

Kristian Kremer
The Entrepreneurial Ecosystem: A Country Comparison Based on the GEI Approach



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INTRODUCTION

According to Martin and Osberg (2007), entrepreneurship has become an area of emerging interest in policy discussions in recent years. Nowadays, it is generally accepted that entrepreneurship is a driving force of innovation and economic growth (Ács et al. 2009, 2016; Audretsch and Keilbach 2004; European Commission 2003; Wennekers 2006). Hence, as a central component of economic growth, promoting activity related to entrepreneurship is gaining increasing importance for policy makers in many countries (Lundström and Stevenson 2005; Audretsch et al. 2006).

The entrepreneur is perceived as someone who has particular skills that enable them to make difficult decisions about the coordination of limited resources under uncertain conditions (Casson 1982). In general, entrepreneurship is described as a process that discovers, evaluates, and exploits opportunities to create future goods and services (Shane and Venkataraman 2000). A more narrow definition characterizes entrepreneurship as “innovation by newly formed independent firms” (Kirchhoff 1994, 37).

Entrepreneurship is considered to be a fundamental and multidimensional concept that is linked to several academic disciplines, including sociology, psychology, and economics (Shane 2003; Casson 2010). According to Deakins and Freel (2009), at least three approaches to understanding entrepreneurship exist: (1) the social-behavioral approach, which underlines the impact of personal attributes as well as the social environment; (2) the psychological trait approach, which deals with an entrepreneur’s personal characteristics; and (3) the economic approach, which studies the role of an entrepreneur within the economy. In short, no general agreement on a definition of entrepreneurship exists. There is no agreement on its key characteristics, not even within the field of economics (Parker 2003). Therefore, Audretsch (2003) concludes that the lack of a commonly acknowledged definition of entrepreneurship mirrors its multidimensionality.

When it comes to measuring entrepreneurship, a distinction must be made between measurements that focus on quantitative aspects and measurements that focus on qualitative aspects (Szerb et al. 2016). Dominant entrepreneurship indicators such as the Global Entrepreneurship Monitor’s (GEM) Total Early-Stage Entrepreneurial Activity (TEA) index correlates nega-

tively with economic development (Szerb et al. 2013). A high rate of self-employment does not necessarily correspond to a high rate of innovative entrepreneurship. It could even be an indication of underdevelopment (Berthold et al. 2006). Indeed, Ács et al. (2017) state that the quantity of entrepreneurship declines as countries develop. Therefore, one has to be very cautious when comparing entrepreneurship figures across countries. With respect to entrepreneurship, Germany lags behind other leading innovation-driven economies and promotion of entrepreneurial activities is necessary. However, this is not a matter of increasing the self-employment rate, but rather a matter of promoting more dynamic and innovative entrepreneurship.

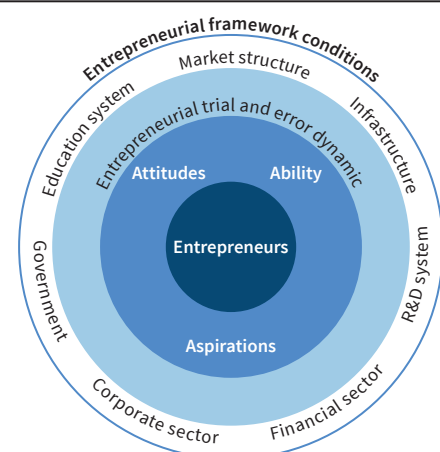
Ács et al. (2017) propose that the entrepreneurial ecosystem of a country is fundamentally a quality rather than a quantity phenomenon. The Global Entrepreneurship and Development Institute (GEDI) has constructed an index to measure this phenomenon, called the Global Entrepreneurship Index (GEI). The GEI approach will be applied in this paper in order to examine Germany’s entrepreneurial ecosystem in comparison to that of the US and the UK. The strengths and weaknesses of the three entrepreneurial ecosystems will be analyzed in detail in order to enhance the understanding of their entrepreneurial performance.

GLOBAL ENTREPRENEURSHIP INDEX METHODOLOGY

Ács and Szerb (2011, 2012) and Ács et al. (2014) developed the GEI with the purpose of measuring an entrepreneurial ecosystem. Ács et al. (2014, 479) define an entrepreneurial ecosystem as 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.” Figure 1 helps illustrate the structure of an entrepreneurial ecosystem. According to Ács et al. (2017), a sound entrepre-

Figure 1

Structure of an Entrepreneurial Ecosystem

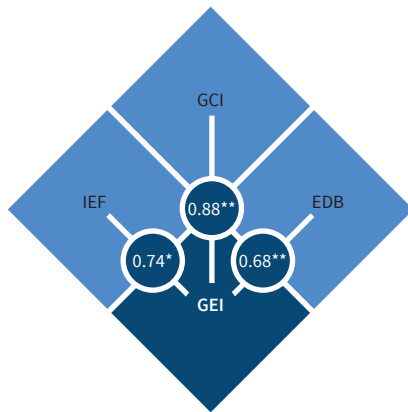


Source: Global Entrepreneurship Index (2017).

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Figure 2

GEI Correlations with Other Indices



Note: * indicates significance at 10 percent and ** at 5 percent level, respectively.
 Source: Global Entrepreneurship Index (2017). © ifo Institute

neural ecosystem will allocate resources towards more productive usage.

The GEI measures the quality and scale of the entrepreneurial ecosystem in countries around the world. By providing a great understanding of a country’s entrepreneurial profile, it gives accurate insights into the strengths and weaknesses of the entrepreneurial ecosystem. The GEI is designed to support policy makers as they explore better ways of promoting entrepreneurship to achieve sustainable economic development (Ács et al. 2017). Figure 2 indicates that the GEI positively correlates with the Ease of Doing Business Index (0.68), the Index of Economic Freedom (0.74), and the Global Competitiveness Index (0.88).

Table 1 shows the multilevel structure of the GEI approach: (1) variables, (2) pillars, (3) subindices and (4) GEI. The GEI includes three subindices: attitudes, abilities, and aspirations. The entrepreneurial attitude (ATT) subindex aims to measure attitudes of individuals related to entrepreneurship. An individual with a posi-

tive attitude towards entrepreneurship is more likely to choose self-employment over alternative occupations. The entrepreneurial ability (ABT) subindex identifies important characteristics of start-ups and entrepreneurs that have the potential for high growth. The ability aspect stands for the quality level of the new ventures that may result. The entrepreneurial aspiration (ASP) subindex refers to the qualitative, distinctive, and strategy-oriented nature of entrepreneurial activities and reflects the potential of a venture to achieve high productivity and rapid growth (Ács et al. 2017; Szerb and Trumbull 2016).

