en/resources/data/">http://atlas.media.mit.edu/en/resources/data/</a>
Depth of Capital Market*	The Depth of Capital Market is one of the six sub-indices of the Venture Capital and Private Equity index. This variable is a complex measure of the size and liquidity of the stock market, level of IPO, M&A and debt and credit market activity. Note that there were some methodological changes over the 2006-2015 time period so previous years comparison is not perfect.	EMLYON Business School France and IESE Business School, Barcelona, Spain	<a href="http://blog.iese.edu/vcpeindex/files/2013/08/VCPE-Index-2013-Annual-HD.pdf">http://blog.iese.edu/vcpeindex/files/2013/08/VCPE-Index-2013-Annual-HD.pdf</a>