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*The Global Entrepreneurship Index
2019*

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Regional Innovation and Entrepreneurship
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The Global Entrepreneurship Index 2019

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Table of Contents

Table of Contents	iii
About The Global Entrepreneurship and Development Institute	v
Foreword:	vi
Chapter 1: The Entrepreneurial Ecosystem	1
Chapter 2: The Entrepreneurial Ecosystem and Global Prosperity	9
Introduction	9
The Global State of Entrepreneurship	9
Top Ten Countries	10
Regional Performance	11
Biggest Gains	12
Biggest Declines	12
Country-level Productivity and the Entrepreneurial Ecosystem	12
Chapter 3: The Global Entrepreneurship Index	15
The fourteen pillars of the Global Entrepreneurial Index	15
Entrepreneurial Attitudes Pillars	15
The Global Entrepreneurship Index, 2019 Rankings	18
The Ranking of the 3As	20
Summaries and Conclusion	25
Chapter 4: Methodology and Data Description	26
Introduction	26
The Structure of the Index	26
The Individual Variables, Indicators and Dataset	29
The Institutional Indicators, Variables and Dataset	35
Missing Variables and Data Imputations	40
Calculating the Scores	40
The Underlying Structure of the Data (reflecting the 2006-2016 dataset)	44
Summary	47
References	48
Appendices	51

Tables and figures

Figure 1.1: The Entrepreneurial Ecosystem Configuration	3
Figure 1.2: Factor Driven Economies at the pillar level	6
Figure 2.1: Global Entrepreneurship 2019 Index Map	10
Table 2.1: Top Ten Countries in the GEI	10
Figure 2.2: Confidence Intervals for Top Ten Scores	11
Table 2.2: Top Scores by Region	11
Table 2.3: Biggest Gains in GEI Score	12
Table 2.4: Biggest Declines in GEI Score (only with decreasing GEI scores)	12
Table 3.1: The Global Entrepreneurship Index Rank of All Countries, 2019	19
Table 3.2: The Global Entrepreneurship Index and Sub-Index Ranks of the First 25 Countries, 2019	21
Table 3.4: Entrepreneurial Abilities Sub-Index and Pillar Values for the First 25 Countries, 2019*	24
Table 3.5: Entrepreneurial Aspirations Sub-Index and Pillar Values for the First 25 Countries, 2019*	25
Table 4.1: The structure of the new Global Entrepreneurship Index (GEI)*	26
Table 4.2: The description of the GEI index pillars	28
Table 4.3: The Description of the Individual Variables Used in the GEI	29
Table 4.4: The Distribution of the Sample by Countries and the Calculation of the Individual Variables	31
Table 4.5: The Description and Source of the Institutional Indicators and Variables Used in the GEI	36
Table 4.6: The Correlation Matrix between the Normalized and Average Equalized Pillars (2006-2016 data)	45
Table 4.7: The Correlation Matrix between the Indicators, Sub-Indices, and the GEI Super-Index after Normalizing and Applying the PFB Method (2006-2016 data)	46
Table A.1: The Global Entrepreneurship Index and Sub-Index Ranks and scores of Countries, 2019	51
Table A.2: Entrepreneurial Attitudes Sub-Index and Pillar Values for Countries, 2019	54
Table A.3: Entrepreneurial Abilities Sub-Index and Pillar Values for Countries, 2019	57
Table A.4: Entrepreneurial Aspirations Sub-Index and Pillar Values for Countries, 2019	60

About The Global Entrepreneurship and Development Institute

Zoltán J. Ács

Founder and President, The GEDI Institute

The Global Entrepreneurship and Development Institute (The GEDI Institute) is the leading research organization advancing knowledge on the relationship between entrepreneurship, economic development, and prosperity. The Institute, headquartered in Washington D.C., was founded by leading entrepreneurship scholars from George Mason University, the University of Pécs, Imperial College London and the London School of Economics. The Institute's flagship project is the Global Entrepreneurship Index (GEI), a breakthrough advance in measuring the quality and dynamics of entrepreneurship ecosystems at a national and regional level. The GEI methodology, on which the data in this report is based, has been validated by rigorous academic peer review and has been widely reported in the media, including in *The Economist*, *The Wall Street Journal*, *Financial Times*, and *Forbes*. The Institute's research has been funded by the European Union, The World Bank and major corporations and banks around the world.

Foreword:

The first version of the Global Entrepreneurship Index (GEI), at that time called the Global Entrepreneurship and Development Index (GEDI), was issued in 2009. Since then, GEI has been published in every year. Altogether, we have eleven books reporting about the level of the entrepreneurship ecosystem for countries all over the five continents. The number of participating nations increased from 64 (2009) to 137 (2018, 2019), although, some of them are based on partial estimations. GEI has reached an increasing attention amongst entrepreneurship scholars, students, policy makers, and think-tank institutions. The last two versions of GEI reached over 40 000 downloads. This, eleventh issue is our final report and we are not planning any other GEI reports.

Why are we finishing such a successful project? - Some may ask. GEI came to existence to provide a solid theory-based entrepreneurship measure that explains the role of entrepreneurship on economic development. While the Global Entrepreneurship Monitor (GEM) initiation, started in 1999, had the same aim, its major entrepreneurship measure, the Total Early-phased Entrepreneurship Activity (TEA) index has failed to provide a consistent story about the role of entrepreneurship over development. By 2007-2008 it cleared up that less developed countries have higher TEA rate and it decreases as nations are getting richer. Zoltan J. Acs and László Szerb, members of the GEM Hungary team provided an alternative by developing a complex index number instead of a simple indicator. Since many GEM members did not like this new concept, we established an independent research unit, the Global Entrepreneurship and Development Institute (www.thegedi.org). Since then our connection with GEM was contradictory. While the recognition and acceptance of GEI increased, our connection with GEM went on the other direction. The situation further worsened when GEI become the official index of a major think-tank institution, the Global Entrepreneurship Network in 2014, ahead of GEM. In 2016, GERA, the execution board of GEM, terminated the contract with GEM Hungary without explaining such a hostile act. As a consequence, we do not have access to the GEM adult population survey data anymore. Since GEI is based on GEM indicators that are only partially publicly available, it killed GEI. This last issue includes partially estimated data but this practice cannot be continued in the future. Since the GEM database related individual variables are calculated as a two-year average, estimating partially these variables seems a reasonable compromise for a final issue.

However, we have some other reasons to finish the GEI project. When GEM started in the late 1990s, it was in the forefront of entrepreneurship research. The questionnaire, developed by Paul D. Reynolds was based on the PSID project aiming to examine the startup gestation process mainly in developed countries. As a consequence, some data proved to be inconsistent when the number of developing countries joining to GEM increased. In particular, the interpretation of the innovation related variables have proved to be difficult. Another problem with the dataset was its focus on the quantity aspects of entrepreneurship activity as opposed to the quality characteristics of startups. While it is important to have

consistency in the questionnaires over time, GEM never found the flexibility and adaptability to initiate changes that update the main questionnaire. After twenty years, TEA is still maintained and considered as the most important output of the yearly GEM reports. While, over twenty years entrepreneurship has transformed a lot. The most important change is the digital revolution that affects all aspect of the economy. GEM still examines mostly traditional startups and the questionnaire has not been changed to reflect to the new needs.

Additionally, the number of GEM nations has been falling during the last decade. While the GEM community peaked in 2013 and 2014 with 70 countries taking part of the annual survey, the membership fell to 65 by 2016, 55 by 2017, and 48 by 2018. Europe reports the highest number of exits from GEM. In parallel, many top researchers actively involved in GEM, writing GEM reports or simply using GEM data, have left the GEM community or publish from other datasets. These are also alarming signs that GEM has been losing steam and space, and GEM based research is in a declining phase.

We also have problems with the institutional data. Thirteen out of our twenty institutional indicators are coming from the World Economic Forum (WEF) Global Competitiveness Index (GCI) database. In 2018, WEF initiated a major change in the structure of GCI introducing the Global Competitiveness Index 4.0, a renewed measure of nation level competitiveness reflecting to the effects of increased globalization and the Fourth Industrial Revolution. As a consequence, many of the indicators we applied in GEI are not available anymore. Alternative indicators would have been a solution, but this would have caused inconsistencies in the longitudinal GEI figures which would produce hard-to-compare index results.

While we are finishing the GEI project, over the last two years we have been working on a new entrepreneurship measure that is the Digital Entrepreneurship Ecosystem Index (DEEI). The first issue of DEEI under the Global Entrepreneurship and Development Institution is coming in 2020. We hope that this new entrepreneurship index will be a successful substitute of our GEI. As finishing the project, we also provide the full dataset including GEI scores, sub-indices and pillars, available for those who intent to use. Note that this dataset for 2006-2016 includes only those countries that participated in the GEM survey in the particular year. If we will have an access to the GEM 2017 data (in 2021) we are completing this dataset with the 2017 data points. The dataset and the associated Technical annex file can be downloaded from the GEDI website (<https://thegedi.org/datasets/>) .

Chapter 1: The Entrepreneurial Ecosystem

Introduction

When the unemployment rate in the United States was 10 percent during the great recession it was considered a catastrophe. However, the unemployment rate in most MENA countries is close to 30 percent and even higher in some other countries. This is a disaster for many parts of the world. It leads to desperation and violence as millions of youth struggle to survive. The world needs to create a billion jobs in the very near future to create global peace and prosperity. Entrepreneurship creates jobs and generates economic growth - the underpinning of a stable and civil society. But before we get into how this works we need to discuss what kind of entrepreneurship we are talking about. Who is an entrepreneur? We are not talking about the basket weaver solo entrepreneur; we are not talking about rural microcredit. We are talking about Silicon Valley, Bill Gates, Sam Walton, FedEx, and Starbucks.

What is Entrepreneurship?

An entrepreneur is a person with the vision to see an innovation and the ability to bring it to market. Most small business owners on main-street in the United States or in the markets of most cities around the world are not entrepreneurs according to this definition. If you walk down the streets of Seventh Avenue in New York City you will see street vendors selling the fare of every country in the world, nail shops and small grocery stores. Few of these establishments are entrepreneurial by our definition because there is nothing new about them. Most of these people are traders or shop owners, performing a sort of small business management. Now these people are important, don't get us wrong, they create jobs and income for their families. But we want to make a distinction here between the small business owner who replicates what others are doing and an entrepreneur who innovates.

Our definition of entrepreneurship is driven not by necessity entrepreneurship but by opportunity. Opportunity entrepreneurship is positively correlated with economic growth. Entrepreneurs envision scalable, high-growth businesses. They also possess the ability to make those visions a reality. They get things done. They go over, under and around obstacles. This is borne out in the relationship observed between regulation and these two categories of entrepreneurs: regulation holds back replicative entrepreneurs but does not have the same impact on opportunity entrepreneurs. Entrepreneurs are the bridge between invention and commercialization. Invention without entrepreneurship stays in the university lab or the R&D facility. Entrepreneurs like Steve Jobs and Bill Gates commercialize other people's inventions. This vision of entrepreneurship actually delivers a product to customers.

While we have drawn a rather narrow definition of the entrepreneur, someone who innovates and gets things done, it is actually very broad. Entrepreneurs are everywhere, in every society, in rich and poor neighborhoods; they are Christians, Muslims and Jews, male and female, gay and straight. They are people of color. Entrepreneurs can be high tech or low tech or even no tech. All over the world entrepreneurs work in all sorts of conditions against great odds - in the slums of Kibera, Bombay and Jakarta. They find ways to innovate and bring products to market. Just because entrepreneurs don't have access to finance, intellectual property protection, or a trained staff does not mean that entrepreneurs do not exist and cannot succeed. For Example, Beleza Natural, which

started with a single salon in 1993 in San Paulo, Brazil, currently operates 29 salons and a cosmetics research lab, produces a full line of hair-care products, and employs 1,400 people. In 2012, the company's revenue was more than \$30 million. Beleza Natural is interesting because it focused its activities on the demand of an overlooked group, in this case low-income women at the bottom of the pyramid. By offering "affordable luxuries" in the form of hair treatment and the salon experience, Beleza Natural was tapping into the so-called "lipstick economy." However, as is the case for other successful female entrepreneurs, Beleza Natural aspired to provide greater benefits to its clients and employees. The company's business objectives extend to broader social and environmental benefits.¹

A second aspect of our definition of entrepreneurship regards the level of technology. In the West, innovation is used synonymously with technology. The heroes in the West are Zuckerberg, Jobs and other Silicon Valley stalwarts. Our definition is open to non tech innovators like Oprah and Bowker. Starbucks serves a centuries old drink, coffee, but it introduced a coffee shop experience that is now in every corner of the world. When you go into Starbucks and there is a long line it disappears in just a few minutes. That is process innovation and very much an example of a non tech entrepreneur. McDonalds did the same for the hamburger. Enterprise Rent a Car did it for car rentals and today employs thousands of people worldwide. Uber did it for taxicabs. They did not invent taxis. They have been around forever. They invented a new process. What low tech entrepreneurship does is increase efficiency: how quickly you can serve a cup of coffee.

Entrepreneurial Ecosystem Elements

Ever since the time of Schumpeter the concepts of entrepreneurship and innovation have been intertwined with economic development. The Global Entrepreneurship Index is an important tool to help countries accurately assess and evaluate their ecosystem to create more jobs. The *entrepreneurial ecosystem* is a new way to contextualize the increasingly complex and interdependent social systems being created.² While the academic literature kept agency, institutions and systems in separate silos, the real communities that practitioners worked in had no such silos and the different building blocks all built upon each other in a single, unified structure. Business books such as Brad Feld's *Start-up communities: Building an entrepreneurial ecosystem in your city*, Daniel Isenberg's *Harvard Business Review* article *What an entrepreneurship ecosystem actually is* and Steven Koltai, *Peace through Entrepreneurship: Investing in a Start-up Culture for Security and Development*, started to suggest that reality was nuanced.

In order to better understand entrepreneurial ecosystems let's start with a few definitions.³ A system is an organized set of interacting and interdependent subsystems that function together as a whole to achieve a purpose. In general, an ecosystem is a purposeful collaborating network of dynamic interacting systems and subsystems that have an ever-changing set of dependencies within a given context.⁴ First, an ecosystem, as opposed to a system has both living and non-living components. Otherwise it's a system like national systems of innovation. In addition, there are outcomes of the ecosystem that the literature calls ecosystem services and there is ecosystem management. The point of this line of research is that it is not just the abundance or endowment of particular key factors of production or resources that shape economic performance, it is also the manner in which that economic activity is configured, or organized, within geographic space.

The most carefully worked out approach to entrepreneurial ecosystems is associated with Acs, Szerb and Autio (2014). This line of research recognizes that it is not just the

abundance or endowment of particular key factors of production or resources that shape economic performance, it is also the manner in which that economic activity is configured, or organized, within geographic space and the role of entrepreneurship in bringing it to life. While the entrepreneurial ecosystem literature does not challenge the efficacy of these other dimensions of spatial organization and structure, such as clusters, specialization, diversity, market power, or localized competition, it suggests that entrepreneurship is also a key dimension enhancing economic performance.