All three subindices include four or five pillars. A healthy entrepreneurial ecosystem requires the pillars (1) to be of similar shape, (2) to continuously improve, and (3) to receive careful maintenance. The 14 pillars reflect that the concept of entrepreneurship has many dimensions. Therefore, each of the 14 pillars includes two variables representing the micro- and macro-level, thus ensuring that the individual and institutional dimensions of an entrepreneurial ecosystem are captured. Analyzing the 14 pillars including the institutional and individual variables can provide an in-depth view of a country’s entrepreneurial ecosystem and its strengths and weaknesses (Ács et al. 2017). A brief description of the pillars is shown in Table 2.

Unlike other entrepreneurship measurements (e.g., TEA, self-employment rate), the GEI approach shows a mild S-shaped relationship between entrepreneurship and the economic development of a country, with an $R^2 = 0.81$ (Figure 3). Also, the three subindices show a significant and strong relation in this regard. The ATT subindex shows a correlation of $R^2 = 0.70$, the ABT subindex shows a correlation of $R^2 = 0.80$ and the ASP subindex shows a correlation of $R^2 = 0.72$. Hence, the explanatory power of the ABT subindex is the strongest among the three subindices, implying the closest relationship between entrepreneurial abilities and the economic development measured by GDP per capita (PPP) (Ács et al. 2017).

Table 1

Structure of the GEI

	Subindices	Pillars	Variables	
			Individual	Institutional
Global Entrepreneurship Index	Attitudes	Opportunity Perception	Opportunity Recognition	Freedom and Property
		Start-Up Skills	Skill Perception	Education
		Risk Acceptance	Risk Perception	Business Risk
		Networking	Know Entrepreneurs	Connectivity
	Abilities	Cultural Support	Career Status	Corruption
		Opportunity Start-Up	Opportunity Motivation	Tax and Government
		Technology Absorption	Technology Level	Tech Absorption
		Human Capital	Educational Level	Labor Market
	Aspirations	Competition	Competitors	Competitiveness
		Product Innovation	New Product	Technology Transfer
		Process Innovation	New Tech	Science
		High Growth	Gazelle	Finance and Strategy
		Internationalization	Export	Economic Complexity
		Risk Capital	Informal Investment	Depth of Capital Market

Source: Global Entrepreneurship Index (2017).

Table 2

Description of the GEI Pillars

Pillars	Description
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 Skills 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 the population's fear of failure has 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 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 Start-Up	The Opportunity Start-Up pillar captures the prevalence of individuals who pursue opportunity-driven start-ups (as opposed to necessity-driven start-ups) of potentially better quality weighted with the combined effect of taxation and government on 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 by weighting 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 start-ups' product or market uniqueness 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 a country's technology transfer capacity.
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 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 the country's economic complexity.
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 necessary to fulfill growth aspirations.

Source: Global Entrepreneurship Index (2017).

A special feature of the GEI approach is the bottleneck methodology. This means the worst-performing pillar acts as a bottleneck that negatively interacts with the other pillars. In consequence, achieving the optimal allocation of entrepreneurial resources depends on equalizing all 14 pillars. Hence, substituting one pillar with another pillar is only partially and not fully possible. As a result, the best way to enhance the GEI is to improve the worst-performing pillar, so boosting the bottleneck pillar should be the most important priority for a country's entrepreneurship policy (Szerb and Trumbull 2016). This approach is based on the Theory of the Weakest Link (TWL) and Theory of Constraints (TOC), arguing that the lowest-value component has the biggest impact on the performance of a system. Therefore, a system can be improved the most by removing the binding constraint (Goldratt 1994). This interrelation is included in the GEI methodology by applying the "penalty for bottleneck" algorithm, which systematically penalizes pillars of an ecosystem according to its poorly performing pillars (Ács et al. 2017). A detailed description of the GEI methodology can be found in Ács et al. (2017).

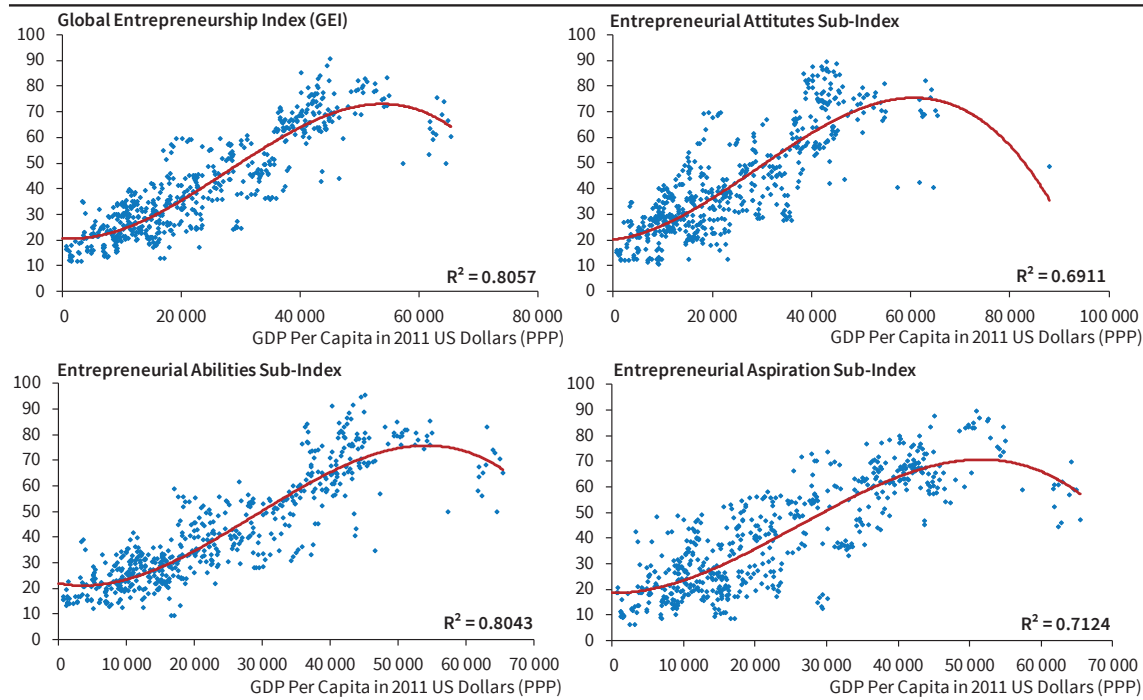
ENTREPRENEURIAL ECOSYSTEM COUNTRY COMPARISON

In the following, the entrepreneurial ecosystems of Germany, the US, and the UK are analyzed and compared to each other based on the GEI approach. While the dataset used includes pooled data from 2011 to 2015 for a total of 93 countries, this paper focuses on the three countries under comparison and the 20 best-ranked countries in the GEI. The average scores of a five-year time period are used in order to decrease measurement error and maximize the number of investigated countries.