Entrepreneurial ecosystems are composed of sub-systems (pillars) that are aggregated into systems (sub- indices) that can be optimized for system performance at the ecosystem level. There is a growing recognition in the entrepreneurship literature that entrepreneurship theory focused only on the entrepreneur may be too narrow. The concept of systems of entrepreneurship is based on three important premises that provide an appropriate platform for analyzing entrepreneurial ecosystems. First, entrepreneurship is fundamentally an action undertaken and driven by agents on the basis of incentives. Second, the individual action is affected by an institutional framework conditions. Third, entrepreneurship ecosystems are complex, multifaceted structures in which many elements interact to produce systems performance, thus, the index method needs to allow the constituent elements to interact. However because the elements are different in each case there is no one size fits all solution. Each one is bespoke.

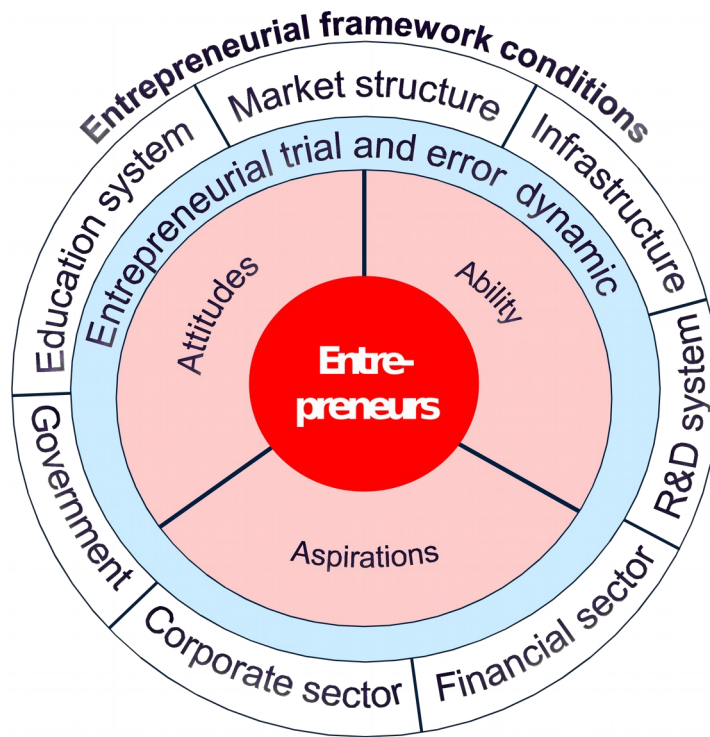
The Global Entrepreneurship Ecosystem

We define entrepreneurial ecosystems at the socio-economic level having properties of self-organization, scalability and sustainability as “...*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.*”⁵ Entrepreneurial Ecosystems are complex socioeconomic structures that are brought to life by individual-level-action. Much of the knowledge relevant for entrepreneurial action is embedded in ecosystem structures and requires individual-level-action to extract it.⁶

The structure of the entrepreneurial ecosystem is illustrated in **Figure 1.1**. Nascent and new entrepreneurs are at the heart of the system. Nascent entrepreneurs are individuals in the process of launching a new venture. These entrepreneurs represent a sub-set of the adult population in a given country. The attitudes that prevail within the wider population influence who chooses to become an entrepreneur. The nascent and new entrepreneurs are characterized by varying degrees of ability and entrepreneurial aspirations.

It is the entrepreneurs who drive the trial and error dynamic. This means entrepreneurs start businesses to pursue opportunities that they themselves perceive. However, entrepreneurs can't tell in advance if opportunities are real or not. The only way to validate an opportunity is to pursue it. The outcome is a trial and error process.

Figure 1.1: The Entrepreneurial Ecosystem Configuration



The entrepreneurial framework conditions matter because they regulate, first who chooses to become an entrepreneur and, second, to what extent the resulting new ventures are able to fulfill their growth potential. The first aspect—entrepreneurial choice—is regulated mostly by soft framework conditions, such as social norms and cultural preferences. The degree to which new ventures are able to fulfill their potential is regulated by a range of entrepreneurial framework conditions, such as, government, research and development, education, infrastructure, financial sector and the corporate sector.

A healthy entrepreneurial ecosystem will drive resource allocation towards productive uses. It will also drive total factor productivity through process innovation (Starbucks). The greater total factor productivity, the greater the economy's capacity to create jobs and wealth.

Agents

The first component of entrepreneurial ecosystems is agency. The entrepreneur drives the system. The entrepreneur is someone who makes judgment-based decisions about the coordination of scarce resources. The term "someone" is defined as the individual and the term "judgment-based decisions" are decisions for which no obviously correct procedure exists. Judgement is not the routine application of a standard rule. As we discussed above, we distinguish two types of entrepreneurial activity: at one pole there is routine entrepreneurship, which is really a type of management and for the rest of the spectrum we have high growth entrepreneurship. By routine entrepreneurship we mean the activities involved in coordinating and executing a well-established ongoing concern in which the parts of the production function in use are well known and that operates in well-established and clearly defined way. This includes the self-employment and small business owner. It is the next taco stand, garage or hair dresser. It is certainly the case that

replicative entrepreneurs can be of great social value. However, these types of firms are not what we mean by ecosystem services.⁷

By high-impact entrepreneurship we mean the activities necessary to create an innovative high-growth venture where not all the markets are well established or clearly defined and in which the relative parts of the production function are not completely known. Innovative entrepreneurs ensure that utilization of invention contributes to increased productivity and facilitates and contributes to economic growth. The gap-filling and input-completing capacities are the unique characteristics of the entrepreneur.

Institutions

The second fundamental component of Entrepreneurial Ecosystems is institutions—the rules of the game. Of particular importance to entrepreneurship are the economic institutions in society such as the structure of property rights and the presence of effective market frameworks (North, 1990). Economic institutions are important because they influence the structure of economic incentives. Without property rights, individuals will not have the incentive to invest in physical or human capital or adopt more efficient technologies. Economic institutions are also important because they help to allocate resources to their most efficient uses; they determine who gets profits, revenues and residual rights of control. When markets were highly restricted and institutions sent the wrong signals, there is little substitution between labor and capital and technological change is minimal.

Institutions create incentives and that the entrepreneurial talent is allocated to activities with the highest private return, which need not have the highest social returns. Universal welfare-enhancing outcomes do not automatically follow from entrepreneurial activity; indeed such activities can generate questionable or undesirable effects. Entrepreneurial talent can be allocated among a range of choices with varying effects from wealth-creation to destruction of economic welfare. If the same actor can become engaged in such alternative activities, then the mechanism through which talent is allocated has important implications for economic outcomes and the quality of this mechanism is the key criterion in evaluating a given set of institutions with respect to growth.

We follow many others, for example Hayek, in proposing that the answer rests upon the institutional system and the incentives that it creates for agents; yet we differ in simultaneously stressing the role of entrepreneurs. In the United States, institutions of private property and contract enforcement gives entrepreneurs the incentive to invest in physical and human capital, to combine inputs in ways to create new production functions, and to complete markets. It is entrepreneurs operating in supportive institutional environments that provide the transmission mechanism from knowledge to economic growth by raising productivity.

The System

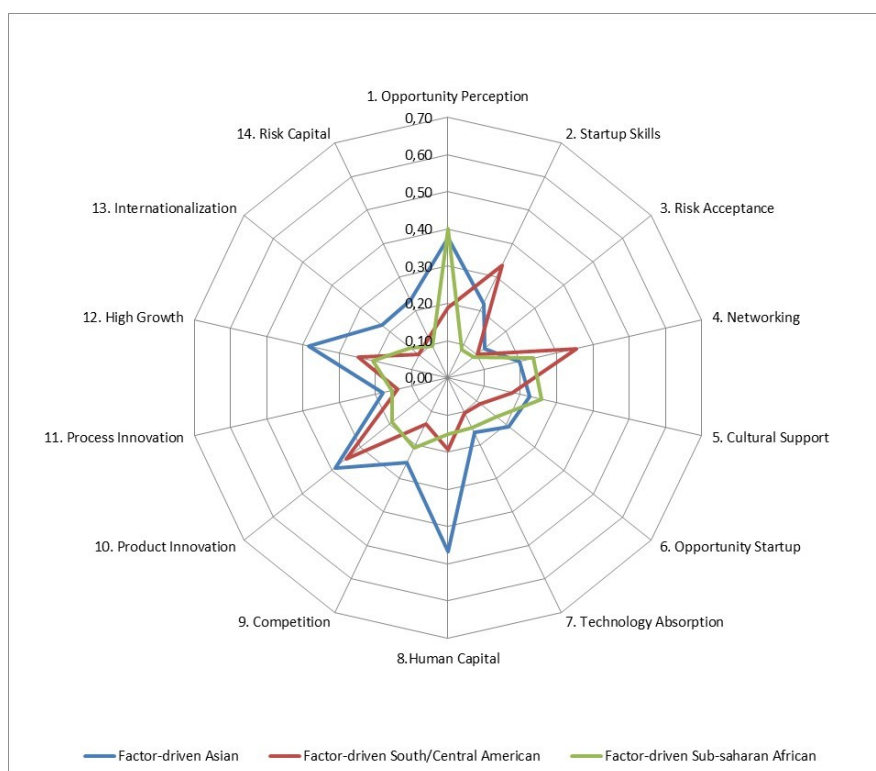
The third component of entrepreneurial ecosystems is the systems. When we look at systems, for example systems of innovation or clusters we have a theory of how the system functions as it produces outputs. Porter's Diamond comes to mind. When we move to an ecosystem we also need to have a theory of how the ecosystem functions. How does an entrepreneurial ecosystem function? It is not enough to have a laundry list of the institutions that might be important: markets, human capital, supports culture, finance

and policy. While all of these may be important how they work as an ecosystem is missing in much of this literature.

Building on the Systems of Innovation literature and the Global Entrepreneurship Monitor methodology we develop an entrepreneurial ecosystem that integrates both institutions and agency and introduce an ecosystem of coherent patterns in a simple, intuitive, and powerful way. The key ideas are the relationships, the complementary, across the systems and subsystems and the importance of bottleneck factors. The concept of complementary in its simplest way is the interaction of two variables. Two choice variables are complements, when doing more of one of them increases the returns to doing more of the other.

Figure 1.2 shows the pillars of the entrepreneurial ecosystem for factor driven economies on three continents and compares them to one another. While their overall entrepreneurial performance are similar, the pillar configuration seems to be different. There are some notable similarities; The Risk Acceptance, the Cultural Support, the Technology Absorption, and the Process Innovation scores are very similar in all three country groups.

Figure 1.2: Factor Driven Economies at the pillar level



Ecosystem Services

While many think of the output of ecosystems as more startups, like GEM, this is wrong and misleading. The dual service created by entrepreneurial ecosystems is (1) resource allocation towards productive uses and (2) the innovative, high-growth ventures that drive this process. The entrepreneurship literature frequently talks about opportunity recognition and the need to assemble resources. However, from a performance perspective the key issue is about resource allocation from existing activities to new ones. The allocation of resources to productive uses will result in high growth, high value new firms. The nutrient in the ecosystem is resources—venture capital! Without nutrients the ecosystem will die. For example, the launch of Uber and AirBnB early this decade and the earlier success of Google, Amazon, Facebook, Twitter, SKYPE, WhatsApp, Craig’s List, created a new breed of company The billion-dollar tech startup was once the stuff of myth, but now they seem to be everywhere, backed by a bull market, readily available venture capital and a new generation of disruptive technology.⁸

Ecosystem Management

In the ecological literatures the practice of managing and enhancing ecosystem benefits is referred to as ecosystem management. Because ecosystem services is created through a myriad of localized interactions between stakeholders, it is not easy to trace gaps in system performance back to specific, well-defined market and structural failures that could be addressed in a top-down mode.⁹

Strengthening the entrepreneurial ecosystem can be done by public private partnerships, banks, universities, foundations, governments and aid agencies. The Global

Entrepreneurial Ecosystem Roadmap (GEER) focuses on the first aspect of this project, that is (1) identifying the holes in the global entrepreneurship ecosystem (2) laying out a roadmap for how to fill in the holes and (3) measuring our progress. The goal of a well-functioning ecosystem is to improve the chances of success for entrepreneurs all over the world. And ultimately reduce unemployment and bring peace to the world.

Chapter 2: The Entrepreneurial Ecosystem and Global Prosperity

Introduction

While a focus on the entrepreneurial ecosystem may seem a novel approach to development, it is consistent with and even complementary to older, more traditional development strategies. As developing economies move from centralized economies to market economies, enterprise and entrepreneurship become important. “The emerging world, long a source of cheap labor, now rivals developed countries for business innovation. Developing countries are becoming hotbeds of business innovation in much the same way as Japan did from the 1950s onwards.”¹⁰

Entrepreneurship is considered an important mechanism that promotes economic development through employment, innovation, and welfare, but it does not appear like manna from heaven as a country moves through the stages of development. Rather, it plays a role in all development stages and is a process that continues over many years. Economists have come to recognize the “input-competing” and “gap-filling” capacities of entrepreneurial activity in development.¹¹ In other words, someone has to create the technology for new products and create the markets where people will buy them.

Two points are important when thinking about entrepreneurship and development. **First, contrary to popular belief, the most entrepreneurial countries in the world are not those that have the most entrepreneurs.** This notion is in fact misleading. In fact, the highest self-employment rates are in low-income countries such as Zambia and Nigeria. This is because low-income economies lack the human capital and infrastructure needed to create high-quality jobs. The result is that many people sell soft drinks and fruit on street corners, but there are few innovative, high-growth startups. Nor do these street vendors represent business ownership as defined in many developed countries.

In entrepreneurship, quality matters more than quantity. To be entrepreneurial, a country needs to have the best entrepreneurs, not necessarily the most. What the “best and the brightest” do is important, and to support their efforts, a country needs a well-functioning entrepreneurial ecosystem ([watch the video](#)).¹² The path to development is to create efficient organizations able to harness technology to increase output and improve the lives of millions.

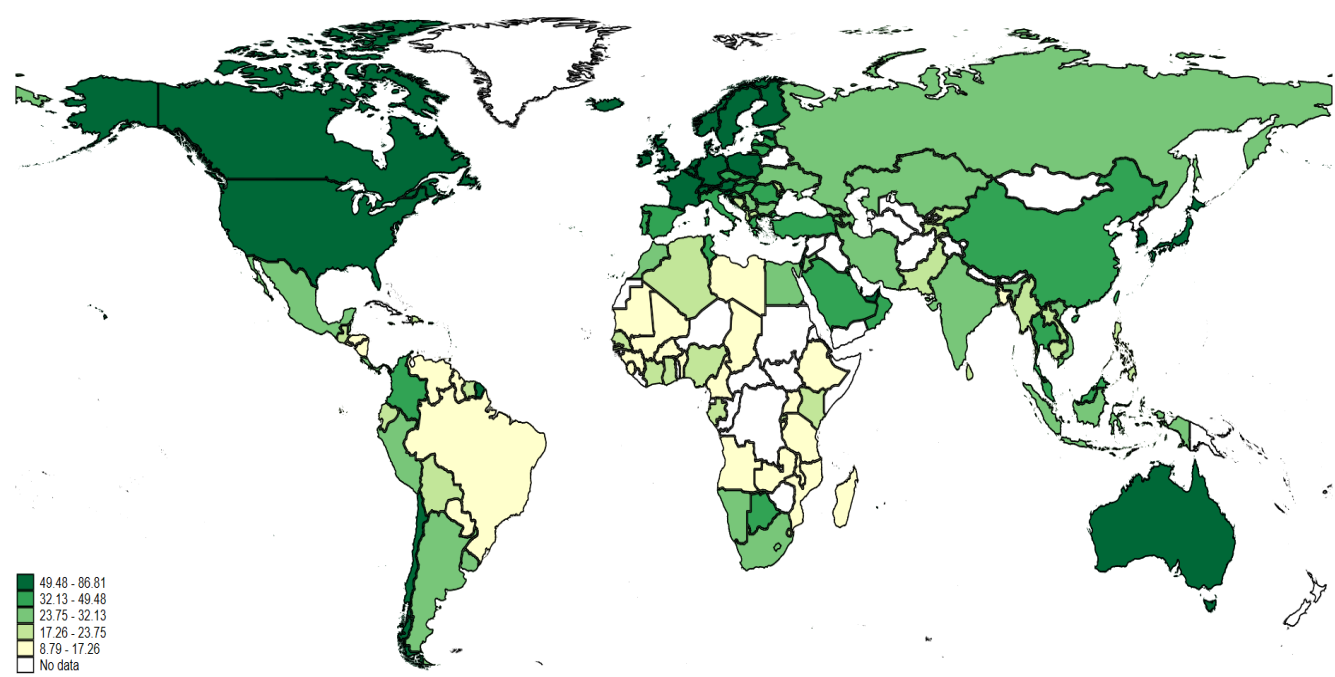
Second, entrepreneurship comes in productive, unproductive, and destructive forms. While productive entrepreneurship makes both entrepreneurs and society better off, unproductive and destructive entrepreneurship make entrepreneurs better off but leave society in worse condition. The GEI strives to measure only productive entrepreneurship that both creates wealth and is scalable.

Entrepreneurial ecosystems support innovative, productive, and rapidly growing new ventures. They consist of multiple interactive elements, all of which need to be in sync in order for innovative and high-growth firms to prosper. Such firms also need skilled employees. They need access to technology. They need a well-functioning infrastructure. They need specialized advice and support. They need access to finance. They need business premises. They need a supportive regulatory framework.

The Global State of Entrepreneurship

The GEI measures both the quality of entrepreneurship in a country and the extent and depth of the supporting entrepreneurial ecosystem. The map below presents a snapshot of the global entrepreneurial ecosystem.

Figure 2.1: Global Entrepreneurship 2019 Index Map



Top Ten Countries

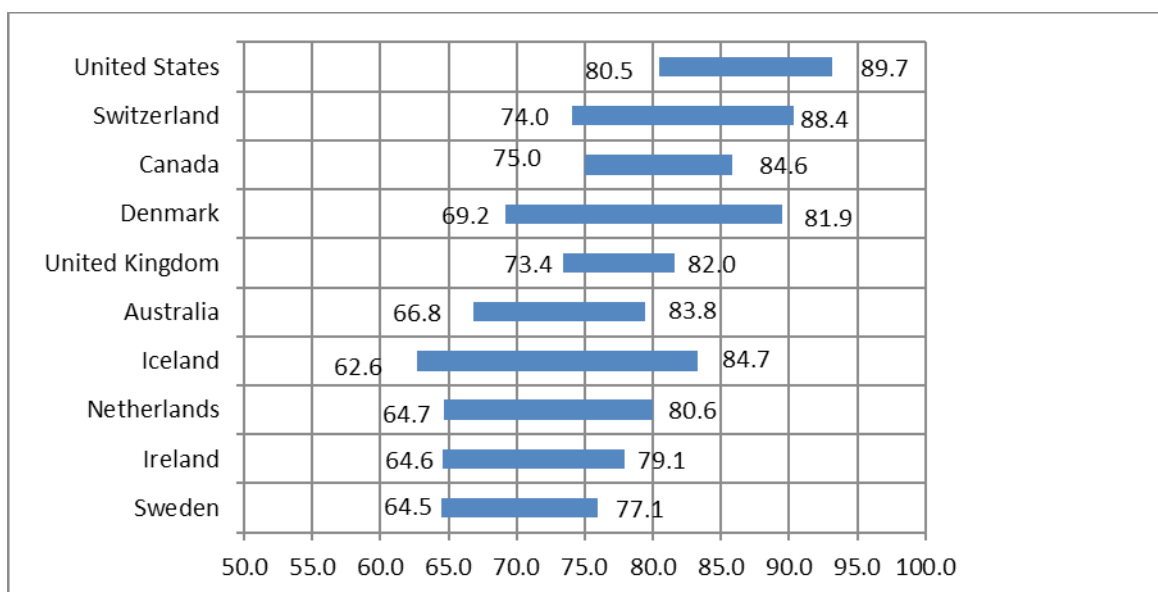
The top ten countries for 2019 show a pattern similar to last years’—high-income, mostly European nations. The top countries are the United States, Switzerland, Canada, Denmark, United Kingdom, Australia, Iceland, Netherlands, Ireland and Sweden. Because the scores in the highest range are so close, small changes in score from one year to the next can produce a relatively large shift in ranks among the top ten. For this reason, we present confidence intervals for the top ten(Figure 2.2) .

Table 2.1: Top Ten Countries in the GEI

Country	GEI 2019 lower limit	GEI 2019 upper limit	GEI 2019	GEI Rank 2019	GEI Rank 2018	Country
United States	80.5	93.2	83.6	1	1	United States
Switzerland	74.0	90.3	80.4	2	2	Switzerland
Canada	75.0	85.8	79.2	3	3	Canada
Denmark	69.2	89.5	77.8	4	6	Denmark
United Kingdom	73.4	81.6	75.5	5	4	United Kingdom
Australia	66.8	79.4	74.3	6	5	Australia

Iceland	62.6	83.3	74.2	7	7	Iceland
Netherlands	64.7	80.0	73.7	8	11	Netherlands
Ireland	64.6	77.9	73.1	9	8	Ireland
Sweden	64.5	76.0	68.5	10	9	Sweden

Figure 2.2: Confidence Intervals for Top Ten Scores



The results show that the No. 1 rank could have gone to any of the top eight nations with the exception of the Ireland and the Sweden. We see that Switzerland has a confidence interval almost similar to the United States.

Regional Performance

For many countries, a regional benchmark is more relevant for identifying best practices for fostering entrepreneurship. This year we have several important changes in Europe, Sub-Saharan Africa and the MENA countries. Below we present the top performer in each region along with individual and institutional score summaries.

Table 2.2: Top Scores by Region

World rank	Country	Region	GDP per capita PPP	Institutional variables	Individual variables	GEI
1	United States	North America	Int'l\$54 225	95.6	80.0	86.8
2	Switzerland	Europe	Int'l\$57 410	93.7	70.9	82.2
6	Australia	Asia-Pacific	Int'l\$39 753	88.3	70.3	77.5
12	Israel	Middle East / North Africa	Int'l\$33 132	83.9	72.1	67.9
19	Chile	South and Central America /	Int'l\$22 767	64.3	76.6	58.3

		Caribbean				
51	Botswana	Sub-Saharan Africa	Int'l\$15 807	46.0	66.0	34.4

The United States leads the world in entrepreneurship, and is first in the North American region, just ahead of peer Canada. Australia ranks first in the Asia-Pacific region, ahead of economic powerhouses Hong Kong, Taiwan, Japan, Singapore, China. Switzerland, which ranked fourth in the European region and eighth overall two years back has strengthened its position remaining the first in Europe. Chile ranks first in South and Central America and the Caribbean (19th overall), 11 places ahead of the next highest scorer in the region—Puerto Rico, at 30th. Israel is 12th overall and tops the MENA region, ahead of UAE at 25st. In Sub-Saharan Africa, Botswana is the leader at 51nd, ranking ahead of nine European nations mainly from the Balkan peninsula and East Europe.

Biggest Gains

Table 2.3: Biggest Gains in GEI Score

Country	Score 2019	Score 2018	Difference in Score	Difference in Rank
Hungary	46.2	36.4	9.8	17
Malaysia	40.1	32.7	7.3	15
Puerto Rico	48.7	42.1	6.6	11
Thailand	33.5	27.4	6.1	17
Denmark	79.3	74.3	5.0	2
Indonesia	26.0	21.0	5.0	19
China	45.9	41.1	4.7	9
Netherlands	72.3	68.1	4.2	3
South Korea	46.2	36.4	3.9	3
Italy	45.1	41.4	3.7	6

Legend: Includes only those countries that have participated in the GEM survey and do not have fully estimated individual data

Biggest Declines

Table 2.4: Biggest Declines in GEI Score (only with decreasing GEI scores)

Country	Score 2019	Score 2018	Difference in Score	Difference in Rank
Tunisia	34.0	42.4	-8.4	-13
Jordan	29.4	36.5	-7.1	-14
Lithuania	44.1	51.1	-7.0	-8
Macedonia	23.1	29.1	-6.0	-19
Uruguay	30.1	35.0	-4.9	-9
Turkey	39.8	44.5	-4.7	-7
Costa Rica	28.8	33.3	-4.4	-9
Brazil	16.1	20.3	-4.2	-20
Colombia	34.1	38.2	-4.1	-5
Belize	26.2	30.0	-3.8	-9

Legend: Includes only those countries that have participated in the GEM survey and do not have estimated individual data.

Country-level Productivity and the Entrepreneurial Ecosystem

Perhaps the first point that should be made in this subchapter is that economic growth does not equal to productivity. Economic growth basically refers to the capacity of countries to produce more goods and services, irrespective of how higher production is achieved. The positive variations in GDP or employment over time are the usual suspects among those interested in studying economic growth figures, mostly because they represent the desired objective of most policy makers, as a measure of economic prosperity.

Productivity is a more complex concept. At the country level, total factor productivity (TFP) deals with two highly interconnected economic aspects. First, TFP has to do with the capacity of countries to allocate and exploit available resources efficiently (P = productivity effect). The notion that markets are good at directing resources is a good catch-all explanation concept; but for many businesses it is hard to find all that is required to perform in the market and to keep the pace of industrial and digital revolutions that not only equip businesses with new—often more technologically advanced—resources, but also change the ways to exploit them.

The second component of TFP deal with the capacity of organizations to channel innovations to the economy (I = innovation effect) that, consequently, translate into higher levels of output per input unit (in the case of countries, GDP per worker). Maybe we all are too used to link innovation to technological inventions that are successfully commercialized. However, our definition of innovation is not restricted to engineering (such as the driverless car) or to medical advances (such as nerve stimulation or non-invasive procedures), and is open to other, equally valuable, types of non-technological innovations related to product and processes.

Let's start with the productivity effect (P). The efficient allocation of resources available in the economy is an important part of the productivity function. The productivity effect is linked to how well new and existing businesses use different resources, including labor, capital, equipment, knowledge, and technology-based inputs. The capacity of Amazon to amalgamate technologies brought from other industries (for example, ICTs, drones) to increase the productivity of its operations (delivery: Amazon Fresh or Amazon Prime Air) is a good example.¹³

From the perspective of the entrepreneurship ecosystem, better institutions backing entrepreneurial activities and an efficient interaction between individual actions and the institutional setting governing entrepreneurial decisions are key ingredients necessary to facilitate the creation of businesses with a greater capacity to generate jobs, and help incumbent businesses to take advantage of better market conditions. For example, in many European countries entrepreneurs have strong incentives to invest in physical and human capital, and to promote the exploitation of resources in an effort to improve the functioning of their businesses. In this case, the supportive institutional environment creates the conditions to promote operational improvements. In other words, entrepreneurial ventures have incentives to 'do things better', that is, to improve their productivity. To sum up, a healthy entrepreneurial ecosystem contributes to national productivity by enhancing market efficiency levels and by promoting the efficient exploitation of resources through new and incumbent businesses.¹⁴

The second effect—innovation (I)—is strictly linked to the Schumpeterian approach to entrepreneurship (creative destruction).¹⁵ For Schumpeter entrepreneurs play a decisive role in the economy by creating and implementing radical innovations that are conducive to economic progress. In this tradition entrepreneurship is critical to spark economic development by promoting innovations, in our terminology ‘create new things or find new ways to do things’. Progress translates in the expansion of the countries’ production possibilities that materialize in a shift of the global frontier.

But, at this point is worth questioning how can radical innovations foster such progress. Moreover, how does the entrepreneurial ecosystem contribute to this progress? It seems logical to argue that inventions are worthless if they do not turn into commercialized innovations, and that the economic impact of such innovations will turn sterile if the market and individuals cannot fully incorporate these innovations in their day-to-day routines.

For Schumpeter, entrepreneurs nurture the economy with innovations and the entrepreneurial ecosystem is critical for the development of this economic function: ‘create new things or find new ways to do things’. If countries enjoy a healthy entrepreneurial ecosystem the efforts of innovative entrepreneurs will materialize in new value-adding combinations of resources that will expand the countries’ productive capacity and the global production frontier.

We found a significant, relatively strong positive correlation between entrepreneurship and total factor productivity (0.35). We also noted that entrepreneurship correlates weakly positively with the productivity effect (0.09). The strongest positive correlation was found between entrepreneurship and the innovation effect (0.39). This result is not surprising if we think a little harder. Just like we cannot imagine progress in the 19th century without the creation and development of steam engines, it is hard to imagine entrepreneurship in the 21st century without the power of technology-driven inventions. With the new millennium industries and markets from all around the globe are witnessing drastic transformations that are the result of a digital revolution in which entrepreneurs are taking an active role by creating new businesses that are responsible of this revolution. The result is a good sign that reinforces our argument that the creation of ‘new things or new ways to do things’ definitely constitutes the vital force driving economic development.

We also examined the connection between the GEI score and the computed total factor productivity values. The correlation between TFP and GEI is 0.35 and the sign is positive: The quality of the entrepreneurial ecosystem (GEI scores) and TFP move in the same direction. Countries with a low-quality entrepreneurial ecosystem tend to show negative TFP values below unity. On contrary, all developed economies with supportive entrepreneurial ecosystems improve their total factor productivity, either by productivity or innovation effects.

As noted earlier, there is a positive association between entrepreneurship and the productivity effect (correlation = 0.09); however, this relationship is less pronounced than that found for the TFP. This result may well be partly explained by the differentiating impact of entrepreneurship over the productivity effect across economies. We observe that the correlation between entrepreneurship and the productivity effect scores the highest among factor driven countries (0.47). We also note that in many underdeveloped and developing territories with low- and mid-level entrepreneurial ecosystem the productivity effect is positive, while the result of the productivity effect for some developed economies is negative. Thus, our results suggest that, in developing economies, the entrepreneurial ecosystem plays a much more decisive role on TFP via productivity improvements, that is,

helping new and established businesses in developing economies to better exploit their limited resources, that is, 'to 'do things better'.

The picture is quite different when we look at the results for the innovation effect. The correlation between entrepreneurship and the innovation effect progressively increases as we move from factor-driven (correlation = -0.41) to innovation-driven economies (correlation = 0.33). Similarly, the impact of the innovation effect is much more potent in innovation-driven economies (1.55%) than in efficiency-driven (1.17%) and in factor-driven economies (-0.59%). In contrast to the stronger effect of the entrepreneurial ecosystem over productivity in developing countries, we found that the positive influence of a healthy entrepreneurial ecosystem over the innovative capacity of new and established businesses is much more powerful in developed economies. With the exception of Turkey, the innovation effect linked to the efficient commercialization of innovations and new technologies is positive in all economies with high quality entrepreneurial ecosystems (GEI > 50).