Table 3 shows the overall scores of the 20 best-ranked entrepreneurial economies in the GEI. The US has a large lead with a GEI score of 80.9 (out of 100). In the three subindices, the US ranks no lower than 4th, emphasizing its overall strong and balanced entrepreneurial ecosystem. By comparison, the UK is ranked 7th with a GEI score of 70.5. It has a strong but less balanced entrepreneurial ecosystem, as its rankings in the three subindices show higher deviations. Thus, ABT (2nd) is by far the UK's strongest subindex, whereas it ranks sub-

Figure 3

Correlations of GEI and the Three Sub-Indices with GDP per Capita (PPP)



Source: Global Entrepreneurship Index (2017).

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stantially lower in the ATT (11th) and ASP (14th) subindices. Germany is ranked 13th overall with a GEI score of 63.9. It ranks considerably lower in the ATT (15th) and ABT (13th) subindices than in the ASP subindex, in which it ranks 11th. In comparison to the other countries in the top 20 ranking, Germany shows a moderately balanced entrepreneurial ecosystem.

The entrepreneurial performance of the 20 best-ranked countries varies significantly from 80.9 (US) to 57.6 (Qatar). Overall, the GEI top 20 ranking is dominated by European countries and countries with a high-income level. The European countries include Sweden, Switzerland, Denmark, UK, Netherlands, Ireland, Finland, France, Belgium, Germany, Austria, Norway, and Luxembourg. However, there are only three European countries ranked in the top six: Sweden, Switzerland, and Denmark. Besides 13 European countries, the top 20 include two countries from North America (US, Canada), two countries from Asia Pacific (Australia, Taiwan), two countries from the Middle East (Israel, Qatar), and one country from South and Central America (Chile).

It is apparent that the GEI scores between second-place Sweden (77.2) and sixth-place Australia (74.5) are very close, differing by only 2.7 points. Therefore, small changes in scores from one year to another can produce a relatively large shift among

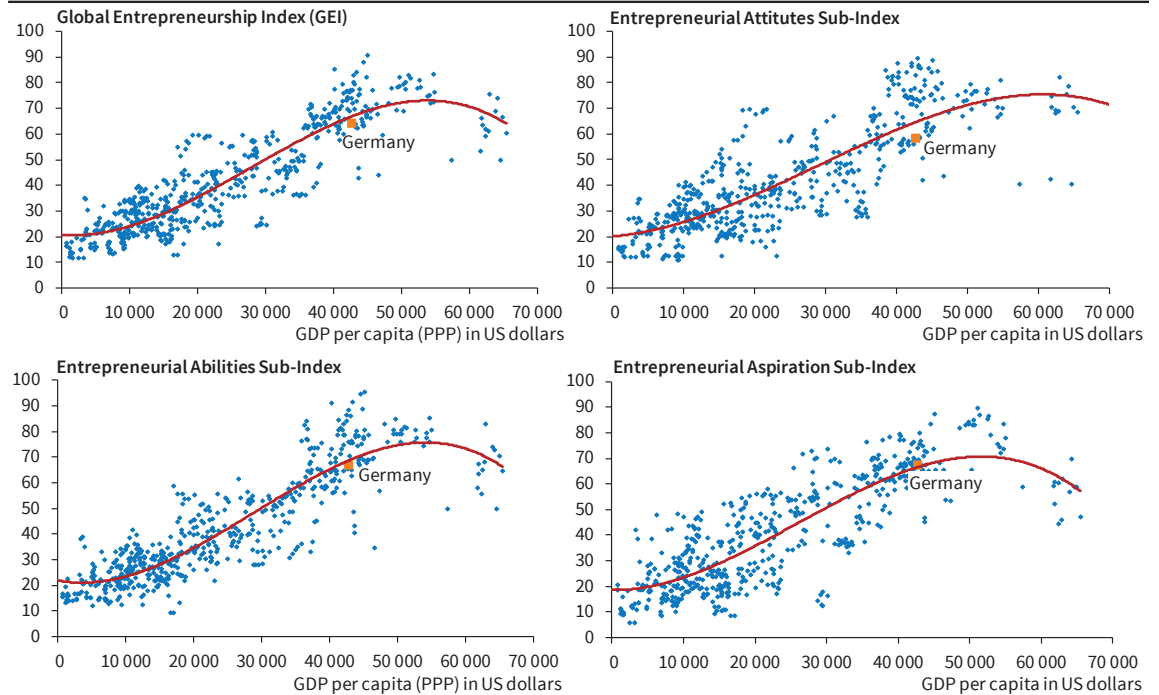
Table 3
GEI Top 20 Ranking, 2011–2015 Average

Country	GEI	Rank	ATT	Rank	ABT	Rank	ASP	Rank
United States	80.9	1	75.8	4	80.5	4	86.5	1
Sweden	77.2	2	78.8	2	80.2	5	72.7	5
Canada	76.5	3	74.2	6	78.9	6	76.4	4
Switzerland	76.3	4	70.1	8	80.8	3	78.0	2
Denmark	76.2	5	73.3	7	86.4	1	68.9	9
Australia	74.5	6	74.3	5	78.7	7	70.4	6
United Kingdom	70.5	7	67.2	11	81.0	2	63.3	14
Netherlands	69.7	8	77.6	3	69.1	9	62.5	15
Ireland	68.6	9	62.4	13	78.4	8	65.1	12
Finland	67.6	10	81.0	1	57.7	17	64.1	13
France	65.8	11	59.9	14	67.4	12	69.9	8
Belgium	64.8	12	57.9	17	68.2	10	68.4	10
Germany	63.9	13	58.1	15	66.5	13	67.2	11
Austria	63.5	14	64.0	12	67.7	11	58.6	23
Taiwan	63.1	15	55.5	18	56.6	20	77.3	3
Norway	60.1	16	68.5	10	64.9	15	47.0	35
Chile	59.1	17	69.2	9	52.0	25	56.2	24
Israel	59.0	18	53.0	20	54.0	23	69.9	7
Luxembourg	58.7	19	48.3	24	66.0	14	61.7	17
Qatar	57.6	20	55.2	19	55.5	21	61.9	16

Source: Global Entrepreneurship Index Data (year).