Based on the relationships reported above, the improvement of the entrepreneurial ecosystem (GEI scores) may well yield to improvements in total factor productivity via the enhanced capacity of businesses to use their available resources (productivity effect) and to exploit the market potential of new technologies and innovations. As a result, if every of the 64 analyzed countries raised its GEI score by 10%, the global total factor productivity will increase 0.22 TFP points, which represents an estimated improvement of 15.80%.¹⁶

Chapter 3: The Global Entrepreneurship Index

The fourteen pillars of the Global Entrepreneurial Index

The pillars of entrepreneurship in the ecosystem are many and complex. While a widely accepted definition of entrepreneurship is lacking, there is general agreement that the concept has numerous dimensions.¹⁷ We take this into account in creating the entrepreneurship index. Some businesses have a larger impact on markets, create more new jobs, and grow faster and become larger than others. We also take into account the fact that entrepreneurship plays a different role at different stages of development.¹⁸ Considering all of these possibilities and limitations, we define entrepreneurship as “the dynamic, institutionally embedded interaction between entrepreneurial attitudes, entrepreneurial abilities, and entrepreneurial aspirations by individuals, which drives the allocation of resources through the creation and operation of new ventures.”

The GEI is composed of three building blocks or sub-indices—what we call the 3As: entrepreneurial attitudes, entrepreneurial abilities, and entrepreneurial aspirations. Entrepreneurial attitudes are about how a country thinks about entrepreneurship. In fact, what does your mother think about it? The second sub index is about abilities. Can you do it? Do you have the skills? The third sub index is about aspirations. Do you want to build a billion-dollar company? These three sub-indices stand on 14 pillars, each of which contains an individual and an institutional variable that corresponds to the micro- and the macro-level aspects of entrepreneurship. Unlike other indexes that incorporate only institutional or individual variables, the pillars of the GEI include both. These pillars are an attempt to capture the open-ended nature of entrepreneurship; analyzing them can provide an in-depth view of the strengths and weaknesses of those listed in the Index. We now describe the 14 pillars of entrepreneurship.

Entrepreneurial Attitudes Pillars

Pillar 1: *Opportunity Perception*. This pillar captures the potential “opportunity perception” of a population by considering the state of property rights and the regulatory burden that could limit the real exploitation of the recognized entrepreneurial opportunity. Within this pillar is the individual variable, Opportunity Recognition, which measures the percentage of the population that can identify good opportunities to start a business in the area where they live. However, the value of these opportunities also depends on the size of the market. The institutional variable Freedom and Property consists of two smaller variables: economic freedom (Economic Freedom) and property rights (Property Rights). Business Freedom – one sub-index of the Index of Economic Freedom variable – is appropriate for capturing the overall burden of regulation, as well as the government’s regulatory efficiency in influencing startups and operating businesses. “The property rights element is an assessment of the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state,” or in other words, enforced property rights guarantee that individuals have the right to harvest the fruits of successful opportunity exploitation and no one is confiscating or stealing their property or business.¹⁹ Both institutional components are vital for individuals to become entrepreneurs and not employees of another business or the state.²⁰

Pillar 2: *Startup Skills*. Launching a successful venture requires the potential entrepreneur to have the necessary startup skills. Skill Perception measures the percentage of the population who believe they have adequate startup skills. Most people in developing

countries think they have the skills needed to start a business, but their skills were usually acquired through workplace trial and error in relatively simple business activities. In developed countries, business formation, operation, management, etc., require skills that are acquired through formal education and training. Hence education, especially postsecondary education, plays a vital role in teaching and developing entrepreneurial skills. Today there are 150 million students enrolled in some kind of education beyond high school, a 53 percent increase in less than a decade. People all over the world see education as a pathway out of poverty.²¹

Pillar 3: Risk Acceptance. Of the personal entrepreneurial traits, fear of failure is one of the most important obstacles to a startup. Aversion to high-risk enterprises can retard nascent entrepreneurship. Risk Perception is defined as the percentage of the population who do not believe that fear of failure would prevent them from starting a business. Country Risk reflects to transfer and convertibility risk of a country and believed to closely correlate to business.²²

Pillar 4: Networking. Networking combines an entrepreneur's personal knowledge with their ability to connect to others in a country and the whole world. This combination serves as a proxy for networking, which is also an important ingredient of successful venture creation and entrepreneurship. Entrepreneurs who have better networks are more successful, can identify more viable opportunities, and can access more and better resources. We define the basic networking potential of a possible entrepreneur by the percentage of the population who personally know an entrepreneur who started a business within two years (Know Entrepreneurs). The connectivity variable has two components: One that measures the urbanization (Urbanization) of the country and the other measuring the quality of the transport infrastructure (Infrastructure).²³

Pillar 5: Cultural Support. This pillar is a combined measure of how a country's inhabitants view entrepreneurs in terms of status and career choice, and how the level of corruption in that country affects this view. Without strong cultural support, the best and brightest do not want to be responsible entrepreneurs, and they decide to enter a traditional profession. Career Status is the average percentage of the population age 18-64 who say that entrepreneurship is a good career choice and enjoys high status. The associated institutional variable measures the level of corruption. High levels of corruption can undermine the high status and steady career paths of legitimate entrepreneurs.²⁴

Entrepreneurial Abilities Pillars

Pillar 6: Opportunity Startup. This is a measure of startups by people who are motivated by opportunity but face red tape and tax payment. An entrepreneur's motivation for starting a business is an important signal of quality. Opportunity entrepreneurs are believed to be better prepared, to have superior skills, and to earn more than what we call necessity entrepreneurs. Opportunity Motivation is defined as the percentage of the Total Entrepreneurial Activity (TEA) businesses started to exploit a good opportunity, to increase income, or to fulfill personal aims, in contrast to those started by people who have no other options for work. The overall effectiveness of the government services is measured by the Good Governance variable and the cost of the governance is by the level of overall taxation (Taxation). The variable is a combination of these two components, government service quality and costs.²⁵

Pillar 7: Technology Absorption. In the modern knowledge economy, information and communication technologies (ICT) play a crucial role in economic development. Not all

sectors provide the same chances for businesses to survive and or their potential for growth. The Technology Level variable is a measure of the businesses that are in technology sectors. The institutional variable, Tech Absorption, is a measure of a country's capacity for firm-level technology absorption, as reported by the World Economic Forum. The diffusion of new technology, and the capability to absorb it, is vital for innovative firms with high growth potential.²⁶

Pillar 8: Human Capital. The prevalence of high-quality human capital is vitally important for ventures that are highly innovative and require an educated, experienced, and healthy workforce to continue to grow. An important feature of a venture with high growth potential is the entrepreneur's level of education. The Educational Level variable captures the quality of entrepreneurs; it is widely held that entrepreneurs with higher education degrees are more capable and willing to start and manage high-growth businesses. The labor market possibilities and the capability to easily hire quality employees also have an impact on business development, innovation, and growth potential. The institutional variable Labor Market has two components. Labor Freedom measures the freedom of the labor from the regulatory perspective and Staff Training is a country's level of investment in business training and employee development. It can be expected that heavy investment in employees pays off and that training increases employee quality.²⁷

Pillar 9: Competition. Competition is a measure of a business's product or market uniqueness, combined with the market power of existing businesses and business groups and the effectiveness of anti-monopoly regulation. The variable Competitors is defined as the percentage of TEA businesses that have only a few competitors offering the same product or service. However, market entry can be prevented or made more difficult if powerful business groups are dominating the market. The extent of market dominance by a few business groups is measured by the variable Market Dominance, a variable reported by the World Economic Forum. The effectiveness of the regulatory bodies (Regulation) could also influence the level of competition in a country. The Competition institutional variable is the combination of Regulation and Market Dominance.²⁸

Entrepreneurial Aspirations Pillars

Pillar 10: Product Innovation. New products play a crucial role in the economy of all countries. While countries were once the source of most new products, today developing countries are producing products that are dramatically cheaper than their Western equivalents. New Product is a measure of a country's potential to generate new products and to adopt or imitate existing products. In order to quantify the potential for new product innovation, an institutional variable related to technology and innovation transfer seems to be relevant. Technology Transfer is a complex measure of whether a business environment allows the application of innovations for developing new products.²⁹

Pillar 11: Process Innovation. Applying and/or creating new technology is another important feature of businesses with high-growth potential. New Tech is defined as the percentage of businesses whose principal underlying technology is less than five years old. However, most entrepreneurial businesses do not just apply new technology, they create it. The problem is similar to the New Product variable: whereas many businesses in developing countries may apply the latest technology, they tend to buy or copy it. An appropriate institutional variable applied here is complex measure combining research and development (R&D), the quality of scientific institutions in a country (Scientific Institutions) and the availability of scientists and engineers (Availability of Scientist). Gross Domestic Expenditure on Research and Development (GERD) is the R&D percentage of GDP as

reported by OECD. While R&D alone does not guarantee successful growth, it is clear that, without systematic research activity, the development and the implementation of new technologies—and therefore future growth—will be inhibited. The Science institutional variable combines together R&D potential with physical scientific infrastructure and science oriented human capital³⁰

Pillar 12: High Growth. High Growth is a combined measure of the percentage of high-growth businesses that intend to employ at least 10 people and plan to grow more than 50 percent in five years (Gazelle variable) with business strategy sophistication (Business Strategy variable) and venture capital financing possibility (Venture Capital). It might be argued that a shortcoming of the Gazelle variable is that growth is not an actual but an expected rate. However, a measure of expected growth is in fact a more appropriate measure of aspiration than a measure of realized growth. Business Strategy refers to “the ability of companies to pursue distinctive strategies, which involves differentiated positioning and innovative means of production and service delivery.” High Growth combines high growth potential with a sophisticated strategy and growth specific venture capital finance.³¹

Pillar 13: Internationalization. Internationalization is believed to be a major determinant of growth. A widely applied proxy for internationalization is exporting. Exporting demands capabilities beyond those needed by businesses that produce only for domestic markets. However, the institutional dimension is also important; a country’s openness to international entrepreneurs—that is, the potential for internationalization—can be estimated by its degree of 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.” The internationalization pillar is designed to capture the degree to which a country’s entrepreneurs are internationalized, as measured by the exporting potential of businesses, controlling for the extent to which the country is able to produce complex products.³²

Pillar 14: Risk Capital. The availability of risk finance, particularly equity rather than debt, is an essential precondition for fulfilling entrepreneurial aspirations that are beyond an individual entrepreneur’s personal financial resources.³³ Here we combine two kinds of finance, the informal investment (Informal Investment) and the institutional depth of capital market (DCM). Informal Investment is defined as the percentage of informal investors in the population age 18-64, multiplied by the average size of individuals’ investment in other people’s new businesses. While the rate of informal investment is high in factor-driven economies, the amount of informal investment is considerably larger in efficiency- and innovation-driven countries; combining them balances these two effects. Our institutional variable here is DCM, 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, which encompass seven aspects of a country’s debt and capital market.

The Global Entrepreneurship Index, 2019 Rankings

In this section, we report the rankings of the 137 countries on the Global Entrepreneurship Index and its three sub-indices. We also provide confidence intervals for the GEI’s. The confidence intervals calculations are based on the Global Entrepreneurship Monitor (GEM)

Total Early-Phased Entrepreneurial Activity (TEA) confidence intervals calculated over the 2010-2016 years. Note that these confidence intervals only partially represent the potential measurement errors, as we do not know the full error term. In addition, we do not have information about the confidence intervals of the 33 countries where we use fully estimated data. In these cases, the upper and the lower limits are the same.

We present the rankings in terms of country development, as measured by per capita GDP. The overall ranking of the countries on the GEI is shown in **Table 3.1**. Like previous years, Anglo-Saxon, Nordic, and Western European countries in the innovation-driven stage of development are in the front ranks. The United States, Switzerland and Canada lead the rankings. Three of the five Nordic countries, Denmark, Iceland, and Sweden, are in the top ten and effectively tied with the United States. Hong Kong, the highest scored Asian country, is in 13th place, and Taiwan is 18th, and South Korea is 21th. Netherlands rise has been continuing from the 10th-place to the 8th position just behind Iceland that held its own in position. Besides their high entrepreneurial performance, these countries represent high income levels.

Of the most populous EU countries, only the United Kingdom places 5th among the top 10 countries. The other large European countries rank in the middle: France is 14th, Germany is 15th, and Spain is 31st followed by Italy in 36th place. While the in the previous year only UK, France, and Germany were relatively well balanced over the 14 pillars, Poland, Spain, and Italy were entrepreneurially less efficient, this year all big countries have improved. The big surprise this year is the rise of Hungary from the 50th to the 33rd place, primarily driven by the Technology Absorption and the aspiration index with very strong scores in high-growth firms, internationalization and venture capital. Despite these improvements, Europe is still struggling to create new billion dollar companies. However, the 26th placed Japan is still very unbalanced over the 14 pillars of entrepreneurship.