Figure 4

GEI Performance Relative to GDP per Capita of Germany, 2011–2015 Average



Source: Global Entrepreneurial Index Data (2017).

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the highest-ranked countries. A regional breakdown of the countries is relevant, especially when performing benchmarks to identify best practices for fostering entrepreneurship. The average GEI score of the European countries in the top 20 ranking is 67.9, which highlights the superior position of the US compared to European countries in regard to entrepreneurial performance.

Figure 4 shows the relationship between Germany's GDP per capita (PPP) and the GEI, as well as the three subindices ATT, ABT, and ASP. Germany performs below the global trend line in the GEI with a score of 63.9. This indicates that Germany has the potential for more dynamic and innovative entrepreneurship, as the performance is lower than its GDP-predicted score would lead one to expect. On closer inspection of the three subindices, it becomes obvious that Germany's lowest score is in the ATT subindex with 58.1. In comparison, its ABT subindex score is 66.5 and its ASP subindex score is 67.2. The ASP subindex is the only index where Germany performs slightly above the global trend line. It is interesting that the ATT subindex, which deals generally with the attitude a society has towards entrepreneurship, is identified as the relative weak point in Germany's entrepreneurial ecosystem.

The GEI performance of the US in relation to its GDP per capita is shown in Figure 5. The US performs above the global trend line in the GEI with a score of 80.9, indicating that the performance of its entrepreneurial ecosystem is higher than its GDP-predicted score. A closer examination reveals that the US performs above the global trend line in all three subindices with a score of 75.8 in ATT, 80.5 in ABT, and 86.5 in ASP.

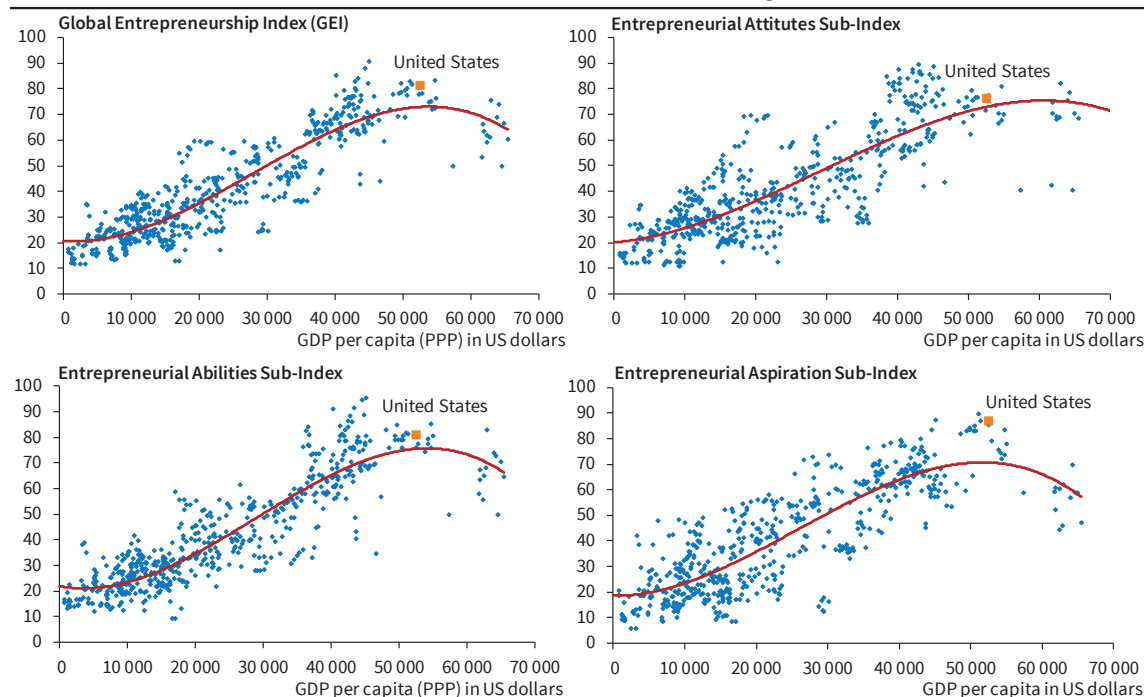
While the US performs better than its GDP-predicted performance for all subindices, its performance is particularly strong in the ASP subindex, which reflects aspirations within ventures that are already in the start-up pipeline.

Figure 6 shows the performance of the UK in relation to its GDP per capita. The UK performs above the global trend line in the GEI with a score of 70.5, indicating that the performance of its entrepreneurial ecosystem is higher than its GDP-predicted score. While the UK performs better than its GDP-predicted performance for all subindices, its performance is particularly strong in the ABT subindex with a score of 81.0. In comparison, it scores 67.2 on the ATT subindex and 63.3 on the ASP. This means the ABT subindex, which refers to start-ups in the medium- or high-technology sectors that are founded by educated and opportunity-motivated individuals, represents a significant proportion of the relatively strong performance of the UK's entrepreneurial ecosystem.

While the overall scores of the GEI and the three subindices reveal something about the entrepreneurial ecosystem performance of a country, they do not provide enough information to draw conclusions about bottlenecks in the ecosystem. Therefore, a closer look at the individual pillars has to be taken in order to identify entrepreneurial strengths and weaknesses of the countries under comparison. Figure 7 shows a comparison of the GEI pillar scores of the entrepreneurial ecosystems in Germany, the US, and the UK. It confirms the previous findings that the US has the strongest entrepreneurial ecosystem, which is more balanced and shows overall higher scores in the GEI pillars compared

Figure 5

GEI Performance Relative to GDP per Capita of the United States, 2011–2015 Average



Source: Global Entrepreneurial Index Data (2017).