Table 3.1. The Global Entrepreneurship Index Rank of All Countries, 2019

Global rank	Country	Score	Global rank	Country	Score	Global rank	Country	Score
1	United States	86.8	19	Chile	58.3	37	Lithuania	44.1
2	Switzerland	82.2	20	Luxembourg	58.1	38	Bahrain	43.8
3	Canada	80.4	21	Korea	58.1	39	Oman	43.6
4	Denmark	79.3	22	Estonia	57.8	40	Czech Republic	43.5
5	United Kingdom	77.5	23	Slovenia	56.5	41	Slovakia	42.6
6	Australia	73.1	24	Norway	56.1	42	Saudi Arabia	42.1
7	Iceland	73.0	25	United Arab Emirates	54.2	43	Malaysia	40.1
8	Netherlands	72.3	26	Japan	53.3	44	Turkey	39.8
9	Ireland	71.3	27	Singapore	52.4	45	Latvia	39.3
10	Sweden	70.2	28	Qatar	51.6	46	Romania	38.6
11	Finland	70.2	29	Poland	49.5	47	Kuwait	37.4
12	Israel	67.9	30	Puerto Rico	48.7	48	Brunei Darussalam	36.5
13	Hong Kong	67.9	31	Spain	46.9	49	Croatia	36.1
14	France	67.1	32	Portugal	46.3	50	Greece	35.4
15	Germany	66.7	33	Hungary	46.2	51	Botswana	34.4
16	Austria	64.9	34	China	45.9	52	Colombia	34.1
17	Belgium	62.2	35	Cyprus	45.6	53	Tunisia	34.0
18	Taiwan	62.1	36	Italy	45.1			

Global rank	Country	Score
54	Thailand	33.5

Global rank	Country	Score
55	Barbados	32.2

Global rank	Country	Score
56	Azerbaijan	32.1
57	Montenegro	31.8
58	South Africa	31.6
59	Kazakhstan	31.0
60	Uruguay	30.1
61	Bulgaria	30.1
62	Namibia	30.0
63	Jordan	29.4
64	Iran	29.4
65	Costa Rica	28.8
66	Lebanon	28.8
67	Serbia	28.6
68	Morocco	28.3
69	Peru	27.7
70	Mexico	27.1
71	Georgia	26.2
72	Belize	26.2
73	Vietnam	26.0
74	Argentina	26.0
75	Indonesia	26.0
76	Panama	25.5
77	Ukraine	25.2
78	India	25.1
79	Jamaica	24.8
80	Russia	24.8
81	Egypt	24.6
82	Armenia	24.3
83	Gabon	23.8
84	Dominican	23.6

Global rank	Country	Score
	Republic	
85	Macedonia	23.1
86	Philippines	23.0
87	Albania	22.5
88	Algeria	22.4
89	Bolivia	22.1
90	Trinidad and Tobago	21.7
91	Ghana	21.6
92	Nigeria	20.8
93	Senegal	20.3
94	Moldova	20.2
95	Rwanda	20.0
96	Kenya	19.8
97	Bosnia and Herzegovina	19.5
98	Tajikistan	19.4
99	Kyrgyz Republic	19.2
100	Côte d'Ivoire	19.1
101	Sri Lanka	19.1
102	Lao PDR	19.1
103	Swaziland	18.8
104	Guatemala	18.7
105	Ecuador	18.5
106	Suriname	18.4
107	Myanmar	18.1
108	Cambodia	17.7
109	Pakistan	17.3

Global rank	Country	Score
110	Tanzania	17.3
111	Ethiopia	17.2
112	Honduras	17.2
113	Gambia, The	17.1
114	Libya	16.6
115	Paraguay	16.6
116	Zambia	16.3
117	Guyana	16.3
118	Brazil	16.1
119	Nicaragua	16.1
120	El Salvador	15.7
121	Cameroon	15.6
122	Guinea	15.5
123	Mali	15.3
124	Angola	15.1
125	Uganda	14.8
126	Liberia	14.8
127	Burkina Faso	13.4
128	Benin	13.3
129	Venezuela	13.1
130	Mozambique	12.8
131	Sierra Leone	12.7
132	Bangladesh	12.5
133	Malawi	11.6
134	Mauritania	10.5
135	Burundi	10.2
136	Madagascar	9.1
137	Chad	8.8

Factor-driven countries with low GDPs, such as Pakistan, Bangladesh, Uganda, and other poor African countries, are at the bottom of the entrepreneurship ranking, as expected. At the same time, these countries' entrepreneurial performance is the least unbalanced. However, some countries—including two former socialist countries, Serbia and Russia, innovation-driven Italy, and two South American countries, Brazil and Trinidad and Tobago—should have higher levels of entrepreneurship, as implied by their development trend lines, and more efficient use of entrepreneurial resources.

The Ranking of the 3As

By definition, the GEI is a three-component index that takes into account the different aspects of the entrepreneurial ecosystem. However, all three components, called sub-indices, are in themselves complex measures that include various characteristics of entrepreneurial attitudes, entrepreneurial abilities, and entrepreneurial aspirations.

Entrepreneurial attitudes are societies' attitudes toward entrepreneurship, which we define as a population's general feelings about recognizing opportunities, knowing entrepreneurs personally, endowing entrepreneurs with high status, accepting the risks associated with business startups, and having the skills to launch a business successfully. The benchmark individuals are those who can recognize valuable business opportunities and have the skills to exploit them; who attach high status to entrepreneurs; who can bear and handle startup risks; who know other entrepreneurs personally (i.e., have a network or role models); and who can generate future entrepreneurial activities.

Moreover, these people can provide the cultural support, financial resources, and networking potential to those who are already entrepreneurs or want to start a business. Entrepreneurial attitudes are important because they express the general feeling of the population toward entrepreneurs and entrepreneurship. Countries need people who can recognize valuable business opportunities, and who perceive that they have the required skills to exploit these opportunities. Moreover, if national attitudes toward entrepreneurship are positive, it will generate cultural support, financial support, and networking benefits for those who want to start businesses.

Entrepreneurial abilities refer to the entrepreneurs' characteristics and those of their businesses. Different types of entrepreneurial abilities can be distinguished within the realm of new business efforts. Creating businesses may vary by industry sector, the legal form of organization, and demographics—age, education, etc. We define entrepreneurial abilities as startups in the medium- or high-technology sectors that are initiated by educated entrepreneurs, and launched because of a person being motivated by an opportunity in an environment that is not overly competitive. In order to calculate the opportunity startup rate, we use the GEM TEA Opportunity Index. TEA captures new startups not only as the creation of new ventures but also as startups within existing businesses, such as a spinoff or other entrepreneurial effort. Differences in the quality of startups are quantified by the entrepreneur's education level—that is, if they have a postsecondary education—and the uniqueness of the product or service as measured by the level of competition. Moreover, it is generally maintained that opportunity motivation is a sign of better planning, a more sophisticated strategy, and higher growth expectations than "necessity" motivation in startups.

Entrepreneurial aspiration reflects the quality aspects of startups and new businesses. Some people just dislike their currently employment situation and want to be their own boss, while others want to create the next Microsoft. Entrepreneurial aspiration is defined as the early-stage entrepreneur's effort to introduce new products and/or services,

develop new production processes, penetrate foreign markets, substantially increase their company's staff, and finance their business with formal and/or informal venture capital. Product and process innovation, internationalization, and high growth are considered the key characteristics of entrepreneurship. Here we added a finance variable to capture the informal and formal venture capital potential that is vital for innovative startups and high-growth firms.

Each of these three building blocks of entrepreneurship influences the other two. For example, entrepreneurial attitudes influence entrepreneurial abilities and entrepreneurial aspirations, while entrepreneurial aspirations and abilities also influence entrepreneurial attitudes.

Table 3.2 shows the ranking of the first 25 countries in the GEI and the rank of the sub-index. The sub-index points and rankings for all 137 countries can be found in the Appendix. The United States is first in the overall Index, and also in one out of the three sub-indices. Switzerland is 9th in attitudes first in aspirations, and third in abilities, as it is more interested in high-impact entrepreneurship than in replicative activities. Chile represents a more unbalanced case, ranking 19th in the overall Index slipping three places in 2018 and another one in 2019, 13th in attitudes, 25th in abilities, and 30th in aspirations. This is a huge challenge for Chile and many other Latin American economies. Generally, countries that rank at the bottom of the GEI also rank at the bottom of the three sub-indices. Israel ranks 12st in the overall Index but performs poorly in attitudes and abilities. However, it ranks 5th in Aspirations, despite having poorer attitudes and abilities. For the "startup nation" it has an overall poor ranking in risk perception – at the bottom of the top 25 countries.

Table 3.2: The Global Entrepreneurship Index and Sub-Index Ranks of the First 25 Countries, 2019

Countries	GEI	GEI rank	ATT	ATT rank	ABT	ABT rank	ASP	ASP rank
United States	86.8	1	83.5	1	89.7	2	87.2	2
Switzerland	82.2	2	72.2	9	85.6	3	88.6	1
Canada	80.4	3	78.0	3	83.8	4	79.4	3
Denmark	79.3	4	75.5	5	90.1	1	72.3	9
United Kingdom	77.5	5	73.5	8	82.6	5	76.3	6
Australia	73.1	6	74.1	7	80.1	6	65.2	19
Iceland	73.0	7	77.8	4	71.0	10	70.1	12
Netherlands	72.3	8	82.3	2	74.4	9	60.3	22
Ireland	71.3	9	65.6	15	79.1	7	69.0	14
Sweden	70.2	10	67.1	14	77.1	8	66.5	17
Finland	70.2	11	74.5	6	64.6	17	71.4	10
Israel	67.9	12	64.0	16	62.6	18	77.2	5
Hong Kong	67.9	13	68.4	10	64.7	16	70.5	11
France	67.1	14	56.8	20	66.8	13	77.7	4
Germany	66.7	15	57.8	19	68.2	11	74.0	8
Austria	64.9	16	63.8	17	65.1	14	65.7	18
Belgium	62.2	17	49.8	27	67.4	12	69.4	13
Taiwan	62.1	18	53.2	25	58.0	22	75.0	7
Chile	58.3	19	67.8	13	53.3	25	53.6	30
Luxembourg	58.1	20	45.6	32	65.0	15	63.7	20

Korea	58.1	21	67.8	12	46.3	36	60.1	23
Estonia	57.8	22	68.0	11	50.8	28	54.8	27
Slovenia	56.5	23	56.5	23	57.6	23	55.4	26
Norway	56.1	24	63.7	18	60.7	20	43.7	41
United Arab Emirates	54.2	25	56.6	22	51.7	27	54.1	28

Tables 3.3-3.5 list the ranks and the 14 pillar values of the first 25 countries for the three sub-indices. Each table gives the values for each of the pillars that make up the respective sub-index. The pillar values for all 137 countries can be found in the Appendices.

Entrepreneurial Attitudes

As stated earlier, entrepreneurial attitude is defined as the general attitude of a country's population toward recognizing opportunities, knowing entrepreneurs personally, attaching high status to entrepreneurs, accepting the risks associated with a business startup, and having the skills to successfully launch businesses. Entrepreneurial attitudes are important because they express the population's general feelings toward entrepreneurs and entrepreneurship.

Table 3.3. Entrepreneurial Attitudes Sub-Index and Pillar Values for the First 25 Countries, 2019*

Countries	ATT	Opportunity Perception	Startup Skills	Risk Acceptance	Networking	Cultural Support
United States	83.53	1.000	1.000	0.931	0.610	0.841
Netherlands	82.29	0.805	0.961	0.949	0.878	1.000
Canada	78.05	0.908	0.834	0.657	0.711	0.984
Iceland	77.85	0.684	0.964	0.918	1.000	0.623
Denmark	75.48	0.999	0.722	0.759	0.611	0.889
Finland	74.50	0.595	0.967	0.784	0.841	0.825
Australia	74.11	0.796	1.000	0.744	0.652	0.736
United Kingdom	73.52	0.749	0.586	0.876	0.649	0.919
Switzerland	72.24	0.714	0.717	0.904	0.586	0.769
Hong Kong	68.44	1.000	0.595	0.457	1.000	0.683
Estonia	67.97	0.665	0.899	0.921	0.408	0.828
South Korea	67.80	0.519	1.000	1.000	1.000	0.478
Chile	67.78	0.590	0.921	1.000	0.727	0.656
Sweden	67.14	0.949	0.454	0.689	0.706	0.844
Ireland	65.62	0.766	0.917	0.823	0.354	0.812
Israel	63.96	0.734	0.624	0.477	1.000	0.707
Austria	63.82	0.642	0.914	0.674	0.545	0.687
Norway	63.72	0.789	0.563	1.000	0.486	1.000
Germany	57.79	0.488	0.637	0.715	0.377	0.861
France	56.85	0.363	0.537	0.809	0.638	0.676
Saudi Arabia	56.80	0.717	0.981	0.468	1.000	0.476
United Arab Emirates	56.63	0.529	0.550	0.303	1.000	1.000
Slovenia	56.53	0.416	1.000	0.915	0.339	0.523
Poland	55.40	0.583	0.809	0.540	0.502	0.544
Taiwan	53.20	0.373	0.525	0.577	0.689	0.595

*Pillar values are the normalized pillar scores and after the average pillar correction.

The benchmark individuals are those who can (1) recognize valuable business opportunities, (2) have the necessary skills to exploit these opportunities, (3) attach high status to and respect entrepreneurs, (4) handle startup risk, and (5) know entrepreneurs personally (i.e., have a network or role models). Moreover, these people can provide the cultural support, financial resources, and networking potential to those who are already entrepreneurs or want to start a business. The United States leads in the Attitudes sub index, followed by Netherlands, Canada, Iceland, Finland, Australia, the United Kingdom, Switzerland, and Hong Kong. Japan (not amongst the best 25) has low attitudes toward entrepreneurship as families do not encourage entrepreneurship for young people. Chile's 13th place is a very strong showing for a South American country. Factor-driven African and Asian countries, including Sierra Leone, Mozambique, Pakistan, Malawi, Cambodia, Burundi, Madagascar, and Chad are at the bottom.

Entrepreneurial Abilities

High entrepreneurial abilities are associated with startups in the medium- or high-technology sectors that are initiated by educated entrepreneurs and launched because of opportunity motivation in a not too competitive environment. Quality differences in startups are quantified by the motivation and education level of the entrepreneur, and by the uniqueness of the product or service, as measured by the level of competition.

Denmark ranks number one on the Entrepreneurial Abilities sub-index and has a very strong showing in all four abilities related pillars. The US ranks second and is relatively weak in Opportunity Startup. Switzerland is stronger than the U.S. in one pillar, Opportunity Startups but weak in Technology Absorption and in Human Capital. Canada ranks fourth, with a significantly lower Entrepreneurial Abilities score than Denmark, the United States and Switzerland. The United Kingdom is strong in Technology Absorption, but low on Human Capital. The first five countries are followed by Australia, Ireland, Sweden, the Netherlands and Iceland.

Table 3.4. Entrepreneurial Abilities Sub-Index and Pillar Values for the First 25 Countries, 2019*

Countries	ABT	Opportunity Startup	Technology Absorption	Human Capital	Competition
Denmark	90.14	1.000	1.000	1.000	0.999
United States	89.67	0.850	0.948	1.000	1.000
Switzerland	85.63	0.908	0.821	0.886	0.997
Canada	83.77	0.929	0.900	0.988	0.754
United Kingdom	82.63	0.894	1.000	0.746	0.821
Australia	80.08	0.891	1.000	0.997	0.613
Ireland	79.13	0.975	0.891	0.922	0.930
Sweden	77.05	1.000	1.000	0.639	0.842
Netherlands	74.45	0.971	0.988	0.451	0.887
Iceland	71.04	1.000	1.000	0.502	0.553
Germany	68.21	0.808	0.820	0.566	0.793
Belgium	67.43	0.591	0.829	0.764	0.817
France	66.78	0.679	0.841	0.678	0.718
Austria	65.09	0.887	0.923	0.362	0.745
Luxembourg	65.04	0.989	0.965	0.601	0.872
Hong Kong	64.66	0.801	0.604	0.936	0.430
Finland	64.59	1.000	0.822	0.461	0.481
Israel	62.58	0.616	1.000	0.864	0.345
Japan	61.43	0.729	0.737	0.938	0.704
Norway	60.73	1.000	0.733	0.449	0.680
Singapore	58.14	1.000	0.727	1.000	0.630
Taiwan	58.02	0.605	0.749	0.727	0.382
Slovenia	57.64	0.559	1.000	0.520	0.478
Puerto Rico	56.01	0.638	0.302	1.000	0.719
Chile	53.33	0.591	0.582	0.615	0.466

*Pillar values are the normalized pillar scores and after the average pillar correction.

Entrepreneurial Aspirations

Entrepreneurial aspiration is the early-stage entrepreneur's effort to introduce new products and/or services, develop new production processes, penetrate foreign markets, substantially increase the firm's staff, and finance a business with formal and/or informal venture capital. In other words, the effort to start new companies that will generate wealth and can be scaled. Product and process innovation, internationalization, and high growth are considered characteristics of entrepreneurship. The benchmark entrepreneurs are those whose businesses (1) produce and sell products/services considered to be new to at least some customers, (2) use a technology less than five years old, (3) have sales in foreign markets, (4) plan to employ at least ten people, and (5) have greater than 50 percent growth over the next five years. The Finance variable captures the informal venture capital potential, as well as the development capital, venture capital, and credit markets, which are vital for innovative startups and high-growth firms.