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to the UK and Germany. The ranking of the subindices indicates that the UK’s entrepreneurial ecosystem is less balanced than Germany’s. However, when taking a closer look at the GEI pillars, it is Germany’s entrepreneurial ecosystem that seems to be less balanced, due to Germany’s significantly low scores in the pillars of Risk Acceptance, Networking, and Human Capital.

The low score in the Risk Acceptance pillar stands for the high level of risk aversion present in the German culture. The Networking pillar combines an entrepreneur’s knowledge and their ability to connect with others. A low score in this pillar might be the result of a quantitatively low level of entrepreneurs and self-employed people in Germany. The Human Capital pillar represents an entrepreneurial ecosystem’s need for an educated, experienced, and healthy workforce. Nevertheless, all three pillars can be seen as the main bottlenecks holding back the German entrepreneurial ecosystem. However, in comparison to the US and the UK, Germany performs relatively well in Technology Absorption, Competition, and Process Innovation.

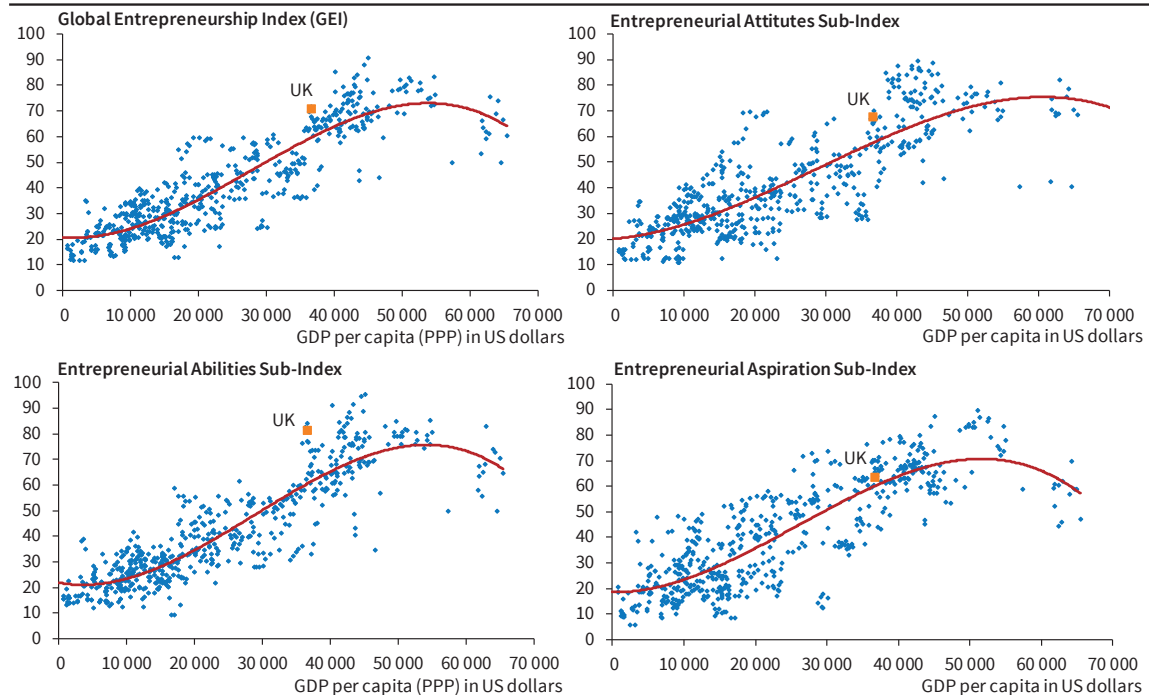
Obviously, Networking is the main bottleneck for the US. The reason seems to be the same as in Germany, although the US has a much higher rate of entrepreneurs and self-employed people. The same applies to Networking in the UK, where it is also a bottleneck. Besides Networking, the UK has a relatively low score in the Start-Up Skills pillar, which is necessary to launch a successful venture and – in developed countries – has to be acquired through formal education. This is probably why Germany also performs weakly on this pillar. For the US, however, Start-Up Skills is one of the main pillars of their entrepreneurial ecosystem.

Figure 8 shows the development of the three subindices and the GEI scores of Germany from year 2008 to 2016. One positive point worth noting is that since 2008, Germany’s GEI score has shown slow but stable growth with the exception of one downturn recorded in 2014. Overall, the GEI score improved from 57.7 in 2008 to 65.9 in 2016, an increase of 14.2 percent. Taking a closer look at the subindices, it seems that the downturn in 2014 corresponds to a strong downturn in the ABT subindex between 2012 and 2014. The reason for this strong downturn probably lies in the Human Capital pillar, which has already been identified as one of Germany’s bottleneck pillars. Nevertheless, the ABT subindex shows the strongest increase of the three subindices with 15.5 percent, indicating that German policy makers are aware of deficits represented in this subindex, in particular deficits related to the Human Capital pillar. For comparison, the ATT subindex experienced an overall increase of 13.6 percent and the ASP subindex an increase of 13.5 percent. It is notable that the ATT subindex is significantly lower than the other two subindices throughout the time period analyzed, emphasizing that the cultural aspects represented by the ATT subindex are of major importance when it comes to Germany’s entrepreneurial ecosystem and seem to be difficult to improve within just a few years.

Compared to the US and the UK, Germany is in a unique position as the financial crisis did not negatively impact its GEI score. In both the US and the UK, GEI score development experienced a downturn between 2008 and 2010 (Figure 9). After 2010, the US shows stable but slow GEI growth until 2016, a trend that also

Figure 6

GEI Performance Relative to GDP per Capita of the United Kingdom, 2011–2015 Average



Source: Global Entrepreneurial Index Data (2017).

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applies to the three subindices. The UK shows a strong increase in its GEI score after 2010, followed by a decrease after 2012 and a renewed rise in 2014, demonstrating much higher deviations compared to Germany and the US. The higher deviations are also apparent in the subindices. The remarkable increase of the GEI score since 2014 is mainly due to a strong increase in the ASP subindex, which rose by 33.3 percent within just two years.

An analysis of the 14 pillars including the individual and institutional variables, as shown in the next three tables, will help provide a deeper understanding of the entrepreneurial ecosystems and their strengths and weaknesses in the three countries under comparison. For each country, 28 normalized variable scores averaged over the 2011–2015 time period are presented, with 1.00 the highest score for each variable and 0.00 the lowest. The colors represent quartiles to indicate a country's position relative to the other countries included in the GEI: red stands for the lowest (4th) and blue for the highest (1st) quartile.

Table 4 shows Germany's GEI data relative to the other 93 countries included in the GEI. With an average GEI score of 63.9, Germany's entrepreneurial ecosystem ranks within the 1st quartile. Start-Up Skills, Risk Acceptance, Human Capital, High Growth (2nd quartile), and Networking (3rd quartile), which had already been identified as bottleneck pillars, are the only pillars not ranked within the 1st quartile. Whereas the institutional variables have an average score of 0.87 and are ranked within the 1st quartile on average, the individual variables have an average score of only 0.60, which ranks them within the 3rd quartile on average. The fact

that Germany has an outstanding institutional environment but performs low on the individual variables suggests that the attitudes, abilities, and aspirations of individuals are holding back entrepreneurial performance. Specifically, individual variables of the ATT sub-index can be identified as a relative weakness within Germany's entrepreneurial ecosystem.

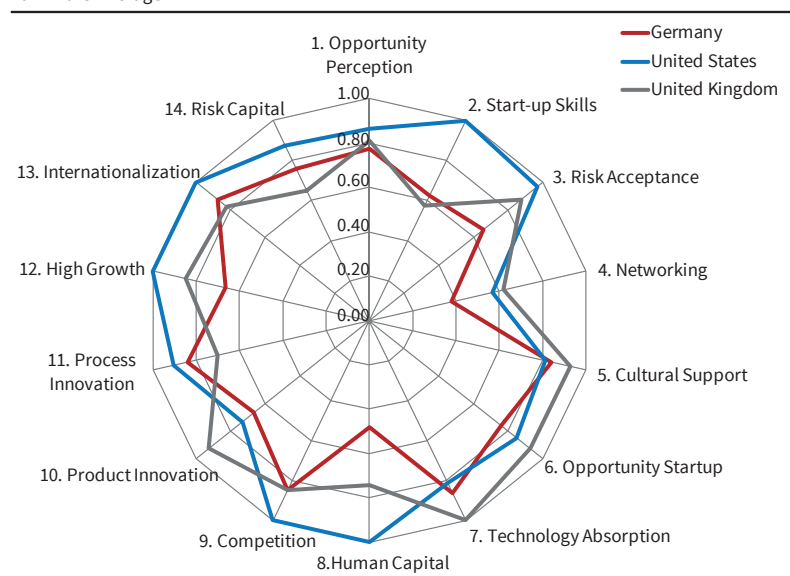
The following takes a closer look at Germany's four major bottleneck pillars. The Start-Up Skills pillar (0.50) is made up of Education (0.76) and Skill Perception (0.43). People think they lack the skills to start a business but their educational level suggests that they are not, which indicates a lack of confidence in their own entrepreneurial abilities. Risk Acceptance (0.59) is made up of Business Risk (1.00) and Risk Perception (0.39). This pillar shows the largest difference between institutional and individual variables and underlines Germans' high level of risk aversion. Networking (0.41) is Germany's weakest pillar and constitutes a combination of Connectivity (0.83) and Know Entrepreneurs (0.37). The Know Entrepreneurs variable represents the percentage of the population aged 18 to 64 that knows someone who started a business in the past two years. As the number of entrepreneurs in Germany and generally in innovation-driven countries is relatively low, it is no surprise that this pillar exhibits weak performance. The Human Capital pillar is a combination of Labor Market conditions and the Educational Level. The fact that Germany's performance is weak in both institutional (0.52) and individual (0.64) variables is probably why this pillar seems to be the most discussed when it comes to the improvement of Germany's entrepreneurial ecosystem.

In comparison, the US (Table 5) ranks within the 1st quartile with an average GEI score of 80.9. Networking (2nd quartile), which was already identified as the main bottleneck pillar, is the only pillar not ranked within the 1st quartile. Similarly to Germany, the US performs better in the institutional variables (0.93) than in the individual variables (0.76). However, the individual variables are still ranked within the 1st quartile on average. On closer inspection, the individual variables of the ATT subindex can be defined as a relative weakness within the US entrepreneurial ecosystem, just like in Germany's.

Besides taking a look at Networking as the main weak pillar, the bottleneck analysis of the US focuses on the individual variables of the ATT subindex. Obviously, the weak performance in the Networking pillar (0.50) is caused by the low score on the Know Entrepreneurs individual variable (0.43). The reason for this low score seems to be the same as in Germany, as the number of entrepreneurs in innovation-driven countries is generally relatively low. The other individual variables of the ATT subindex are all ranked in the 2nd quartile. Thus, the US has relatively weak performance in terms of Opportunity Recognition, Skill Perception, Risk Perception, and Career Status. Although these variables constitute the main bottlenecks of the US entrepreneurial ecosystem, the performance in this regard is still satisfying, especially compared to other leading innovation-driven countries.

Figure 7

Country Comparison of GEI Pillars
2011–2015 Average



Source: Global Entrepreneurship Index Data (2017).

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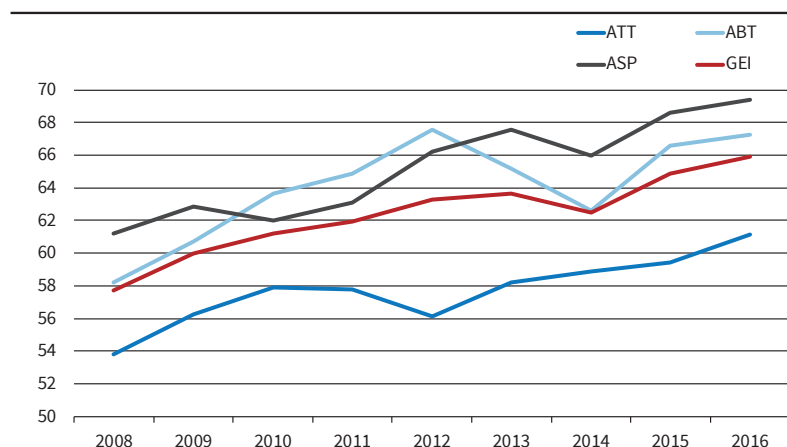
The UK's entrepreneurial ecosystem (Table 6) ranks within the 1st quartile with an average GEI score of 70.5. In comparison to Germany and the US, the UK has the most pillars not ranked within the 1st quartile. Start-Up Skills, Networking, Process Innovation, High Growth, Internationalization, and Risk Capital are all ranked within the 2nd quartile. Similarly to Germany and the US, the UK performs better on the institutional variables than in the individual variables. With an average score of 0.87, the institutional variables are ranked within the 1st quartile on average. The individual variables are ranked only within the 3rd quartile on average with an average score of 0.66. Thus, the average difference between both variables is smaller compared to Germany, but higher compared to the US. The individual variables of the ATT and ASP subindices can be identified as relative weaknesses within the entrepreneurial ecosystem.