Switzerland leads Entrepreneurial Aspirations sub-index. While showing some weakness in Product Innovation, it is very strong in Process Innovation and High Growth. By surprise, the US weakest aspiration related pillar is Risk Capital due to weaknesses in informal finance. The two strong leaders are followed by much weaker performance nations,

Canada, France, Israel, The United Kingdom, Taiwan, Germany, Denmark, and Finland which round out the top ten. Netherlands, performing second and ninth in Entrepreneurial Attitudes and Entrepreneurial Abilities, respectively, is only 22nd in Entrepreneurial Aspirations. On the contrary, developed Asian countries, Taiwan, Hong Kong, Singapore and South Korea show much better performance in aspiration related pillars then in any other two sub-indices.

Table 3.5. Entrepreneurial Aspirations Sub-Index and Pillar Values for the First 25 Countries, 2019*

Countries	ASP	Product Innovation	Process Innovation	High Growth	Internationalization	Risk Capital
Switzerland	88.61	0.752	1.000	0.988	1.000	1.000
United States	87.22	0.876	0.934	1.000	1.000	0.778
Canada	79.40	0.943	0.837	0.551	0.879	1.000
France	77.66	1.000	1.000	0.777	1.000	0.743
Israel	77.22	1.000	1.000	0.682	0.972	0.895
United Kingdom	76.34	0.679	0.670	0.894	1.000	0.707
Taiwan	75.01	1.000	0.806	0.987	0.528	1.000
Germany	74.02	0.597	0.833	0.859	1.000	0.900
Denmark	72.34	0.986	0.704	0.618	0.521	1.000
Finland	71.37	0.854	0.764	0.699	1.000	0.510
Hong Kong	70.49	0.689	0.431	1.000	0.753	1.000
Iceland	70.05	0.693	0.792	0.704	0.923	0.544
Belgium	69.40	0.804	0.941	0.572	1.000	0.631
Ireland	69.00	0.792	0.624	0.811	1.000	0.636
Japan	67.14	0.779	1.000	0.960	1.000	0.722
China	66.65	1.000	0.790	0.837	0.422	0.964
Sweden	66.52	0.705	0.858	0.407	1.000	0.660
Austria	65.71	0.803	0.812	0.410	1.000	0.633
Australia	65.21	0.490	0.668	0.662	0.584	1.000
Luxembourg	63.71	1.000	0.616	0.638	0.996	0.915
Singapore	60.48	0.634	1.000	1.000	1.000	0.815
Netherlands	60.28	0.614	0.667	0.523	0.693	0.590
South Korea	60.10	0.600	1.000	0.507	0.542	0.692
Qatar	59.39	0.837	0.548	1.000	0.576	0.731
Italy	57.00	0.838	0.667	0.335	0.883	0.598

*Pillar values are the normalized pillar scores after the average pillar correction.

Summaries and Conclusion

Entrepreneurship is similar to other social creatures, in that it is a multidimensional phenomenon whose exact meaning is difficult to identify. There is only one thing more difficult: how to measure this vaguely defined creature. Over the decades, researchers have created several entrepreneurship indicators, but none has been able to reflect the complex nature of entrepreneurship and provide a plausible explanation of its role in development. The Global Entrepreneurship Index is the first, and presently the only, complex measure of the national-level entrepreneurship ecosystem that reflects the multifaceted nature of entrepreneurship. In this chapter, we presented the entrepreneurial performance of 137 of the world's countries, which included country-level values for the GEI—entrepreneurial attitudes, entrepreneurial abilities, and entrepreneurial aspirations—and for the 14 pillars.

Chapter 4: Methodology and Data Description

Introduction

In previous GEI publications, we have described the Global Entrepreneurship Index methodology in detail.³⁴ Here we describe the structure of the dataset, and a short summary of the GEI methodology.

The Structure of the Index

We have defined country-level entrepreneurship as “the dynamic, institutionally embedded interaction between entrepreneurial attitudes, entrepreneurial abilities, and entrepreneurial aspirations by individuals, which drives the allocation of resources through the creation and operation of new ventures.”³⁵ According to this definition, we propose five-level index building: (1) indicators (2) variables, (3) pillars, (4) sub-indices, and, finally, (5) the super-index. All three sub-indices contain several pillars, which can be interpreted as the quasi-independent building blocks of this entrepreneurship index. Note that some variables are complex creatures themselves (e.g. Depth of Capital Market) some contain two indicators (e.g. Freedom, Education, Informal investment). We consider the pillar level as the most important constituent of GEI.

Table 4.1: The structure of the new Global Entrepreneurship Index (GEI)*

GLOBAL ENTREPRENEURSHIP INDEX	Sub-indexes	Pillars	Variables (ind./inst.)
	ATTITUDES SUB-INDEX	OPPORTUNITY PERCEPTION	OPPORTUNITY RECOGNITION
			FREEDOM (ECONOMIC FREEDOM *PROPERTY RIGHTS)
		STARTUP SKILLS	SKILL PERCEPTION
			EDUCATION (TERTIARY EDUCATION*QUALITY OF EDUCATION)
		RISK ACCEPTANCE	RISK PERCEPTION
			COUNTRY RISK
		NETWORKING	KNOW ENTREPRENEURS
			AGGLOMERATION (URBANIZATION*INFRASTRUCTURE)
		CULTURAL SUPPORT	CAREER STATUS
			CORRUPTION
	ABILITIES SUB-INDEX	OPPORTUNITY STARTUP	OPPORTUNITY MOTIVATION
			GOVERNANCE (TAXATION*GOOD GOVERNANCE)
		TECHNOLOGY ABSORPTION	TECHNOLOGY LEVEL
			TECHNOLOGY ABSORPTION
		HUMAN CAPITAL	EDUCATIONAL LEVEL
			LABOR MARKET (STAFF TRAINING*LABOUR FREEDOM)
	ASPIRATION SUB-INDEX	PRODUCT INNOVATION	COMPETITORS
			COMPETITIVENESS (MARKET DOMINANCE*REGULATION)
		PROCESS INNOVATION	NEW PRODUCT
			TECH TRANSFER
		HIGH GROWTH	NEW TECHNOLOGY
			SCIENCE (GERD*((AVERAGEQUALITY OF SCIENTIFICAL INSTITUTIONS +AVAILABILITY OF SCIENTISTS AND ENGINEERS))
		INTERNATIONALIZATION	GAZELLE
			FINANCE AND STRATEGY (VENTURE CAPITAL*BUSINESS SOPHISTICATION)
			EXPORT

			ECONOMIC COMPLEXITY
		RISK CAPITAL	INFORMAL INVESTMENT
			DEPTH OF CAPITAL MARKET

*Individual variables are colored with white background while institutional ones with light blue background.

In this section, we describe the sub-indices and pillars. In the following section, we describe the variables and the indicators. The three sub-indices of Attitudes, Abilities, and Aspirations constitute the entrepreneurship super-index, which we call the Global Entrepreneurship Index. While in chapter 2 we have provided a detailed portrayal of the GEI index components here we focus on the measurement of the particular variables and pillars. The structure of the index is in **Table 4.1**.

Entrepreneurial attitudes reflect the people's attitudes toward entrepreneurship. It involves opportunity recognition, startup skills, risk perception, networking, and cultural supports of entrepreneurs. Institutional embedding's 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, the level of competition and digital startup capabilities. These individual factors coincide with the proper institutional factors of taxation and the efficiency of government operation (Governance), 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 (Regulation).

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.

Table 4.2 provides a short description and interpretation of the pillars we apply.

Table 4.2: The description of the GEI index pillars

Pillar name	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 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

By applying the Penalty for Bottleneck approach, the GEI methodology captures the notion that systems, by definition, comprise multiple components, and that these components co-produce system performance. These are defining characteristics of any system, which simple summative indices fail to capture. In a simple summative index, each system component contributes directly and independently to system performance. In the context of entrepreneurship, this would mean, for example, that a national measure of education would, directly and independent of other system components, contribute to "national entrepreneurship," while in reality we know that education cannot contribute much to a country's entrepreneurial performance if individuals fail to act. On the other hand, if

education were absent, the economic potential of entrepreneurial entries would be severely constrained. Moreover, even if both education and agency were present, country-level entrepreneurial performance would be constrained if, for example, growth aspirations were missing or if there were no financial resources available to feed the growth of new ventures. A simple summative index would fail to recognize such interactions, thereby ignoring crucial aspects of system-level performance.

The Individual Variables, Indicators and Dataset

As mentioned previously, an entrepreneurship index should incorporate both individual-level and institutional/environmental variables. All individual-level variables are from the GEM survey. The institutional variables are obtained from various sources. The full list and description of the applied GEM individual variables can be seen in **Table 4.3**.

Table 4.3. The Description of the Individual Variables Used in the GEI

Individual variables/indicators*	Description
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 Perception	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
Career*	The percentage of the 18-64 aged population saying that people consider starting business as good career 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 Career and Status
Opportunity Motivation	Percentage of the TEA businesses initiated because of opportunity startup 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 Technology	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	The mean amount of 3-year informal investment

Individual variables/indicators*	Description
Investment Mean*	
Business Angel*	The percentage of the population aged 18-64 who provided funds for new business in past 3 years, excluding stocks and funds, average
Informal Investment	The amount of informal investment calculated as Informal investment mean x Business Angel

In most cases the indicators are also used as variables with two exceptions, namely Informal Investment and Carrier Status.

Since we have access to the full GEM individual data only for the period 2006-2016, we employed a different technique for getting the 2017 data. Out of the fourteen individual variables, we have access to six variables: Opportunity Perception, Skill Perception, Risk Perception, Carrier Status, Opportunity Motivation, New Product for all the countries participated in the GEM 2017 survey.¹ For Canada, Lebanon, Netherlands, Saudi Arabia, South Korea, and the United Arab Emirates we accessed information for an additional set of six variables from the GEM United Arab Emirates report.² These variables are the followings: Education level, Competitors, New Technology, Gazelle, Export, Informal investment mean. Therefore, for these countries only two variables are missing (i.e., the Know Entrepreneurs and Technology level). For Hungary we have GEM based survey variables but data harmonization was done by the Regional Innovation and Entrepreneurship Center (RIERC) in the Faculty of Business and Economics, University of Pecs. For the remaining 48 countries, we estimated the missing eight variables for the year 2017 as the average of the three previous periods or less, depending on data availability.

For the computation of the individual variables we included 350,037 observations from 103 countries of the GEM Adult Population Survey. Out of the 103 countries, 64 countries have individual data for the period 2016-2017, while 39 countries have individual data for the pre-2016 period. Based on the GEM Adult Population Survey data, we used information for neighboring and similar countries to estimate the fourteen individual variables for 34 countries. It is important to note that any estimation involves a potential of higher error term as compared to those countries that participated in the regular GEM survey. Therefore, the pillar scores, the sub-indices and the GEI scores based on estimated individual data should be taken with a grain of salt.

Since the availability of the institutional data also limited the selection of countries, we could include only those nations that participated in the World Economic Forum 2016-2017 or 2017-2018 Global Competitiveness Report (GCR) survey. Some GCR countries were left out because of the lack of similar or nearby GEM countries. The size of the sample in the different years as well as the number of participating countries and the calculation of the individual variables, including the 34 non-GEM countries, are reported in **Table 4.4**. For countries whose data are only available until 2016, the analyses and estimations should be read with caution and cannot be used for any policy suggestions. This is particularly true for countries with fully estimated individual data.³⁶ In fact, even GEM survey backed

1 See Singer, S., Herrington, M., & Menipaz, E. (2018). Global Report 2017/18. Global Entrepreneurship Research Association

2 Chabrak, N. ; C. Bouhaddioui, E. Bascavusoglu-Moreau, L. D. W. Thomas (2018) Annual report, GEM United Arab Emirates 2017/18, United Arab Emirates University

calculated variables and pillars are only the starting point of a detailed GEI based policy analysis.³⁷

Table 4.4. The Distribution of the Sample by Countries and the Calculation of the Individual Variables

Country/year	2010	2011	2012	2013	2014	2015	2016	2017	Individual variable method of calculation
Albania									Average of Macedonia 2016 and Bosnia 2017
Algeria				2497					2013
Angola				2049	2028				Average of 2013-2014
Argentina							1679	partial estimation	Average of 2016-2017
Armenia									Average of Georgia 2016 and Russia 2016
Australia							1593	partial estimation	Average of 2016-2017
Austria					4554		4581		Average of 2014-2016
Azerbaijan									Average of Georgia 2016 and Turkey 2016
Bahrain									Same as Qatar 2016-2017
Bangladesh		1932							2011
Barbados					2000	2000			Average of 2014-2015
Belgium					2004	2022			Average of 2014-2015
Belize					2012		2267		Average of 2014 and 2016
Benin					2000				2014
Bolivia					2590				2014
Bosnia and Herzegovina								partial estimation	Average of 2014-2017
Botswana					2146	2200			Average of 2014-2015
Brazil							2000	partial estimation	Average of 2016-2017
Brunei Darussalam									Average of Malaysia 2017 and Singapore 2014
Bulgaria							2000	partial estimation	Average of 2016-2017
Burkina Faso						2325	2325		Average of 2015-2016
Burundi									Average of Burkina Faso and Cameroon 2016
Cambodia									Average of Thailand 2016 and Vietnam 2015
Cameroon						2397	2413		Average of 2015-2016
Canada							1767	partial estimation	Average of 2016-2017
Chad									Average of Burkina Faso

				and Cameroon 2016
Chile		7961	partial estimation	Average of 2016-2017
China		3513	partial estimation	Average of 2016-2017
Colombia		2069	partial estimation	Average of 2016-2017
Costa Rica	2057			2014
Côte d'Ivoire				Average of Burkina Faso and Cameroon 2016
Croatia		2000	partial estimation	Average of 2016-2017
Cyprus		2000	partial estimation	Average of 2016-2017
Czech Republic	5009			2013
Denmark	2008			2014
Dominican Republic	2007*			2009
Ecuador		1841		2016, partial 2017
Egypt	2501	2528	partial estimation	Average of 2016-2017
El Salvador	2014	1753		Average of 2014 and 2016
Estonia		1993	partial estimation	Average of 2016-2017
Ethiopia	3003			2012
Finland	2007	2018		Average of 2015-2016
France		1541	partial estimation	Average of 2016-2017
Gabon				Average of Namibia 2014 and Botswana 2015
Gambia, The				Average of Burkina Faso and Cameroon 2016
Georgia	1648	1579		Average of 2014 and 2016
Germany		3944	partial estimation	Average of 2016-2017
Ghana	2100			2013
Greece		2000	partial estimation	Average of 2016-2017
Guatemala		2219	partial estimation	Average of 2016-2017

Guinea				Average of Burkina Faso and Cameroon 2016
Guyana				Same as Suriname 2014
Honduras				Average of Guatemala and Panama
Hong Kong		1783		2016
Hungary		2011	2000	Average of 2016-2017
Iceland	1684			2010
India		3400	partial estimation	Average of 2016-2017
Indonesia		3464	partial estimation	Average of 2016-2017
Iran		3295	partial estimation	Average of 2016-2017
Ireland		2004	partial estimation	Average of 2016-2017
Israel		2516	partial estimation	Average of 2016-2017
Italy		2045	partial estimation	Average of 2016-2017
Jamaica	2637	2020		Average of 2014 and 2016
Japan	2006			2014, partial 2017
Jordan		1830		2016
Kazakhstan		2086	partial estimation	Average of 2016-2017
Kenya				Average of Burkina Faso and Cameroon 2016
South Korea		2000	partial estimation	Average of 2016-2017
Kuwait				Same as Qatar
Kyrgyz Republic				Average of Kazakhstan and Russia 2016
Lao PDR				Average of Thailand and Vietnam
Latvia		1625	partial estimation	Average of 2016-2017
Lebanon		2600		2016, partial 2017
Liberia				Average of Burkina Faso and Cameroon 2016
Libya	2246			2013
Lithuania	2000	2000		Average of 2013-2014
Luxembourg		2024	partial estimation	Average of 2016-2017

Macedonia	1998	1991		Average of 2015-2016
Madagascar				Average of Burkina Faso 2016 and Angola 2014, partial 2017
Malawi	2094			2013
Malaysia		2005	partial estimation	Average of 2016-2017
Mali				Average of Burkina Faso and Cameroon 2016
Mauritania				Average of Burkina Faso and Cameroon 2016
Mexico		5111	partial estimation	Average of 2016-2017
Moldova				Average of Romania 2015 and Russia 2016
Montenegro	2000			2010
Morocco		2005	partial estimation	Average of 2016-2017
Mozambique				Average of Burkina Faso and Cameroon 2016
Myanmar				Average of Thailand and Vietnam
Namibia	1938			2013
Netherlands		1768	partial estimation	Average of 2016-2017
Nicaragua				Average of Guatemala and Panama
Nigeria	2604			2013
Norway	2000	2000		Average of 2014-2015
Oman				Same as Qatar
Pakistan	2000			2012
Panama		2015	partial estimation	Average of 2016-2017
Paraguay				Average of Ecuador and Peru
Peru		2080	partial estimation	Average of 2016-2017
Philippines	2000	2000		Average of 2014-2015
Poland		1623	partial estimation	Average of 2016-2017
Portugal		2005	2003	Average of 2015-2016
Puerto Rico		1998	partial estimation	Average of 2016-2017
Qatar		2980	partial	Average of 2016-2017

			estimation	
Romania	1998	2002		Average of 2014-2015
Russia	2001	2007		Average of 2014 and 2016
Rwanda				Average of Burkina Faso and Cameroon 2016
Saudi Arabia		4049	partial estimation	Average of 2016-2017
Senegal		2363		2015
Serbia	1766*			2009
Sierra Leone				Average of Burkina Faso and Cameroon 2016
Singapore	1998	2004		Average of 2013-2014
Slovakia		2000	partial estimation	Average of 2016-2017
Slovenia		1621	partial estimation	Average of 2016-2017
South Africa		2862	partial estimation	Average of 2016-2017
Spain		22000	partial estimation	Average of 2016-2017
Sri Lanka				Same as India
Suriname	2074	2006		Average of 2013-2014
Swaziland				Average of Namibia 2014 and Botswana 2015
Sweden		3663	partial estimation	Average of 2016-2017
Switzerland		2834	partial estimation	Average of 2016-2017
Taiwan		2000	partial estimation	Average of 2016-2017
Tajikistan				Average of Kazakhstan and Russia 2016
Tanzania				Average of Burkina Faso and Cameroon 2016
Thailand		2693	partial estimation	Average of 2016-2017
Trinidad and Tobago	1787	1769		Average of 2013-2014
Tunisia		1946		2015
Turkey	32945	2411		Average of 2013 and 2016

Uganda	251 3	2112		Average of 2013-2014
Ukraine				Average of Romania 2015 and Russia 2016
United Arab Emirates		2011	partial estimation	Average of 2016-2017
United Kingdom		8224	partial estimation	Average of 2016-2017
United States		2573	partial estimation	Average of 2016-2017
Uruguay		1615	partial estimation	Average of 2016-2017
Venezuela	188 8			2011
Vietnam		2000		2015, partial 2017
Zambia	209 9			2013

*Data are from 2009

The Institutional Indicators, Variables and Dataset

Since the GEM lacks the necessary institutional indicators, we complement individual indicators and variables with other widely used relevant data from Transparency International (Corruption Perception Index), UNESCO (tertiary education enrollment, GERD), World Economic Forum (infrastructure, regulation, scientific institutions, availability of scientists, business sophistication, technology absorption and technology transfer capability, staff training, market dominance, venture capital), United Nations (urbanization), The Heritage Foundation and World Bank (economic freedom, property rights, labor freedom), the World Bank (taxation, good governance), the Observatory of Economic Complexity (economic complexity), OECD (country risk), and the Venture Capital & Private Equity Country Attractiveness Index (depth of capital market³⁸).

In this version, we apply the most recent institutional indicators and variables available on June 31, 2018. The full description of the institutional indicators and variables and their sources can be found in **Table 4.5**.

Table 4.5. The Description and Source of the Institutional Indicators and Variables Used in the GEI

Institutional Variable/inicator*	Description	Source of Data	Data Availability
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 Doing Business study”. (http://www.heritage.org/Index/pdf/Index09_Methodology.pdf). Data are collected from 2016.	Heritage Foundation /World Bank	http://www.heritage.org/index/explore.aspx
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.” (http://www.heritage.org/index/property-rights)	Heritage Foundation /World Bank	http://www.heritage.org/index/explore.aspx
Freedom and Property	Economic Freedom x Property Rights	Own calculation	
Tertiary Education*	Gross enrolment ratio in tertiary education, 2016 or latest available data.	World Bank	http://data.worldbank.org/indicator/SE.TER.ENR
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]”	World Economic Forum	The Global Competitiveness Index Historical Dataset, 2007-2017 World Economic Forum, Version 20180226
Education	Tertiary Education x 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	OECD	http://www.oecd.org/trade/xcred/cre-crc-historical-internet-english.pdf

Institutional Variable/indicator*	Description	Source of Data	Data Availability
	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). 2017.		
Urbanization *	Urbanization that is the percentage of the population living in urban areas, data are from the Population Division of the United Nations, 2016 or latest available data	United Nations	http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS
Infrastructure*	Pillar 2, Infrastructure in the World Competitiveness Report: "Extensive and efficient infrastructure is critical for ensuring the effective functioning of the economy."	World Economic Forum	The Global Competitiveness Index Historical Dataset, 2007-2017 World Economic Forum, Version 20180226
Connectivity	Urbanization x 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." (http://www.transparency.org/policy_research/surveys_indices/cpi/2009) Overall performance is measured on a ten point Likert scale. Data are collected over the last 24 months.	Transparency International	https://www.transparency.org/news/feature/corruption_perceptions_index_2016#table
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." (http://www.doingbusiness.org/data/exploretopics/paying-taxes)	World Bank	http://www.doingbusiness.org/data/distance-to-frontier
Good Governance *	The effectiveness of the government "the capacity of the government to effectively formulate and implement sound policies" (http://info.worldbank.org/governance/wgi/#home)	World Bank	http://qog.pol.gu.se/data/datadownloads/qogbasicdata
Taxgovern	Measures the effectiveness of using the taxes by combining together the level of the tax by the quality of government services, Taxation x Good Governance	Own calculation	
Tech Absorption	Firm level technology absorption capability: "In your country, to what extent do businesses adopt the latest technologies? [1 = not at all; 7 = to a great extent])".	World Economic Forum	The Global Competitiveness Index Historical Dataset, 2007-2017 World Economic Forum, Version 20180226
Labor	Measures the freedom of the labor as "(...) that considers various aspects	Heritage	http://www.heritage.org/

Institutional Variable/inicator*	Description	Source of Data	Data Availability
Freedom*	of the legal and regulatory framework of a country's labor market, including regulations concerning minimum wages, laws inhibiting layoffs, severance requirements, and measurable regulatory restraints on hiring and hours worked." (http://www.heritage.org/index/labor-freedom)	Foundation	index/download
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 Index Historical Dataset, 2007-2017 World Economic Forum, Version 20180226
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 Index Historical Dataset, 2007-2017 World Economic Forum, Version 20180226
Market Dominance*	Extent of market dominance: "In your country, how do you characterize corporate activity? [1 = dominated by a few business groups; 7 = spread among many firms] ".	World Economic Forum	The Global Competitiveness Index Historical Dataset, 2007-2017 World Economic Forum, Version 20180226
Compregulation	Regulation x 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 and the collaboration in research between universities and industry, and the protection of intellectual property.	World Economic Forum	The Global Competitiveness Index Historical Dataset, 2007-2017 World Economic Forum, Version 20180226
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	http://data.uis.unesco.org/?ReportId=2656
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 =	World Economic Forum	The Global Competitiveness Index Historical Dataset,

Institutional Variable/in dicator*	Description	Source of Data	Data Availability
	extremely good – among the best in the world] “		2007-2017 World Economic Forum, Version 20180226
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 Index Historical Dataset, 2007-2017 World Economic Forum, Version 20180226
Science	GERD x 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 Index Historical Dataset, 2007-2017 World Economic Forum, Version 20180226
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 Index Historical Dataset, 2007-2017 World Economic Forum, Version 20180226
Finance and Strategy	Venture Capital x 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.” (http://atlas.media.mit.edu/en/resources/economic_complexity/)	Observatory of Economic Complexity	http://atlas.media.mit.edu/en/rankings/country/eci/
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	http://blog.iese.edu/vcp_eindex/

Institution al Variable/in dicator*	Description	Source of Data	Data Availability
		School, Barcelona, Spain	

**Special thanks to Alexander Groh and his team for providing the Depth of Capital Market data.

Missing Variables and Data Imputations

Since our basic individual data are provided by the GEM, participation in the GEM survey determines the potential list of countries and sample size. However, there is another potential limitation, the availability of institutional data. Because seven out of our fourteen institutional variables are from the GCI, it is particularly important to have these variables. From previous years, we had to cancel out Tonga, Vanuatu, the West Bank and Gaza Strip, Yemen, and Syria because of the lack of proper institutional variables.³⁹

A few variables are missing for some countries. Since we did not want to drop any more countries from the sample, we estimated the missing data using expert techniques, as follows: the GERD measure lacked data for Angola, Bangladesh, Belize, Benin, Cameroon, Chad, Côte d'Ivoire, Guinea, Libya, Malawi, Mauritania, Namibia, Oman, Qatar, Rwanda, Sierra Leone, Suriname, Swaziland, Tanzania, and Venezuela. In these cases, other government sources and data from similar nearby countries provided adequate estimates. Economic complexity data for Armenia, Azerbaijan, Brunei Darussalam, Guinea, Kyrgyz Republic, Montenegro, Myanmar, Swaziland, and Tajikistan are estimated similarly to the GERD, by applying nearby country data points. Puerto Rico's business freedom dataset is the same as the US. All the other data are available for all countries; therefore, we believe that these rough estimates do not influence our results noticeably.⁴⁰

Calculating the Scores

The GEI scores for all the countries are calculated according to the following nine points.

1. **The selection of indicators:** We start with the indicators that come directly from the original sources for each country involved in the analysis. The indicators can be at the individual level (personal or business) that are coming from the GEM Adult Population Survey, or the institutional/environmental level that are coming from various other sources. Altogether we use 16 individual and 20 institutional indicators.
2. **The calculation of variables:** Most cases the indicators are also used as variables. However, two cases in the individual variables and eight cases in the institutional variables contain two or three indicators. The calculation of these variables is the followings

$$Carrier\ Status_{i,l} = Carrier_{i,l} * Status_{i,l} \quad (1a)$$

for all $l = 1, 2$ the number individual indicators
 $i = 1 \dots k$, the number of countries

$$Informal\ Investment\ Mean_{i,l} = Business\ Angel_{i,l} * Informal\ Investment_{i,l} \quad (1b)$$

for all $l = 1, 2$ the number individual indicators
 $i = 1 \dots k$, the number of countries

$$Freedom \wedge Property_{i,l} = Economic\ Freedom_{i,l} * Property\ Rights_{i,l} \quad (1c)$$

for all $l = 1, 2$ the number individual indicators
 $i = 1 \dots k$, the number of countries

$$Education_{i,l} = Tertiary\ Education_{i,l} * Quality\ of\ Education_{i,l} \quad (1d)$$

for all $l = 1, 2$ the number individual indicators
 $i = 1 \dots k$, the number of countries

$$Connectivity_{i,l} = Urbanization_{i,l} * Infra\ structure_{i,l} \quad (1e)$$

for all $l = 1, 2$ the number individual indicators
 $i = 1 \dots k$, the number of countries

$$Taxgovern_{i,l} = Taxation_{i,l} * Good\ Governance_{i,l} \quad (1f)$$

for all $l = 1, 2$ the number individual indicators
 $i = 1 \dots k$, the number of countries

$$Labor\ Marekt_{i,l} = Labor\ Freedom_{i,l} * Staff\ Training_{i,l} \quad (1g)$$

for all $l = 1, 2$ the number individual indicators
 $i = 1 \dots k$, the number of countries

$$Compregulation_{i,l} = Regulation_{i,l} * Market\ Dominance_{i,l} \quad (1h)$$

for all $l = 1, 2$ the number individual indicators
 $i = 1 \dots k$, the number of countries

$$Science_{i,l} = Gerd_{i,l} * Scientific\ Inst\ itutions_{i,l} * Availability\ of\ Scientists_{i,l} \quad (1i)$$

for all $l = 1, 2, 3$ the number individual indicators
 $i = 1 \dots k$, the number of countries

$$Finance \wedge Strategy_{i,l} = Venture\ Capital_{i,l} * Busienss\ Strategy_{i,l} \quad (1j)$$

for all $l = 1, 2$ the number individual indicators
 $i = 1 \dots k$, the number of countries

3. **The construction of the pillars:** We calculate all pillars from the variables using the interaction variable method; that is, by multiplying the individual variable with the proper institutional variable.

$$z_{i,j} = IND_{i,j} * INS_{i,j} \quad (2)$$

for all $j = 1 \dots p$, the number of individual, institutional variables and pillars

$IND_{i,j}$ is the original score value for country i and variable j individual variable

$INS_{i,j}$ is the original score value for country i and variable j institutional variable

$z_{i,j}$ is the calculated pillar value for country i and pillar j

4. **Normalization:** Pillar values were first normalized to a range from 0 to 1, according to equation 2:

$$x_{i,j} = \frac{z_{i,j}}{\max z_{i,j}} \quad (3)$$

for all $j = 1 \dots p$, the number of pillars
 where $x_{i,j}$ is the normalized score value for country i and pillar j
 $\max z_{i,j}$ is the maximum value for pillar j

5. **Capping:** All index building is based on a benchmarking principle. We selected the 95th percentile score adjustment, meaning that any observed values higher than the 95th percentile are lowered to the 95th percentile. For the 137 countries in our dataset, we use the benchmarks values from the full dataset, which contains all the 675 observations made over the 2006-2017 time period.
6. **Average pillar adjustment:** The different averages of the normalized values of the indicators imply that reaching the same indicator values requires different effort and resources. Since we want to apply the GEI for public policy purposes, the additional resources for the same marginal improvement of the indicator values should be the same for all indicators. Therefore, we need a transformation to equalize the average values of the components. Equation 3 shows the calculation of the average value of pillar j :

$$\acute{x}_j = \frac{\sum_{i=1}^n x_{i,j}}{n} \text{ for all } j \quad (4)$$

We want to transform the $x_{i,j}$ values such that the potential minimum value is 0 and the maximum value is 1:

$$y_{i,j} = x_{i,j}^k \quad (5)$$

where k is the “strength of adjustment”, the k -th moment of x_j is exactly the needed average, \acute{y}_j

We have to find the root of the following equation for k :

$$\sum_{i=1}^n x_{i,j}^k - n \acute{y}_j = 0 \quad (6)$$

It is easy to see, based on previous conditions and derivatives, that the function is decreasing and convex, which means it can be solved quickly using the well-known Newton-Raphson method with an initial guess of 0. After obtaining k , the computations are straightforward. Note that if

$$\acute{x}_j < \acute{y}_j \quad k < 1$$

$$\acute{x}_j = \acute{y}_j \quad k = 1$$

$$\dot{x}_j > \dot{y}_j \quad k > 1$$

then k is thought of as the strength (and direction) of adjustment.