It is notable that the UK performs very well in the individual variables of the ABT subindex, which are all ranked within the 1st quartile.

The bottleneck analysis of the UK's entrepreneurial ecosystem focuses on three pillars, including Networking, Risk Capital, and Start-Up Skills. It is worth noting that Networking is a bottleneck for all three countries under comparison. The reason seems to be the same in all cases, although a closer inspection would be necessary. Similar to

Figure 8

Development of Three Sub-Indices and GEI Scores of Germany
2008–2016

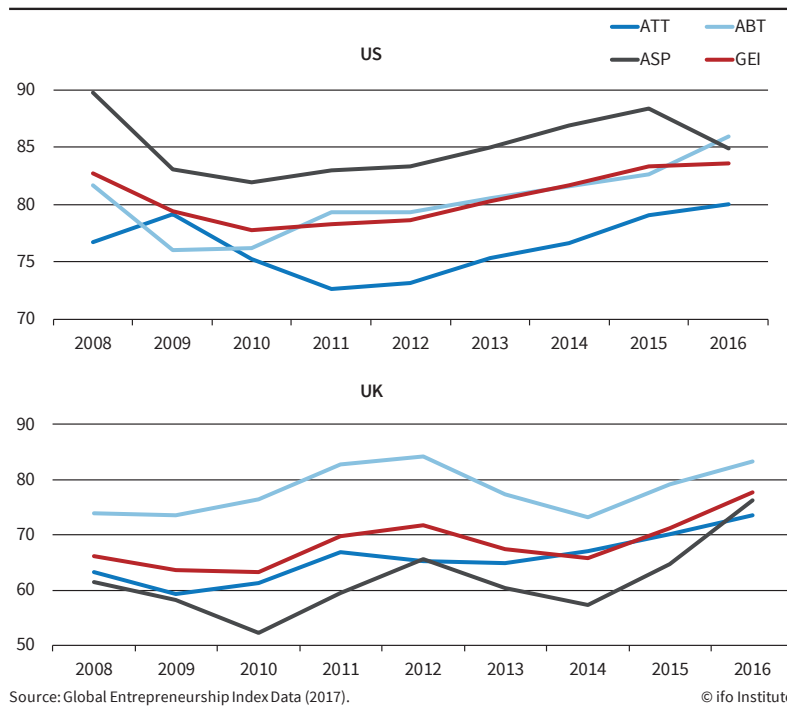


Source: Global Entrepreneurship Index Data (2017).

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Figure 9

Development of Three Sub-Indices and GEI Scores of the US and UK 2008–2016



Germany, a divergence can be identified in the UK’s Start-Up Skills pillar. The divergence between the institutional variable of Education and the individual variable of Skill Perception might indicate people’s lack of confidence in their own entrepreneurial abilities. Compared to Germany (0.72) and the US (1.00), the UK (0.56) shows relatively weak performance in the Risk Capital pillar, which is made up of Depth of Capital Market (0.99) and Informal Investment (0.63). Thus, the UK is in need of more informal investors who make higher investments in other people’s new businesses to improve entrepreneurial performance.

GERMANY’S ENTREPRENEURIAL ECOSYSTEM

The previous analysis of Germany’s entrepreneurial ecosystem and the comparison to the US and the UK based on the GEI approach revealed interesting insights into its strengths and weaknesses. The following literature review will contribute additional information and enhance the understanding of the issues Germany is facing as it competes with leading entrepreneurial ecosystems like the US and the UK.

Germany is one of Europe’s innovation leaders with high use of and access to technology (Kontolaimou et al. 2016). Its economy is characterized by a strong small- and medium-sized business sector. Yet in regard to start-up activity, Germany ranks among the lowest of the OECD countries. Indeed, entrepreneurs represented only 7 to 9 percent of the working population from the 1970s to 2000s (Freytag and Thurik 2007). Over the years, the number of companies being founded

in Germany has been decreasing, and in 2016, the number of individuals who started a self-employed activity fell to a new low of 672,000 (KfW 2017). There has been a decreasing number not only of new individual project businesses, but also of larger and more innovative businesses. Although Germany’s macroeconomic performance is relatively good, innovative companies like Apple, Google, or Amazon are not being founded in Germany or in the European Union in general (Röhl 2016). Ács et al. (2017) confirm that Europe is still struggling to create innovative new billion-dollar companies as the US is able to do.

Liñán and Fernandez-Serrano (2014) confirm the deep interrelationships between entrepreneurial activities, economic variables, and cultural facets. The cultural facets

of entrepreneurship reflect an informal institutional framework that includes values, norms, and codes of conduct associated with an advanced level of social approval and acceptance of entrepreneurship (Kibler et al. 2014). Strong signs exist that Germany’s weakness in regard to entrepreneurship is related to cultural dimensions. However, establishing an entrepreneurial culture may require a longer period of time. In contrast, governance structures, formal institutions, and resource allocation change much more frequently and can be considered as anchored in a country’s informal institutional framework (Fritsch and Wyrwich 2014). Nevertheless, there exists the possibility that activities related to entrepreneurship may lead to cultural change (Liñán and Fernandez-Serrano 2014).

German’s perception of the role of the state contradicts greatly with the perceptions prevalent in the US and the UK. In Germany, people rely more on a strong and supporting state with regard to both social policy and the economy (Röhl 2016). Indeed, with no difference across generations, 62 percent of Germans believe the state is responsible for providing social supports. Furthermore, 72 percent of Germans view success as being outside individual control, with a split evident between academics (55 percent) and non-academics (74 percent) (Fuerlinger et al. 2015). This goes along with a high level of risk aversion, as the idea of being self-employed is primarily seen as a source of greater risk (Röhl 2016). Therefore, it is no surprise that Germans value the employee-friendly environment, and associate entrepreneurship as a career with higher risk.

Table 4

Germany's GEI Data, 2011–2015 Average

Subindices	Institutional Variables		Individual Variables		Pillars	
Entrepreneurial Attitudes	Freedom and Property	0.96	Opportunity Recognition	0.55	Opportunity Perception	0.74
	Education	0.76	Skill Perception	0.43	Start-Up Skills	0.50
	Business Risk	1.00	Risk Perception	0.39	Risk Acceptance	0.59
	Connectivity	0.83	Know Entrepreneurs	0.37	Networking	0.41
	Corruption	0.89	Career Status	0.52	Cultural Support	0.80
				ATT average	58.1	
Entrepreneurial Abilities	Tax and Government	0.85	Opportunity Motivation	0.72	Opportunity Start-Up	0.75
	Tech Absorption	0.86	Technology Level	0.88	Technology Absorption	0.85
	Labor Market	0.52	Educational Level	0.64	Human Capital	0.41
	Competitiveness	0.92	Competitors	0.75	Competition	0.88
				ABT average	66.5	
Entrepreneurial Aspirations	Technology Transfer	0.97	New Product	0.57	Product Innovation	0.67
	Science	0.93	New Tech	0.48	Process Innovation	0.81
	Finance and Strategy	0.77	Gazelle	0.66	High Growth	0.62
	Economic Complexity	1.00	Export	0.74	Internationalization	0.77
	Depth of Capital Market	0.92	Informal Investment	0.76	Risk Capital	0.72
					ASP average	67.2
	Institutional average	0.87	Individual average	0.60	GEI	63.9

Source: Global Entrepreneurship Index Data (2017).

Table 5

US's GEI Data, 2011–2015 Average

Subindices	Institutional Variables		Individual Variables		Pillars	
Entrepreneurial Attitudes	Freedom and Property	0.91	Opportunity Recognition	0.68	Opportunity Perception	0.83
	Education	1.00	Skill Perception	0.68	Start-Up Skills	1.00
	Business Risk	1.00	Risk Perception	0.65	Risk Acceptance	0.91
	Connectivity	0.84	Know Entrepreneurs	0.43	Networking	0.50
	Corruption	0.82	Career Status	0.66	Cultural Support	0.83
				ATT average	75.8	
Entrepreneurial Abilities	Tax and Government	0.81	Opportunity Motivation	0.73	Opportunity Start-Up	0.72
	Tech Absorption	0.93	Technology Level	0.84	Technology Absorption	0.80
	Labor Market	1.00	Educational Level	0.95	Human Capital	1.00
	Competitiveness	0.85	Competitors	1.00	Competition	0.97
				ABT average	80.5	
Entrepreneurial Aspirations	Technology Transfer	0.98	New Product	0.66	Product Innovation	0.85
	Science	0.95	New Tech	0.56	Process Innovation	0.92
	Finance and Strategy	0.95	Gazelle	0.85	High Growth	1.00
	Economic Complexity	0.92	Export	1.00	Internationalization	1.00
	Depth of Capital Market	1.00	Informal Investment	0.92	Risk Capital	1.00
					ASP average	86.5
	Institutional average	0.93	Individual average	0.76	GEI	80.9

Source: Global Entrepreneurship Index Data (2017).

Table 6

UK's GEI Data, 2011–2015 Average

Subindices	Institutional Variables		Individual Variables		Pillars	
Entrepreneurial Attitudes	Freedom and Property	0.98	Opportunity Recognition	0.57	Opportunity Perception	0.77
	Education	0.74	Skill Perception	0.53	Start-Up Skills	0.58
	Business Risk	1.00	Risk Perception	0.53	Risk Acceptance	0.77
	Connectivity	0.81	Know Entrepreneurs	0.47	Networking	0.52
	Corruption	0.87	Career Status	0.57	Cultural Support	0.82
				ATT average	67.2	
Entrepreneurial Abilities	Tax and Government	0.93	Opportunity Motivation	0.79	Opportunity Start-Up	0.88
	Tech Absorption	0.82	Technology Level	0.91	Technology Absorption	0.88
	Labor Market	0.76	Educational Level	0.85	Human Capital	0.76
	Competitiveness	0.87	Competitors	0.92	Competition	0.94
				ABT average	81.0	
Entrepreneurial Aspirations	Technology Transfer	0.86	New Product	0.62	Product Innovation	0.66
	Science	0.79	New Tech	0.56	Process Innovation	0.68
	Finance and Strategy	0.82	Gazelle	0.66	High Growth	0.65
	Economic Complexity	0.91	Export	0.69	Internationalization	0.65
	Depth of Capital Market	0.99	Informal Investment	0.63	Risk Capital	0.56
					ASP average	63.3
	Institutional average	0.87	Individual average	0.66	GEI	70.5

Source: Global Entrepreneurship Index Data (2017).

According to Bittorf (2013), an entrepreneurial culture and entrepreneurship are also fostered in a country's education system. In the German education system, less idealistic educational concerns like knowledge transfer and usefulness were originally not important, leading to the absence of economics in secondary school curricula. Nevertheless, Fuerlinger et al. (2015) stress that much has been improved in Germany in terms of entrepreneurial education. However, an underdevelopment of education on economic and entrepreneurship topics is still seen as an obstacle in Germany's entrepreneurial ecosystem (Röhl 2016).

SUMMARY AND CONCLUSION

This paper provides a detailed description of the GEI methodology as an approach to measure the entrepreneurial ecosystem of a country in a qualitative way. The GEI approach has been applied in order to analyze Germany's entrepreneurial ecosystem in comparison to the US and the UK. The outcome of the analysis reveals that Germany already has a healthy entrepreneurial ecosystem. However, it performs below its GDP-predicted trend line, indicating potential for more dynamic and innovative entrepreneurship. In comparison, the US and the UK both perform above their GDP-predicted trend lines. The US holds a large lead in the GEI ranking by showing an overall strong and balanced entrepreneurial ecosystem. In order to compete with leading entrepreneurial ecosystems, Germany mainly faces cultural issues and issues related to entrepreneurship education.

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