The adjusted pillar values are calculated for all the 2006-2017 time period; these values and this distribution are applied for the 137 countries in the GEI 2019 edition. It means that the average adjusted pillar values of the countries that participated in the 2017 GEM cycle are exactly same in the 2006-2017 dataset and in the 2019 GEI edition.

6. **Penalizing:** After these transformations, the PFB methodology was used to create indicator-adjusted PFB values. We define our penalty function as follows:

$$h_{(i),j} = \min y_{(i),j} + (1 - e^{-(y_{(i),j} - \min y_{(i),j})}) \quad (7)$$

where $h_{i,j}$ is the modified, post-penalty value of pillar j in country i

$y_{i,j}$ is the normalized value of index component j in country i

y_{\min} is the lowest value of $y_{i,j}$ for country i .

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

$j = 1, 2, \dots, p$ = the number of pillars

7. 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 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.

$$ATT_i = 100 \sum_{j=1}^5 \frac{h_j}{5} \quad (8a)$$

$$ABT_i = 100 \sum_{j=6}^9 \frac{h_j}{4} \quad (8b)$$

$$ASP_i = 100 \sum_{j=10}^{14} \frac{h_j}{5} \quad (8c)$$

where $h_{i,j}$ is the modified, post-penalty value of pillar j in country i

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

$j = 1, 2, \dots, p$ = the number of pillars

8. 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 the efficiency of the entrepreneurship resources

$$GEI_i = \frac{1}{3} (ATT_i + ABT_i + ASP_i) \quad (9)$$

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

Recently, we report not only the GEI scores but also the associated measurement error terms for those countries that have participated in the GEM survey (see Chapter 2). It is impossible to make an error calculation for the countries that have only estimated individual data. The report of the confidence intervals is important in two respects. First, when comparing different countries, we can see if the differences in the two countries' GEI scores are significant or not. Based on the 2019 GEI scores, the GEI scores of the first five countries—the United States, Switzerland, Canada, Denmark, and United Kingdom—do not differ significantly. However, the GEI score difference is significant between the US in first place and the Australia in sixth. Second, from year to year we can see if changes in the GEI scores are significant, or if they perhaps are due to measurement error.

The confidence interval calculation is based on the error terms of the Total Early-Phased Entrepreneurship Activity index, as reported by the GEM each year. An important note is that the real measurement error is unknown, since we use many data from different sources for which confidence intervals are not currently available. Keep in mind that the real measurement errors are higher than the values reported here.

The Underlying Structure of the Data (reflecting the 2006-2016 dataset)

While the number of composite indicators has been increasing over the last few decades, some index creators pay little attention to the interrelationship between the different variables. Although the PFB methodology provides a practical solution for how to take this interrelationship into account, it does not save us from examining the underlying structure of the data. It is particularly important to have a well-defined nested structure of the whole index. The arbitrary selection of the variables—in our case the pillars—would cause confusion, false interpretation, and, finally, a misleading policy interpretation. The OECD handbook of composite indicators recommends analyzing the dataset in two dimensions, pillars and countries.⁴¹ We have already provided detailed analyses at the country level; here we are presenting a pillar-level analysis by calculating the common (Pearson) correlation coefficients. Since we have only estimated data from 34 countries, it is better to examine not the 137 countries involved in our analysis but the full 2006-2016 dataset, with 620 data points excluding the estimated country data.

We report correlations between the normalized and average equalized pillars, shown in **Table 4.6**, and the correlations between the normalized indicators after applying the PFB methodology, shown in **Table 4.7**. In general, significant and medium to high correlations exist between the pillars in both cases. The lowest correlation is between Networking and Internationalization (0.283) and the highest is between Opportunity Perception and Cultural Support (0.831).

The PFB pillars, as can be expected, improved the correlation, implying a closer relationship between the entrepreneurial features. The positive connection between the entrepreneurship pillars is vital for proper policy interpretation and suggestions. If the connection between the pillars were negative, it would have implied that one pillar can only be improved at the cost of the other pillar. In this case, the improvement of the weakest pillar value would not necessary to improve the GEI value. This is not the case.

There are other ways to check out the consistency of the dataset and the potentially strong connection between the pillars. Both the Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity reinforce the fact that the 14 GEI pillars are closely correlated, and it is worth looking for a single complex measure.⁴² The most popular test of the internal consistency of the pillars is based on the Cronbach Coefficient Alpha (c-alpha). The c-alpha value for the 14 pillars is 0.95 with the original data, and 0.97 after

applying the PFB methodology; both are well above the critical 0.7 threshold value.⁴³ In sum, all of these tests support the internal consistency of the structure as described with the 14 selected pillars.

Table 4.6. The Correlation Matrix between the Normalized and Average Equalized Pillars (2006-2016 data)

[illegible]

Table 4.7. The Correlation Matrix between the Indicators, Sub-Indices, and the GEI Super-Index after Normalizing and Applying the PFB Method (2006-2016 data)

		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Opportunity Perception		.628**	.676* *	.869* *	.896* *	.801* *	.635* *	.597* *	.761* *	.785* *	.588* *	.560* *	.605* *	.538* *	.591* *	.658* *	.815* *
2	Startup Skills			.565* *	.671* *	.804* *	.679* *	.655* *	.557* *	.579* *	.696* *	.491* *	.575* *	.502* *	.575* *	.621* *	.635* *	.745* *
3	Risk Acceptance				.648* *	.780* *	.879* *	.830* *	.725* *	.674* *	.765* *	.842* *	.652* *	.763* *	.634* *	.662* *	.709* *	.784* *
4	Networking					.707* *	.816* *	.704* *	.568* *	.510* *	.616* *	.675* *	.628* *	.610* *	.540* *	.445* *	.603* *	.646* *
5	Cultural Support						.931* *	.864* *	.727* *	.642* *	.810* *	.856* *	.662* *	.692* *	.685* *	.644* *	.733* *	.781* *
6	ATTINDEX							.899* *	.770* *	.694* *	.819* *	.895* *	.698* *	.745* *	.688* *	.669* *	.756* *	.814* *
7	Opportunity Startup								.770* *	.736* *	.823* *	.936* *	.673* *	.781* *	.663* *	.713* *	.776* *	.827* *
8	Technology Absorption									.647* *	.702* *	.883* *	.638* *	.783* *	.690* *	.705* *	.746* *	.816* *
9	Human Capital										.664* *	.848* *	.600* *	.643* *	.718* *	.636* *	.707* *	.754* *
10	Competition											.893* *	.629* *	.718* *	.610* *	.657* *	.680* *	.755* *
11	ABTINDEX												.714* *	.824* *	.752* *	.763* *	.818* *	.887* *
12	Product Innovation													.719* *	.711* *	.599* *	.703* *	.850* *
13	Process Innovation														.672* *	.736* *	.771* *	.896* *
14	High Growth															.675* *	.724* *	.858* *
15	Internationalization																.740* *	.862* *

[illegible]

Summary

In this chapter, we have described the index-building methodology and the dataset. The GEI, a complex index reflecting the multidimensional nature of entrepreneurship, consists of three sub-indices, fourteen pillars, 28 variables and 36 indicators. Out of the 36 indicators, we calculated fourteen individual and fourteen institutional variables. While some researchers insist on simple entrepreneurship indicators, none of the previously applied measures was able to explain the role of entrepreneurship in economic development with a single indicator.

Our index-building logic differs from other widely applied indices in three respects: it incorporates both individual and institutional variables, it equalizes the 14 pillar values for equalizing the marginal effects, and it takes into account the weakest link in the system. The institutional variables can also be viewed as country-specific weighting factors. Moreover, institutional variables can balance out the potential inconsistency of the GEM data collection. The weakest link refers to the decreased performance effect of the bottleneck. Practically speaking, it means that the higher pillar values are adjusted to the weakest performing pillar value. While the exact measure of the penalty is unknown, meaning that the solution is not necessarily optimal, it still provides a better solution than calculating the simple arithmetic averages. Consequently, the newly developed PFB can be applied in cases where an imperfect substitutability exists among the variables and the efficiency of the system depends on the weakest performing variable. The method is particularly useful in making policy suggestions.

The GEM survey served as a source for the individual variables. However, we had to rely on some estimation techniques to get eight individual variables for 48 countries participating in the GEM 2017 survey. For six countries we estimated only two individual variables and for Hungary we have up-to-date data for all the fourteen variables. For 34 countries we only have data from previous years. Altogether, the sample includes 350,037 individuals from 103 countries. Individual data for 34 other countries are estimated by using similar or nearby country individual data, resulting in a sample size of 137 countries. Precaution is advised in any cases where estimated or pre 2014 GEM survey individual data are applied.

The availability of the institutional variables for all the countries has limited our selection possibilities. The proper interpretation of a particular institutional variable has been an important aspect of the selection. In this version of GEI we increased the number of institutional indicators to 20 that have resulted an improvement of the internal consistency of the dataset as well as provided a wider aspect of describing the national system of entrepreneurship. In all cases, we used the most recent institutional data available as of June, 31, 2018.

We summarized the index-building steps in nine points. Since these steps were described in full detail in the previous publications, we provided only a short description.⁴⁴

We have analyzed the underlying structure of the dataset in the variable level. The correlation coefficients, the Kaiser-Mayer-Olkin measures, and the Bartlett and c-alpha tests all suggested that the 14 pillars have a close relation to one another and that there is a place to construct a composite indicator. These tests were executed with the normalized original, as well as with the PFB adjusted variables. As expected, the PFB methodology improved the internal consistency of the dataset.

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Appendices

Table A.1: The Global Entrepreneurship Index and Sub-Index Ranks and scores of Countries, 2019

Countries	GEI	GEI rank	ATT	ATT rank	ABT	ABT rank	ASP	ASP rank
United States	86.8	1	1	89.7	2	87.2	2	83.5
Switzerland	82.2	2	9	85.6	3	88.6	1	72.2
Canada	80.4	3	3	83.8	4	79.4	3	78.0
Denmark	79.3	4	5	90.1	1	72.3	9	75.5
United Kingdom	77.5	5	8	82.6	5	76.3	6	73.5
Australia	73.1	6	7	80.1	6	65.2	19	74.1
Iceland	73.0	7	4	71.0	10	70.1	12	77.8
Netherlands	72.3	8	2	74.4	9	60.3	22	82.3
Ireland	71.3	9	15	79.1	7	69.0	14	65.6
Sweden	70.2	10	14	77.1	8	66.5	17	67.1
Finland	70.2	11	6	64.6	17	71.4	10	74.5
Israel	67.9	12	16	62.6	18	77.2	5	64.0
Hong Kong	67.9	13	10	64.7	16	70.5	11	68.4
France	67.1	14	20	66.8	13	77.7	4	56.8
Germany	66.7	15	19	68.2	11	74.0	8	57.8
Austria	64.9	16	17	65.1	14	65.7	18	63.8
Belgium	62.2	17	27	67.4	12	69.4	13	49.8
Taiwan	62.1	18	25	58.0	22	75.0	7	53.2
Chile	58.3	19	13	53.3	25	53.6	30	67.8
Luxembourg	58.1	20	32	65.0	15	63.7	20	45.6
Korea	58.1	21	12	46.3	36	60.1	23	67.8
Estonia	57.8	22	11	50.8	28	54.8	27	68.0
Slovenia	56.5	23	23	57.6	23	55.4	26	56.5
Norway	56.1	24	18	60.7	20	43.7	41	63.7
United Arab Emirates	54.2	25	22	51.7	27	54.1	28	56.6
Japan	53.3	26	65	61.4	19	67.1	15	31.4
Singapore	52.4	27	39	58.1	21	60.5	21	38.4
Qatar	51.6	28	33	52.4	26	59.4	24	43.0
Poland	49.5	29	24	47.2	33	45.9	38	55.4
Puerto Rico	48.7	30	28	56.0	24	41.9	42	48.3
Spain	46.9	31	26	50.8	29	38.1	50	51.8
Portugal	46.3	32	29	46.7	35	45.3	39	46.8
Hungary	46.2	33	48	48.7	31	53.8	29	36.1
China	45.9	34	43	34.2	47	66.6	16	36.8
Cyprus	45.6	35	30	49.3	30	41.1	43	46.3
Italy	45.1	36	41	40.5	40	57.0	25	37.9
Lithuania	44.1	37	49	46.9	34	49.8	35	35.5
Bahrain	43.8	38	44	47.6	32	47.4	37	36.5
Oman	43.6	39	52	42.4	39	53.2	31	35.2
Czech Republic	43.5	40	53	42.6	37	53.1	32	34.7
Slovakia	42.6	41	45	40.5	41	51.1	34	36.4
Saudi Arabia	42.1	42	21	29.8	61	39.6	46	56.8
Malaysia	40.1	43	34	39.2	44	39.5	47	41.5

Turkey	39.8	44	56	33.2	49	51.6	33	34.6
Latvia	39.3	45	40	42.5	38	37.3	51	38.2
Romania	38.6	46	54	33.7	48	47.6	36	34.7
Kuwait	37.4	47	61	38.0	45	41.0	44	33.3
Brunei Darussalam	36.5	48	50	39.4	43	34.9	54	35.2
Croatia	36.1	49	64	31.8	53	44.5	40	32.0
Greece	35.4	50	58	39.6	42	32.7	55	33.8
Botswana	34.4	51	31	32.0	52	25.4	72	45.6
Colombia	34.1	52	35	30.5	60	30.9	58	40.9
Tunisia	34.0	53	71	36.0	46	36.4	52	29.6
Thailand	33.5	54	74	31.8	54	39.9	45	28.8
Barbados	32.2	55	36	31.6	56	24.9	74	40.1
Azerbaijan	32.1	56	87	33.2	50	39.3	48	24.0
Montenegro	31.8	57	51	25.0	77	35.2	53	35.2
South Africa	31.6	58	81	29.3	62	39.2	49	26.3
Kazakhstan	31.0	59	59	31.0	58	28.3	63	33.6
Uruguay	30.1	60	38	31.1	57	20.4	90	38.7
Bulgaria	30.1	61	62	26.5	73	31.3	57	32.4
Namibia	30.0	62	57	26.7	71	29.2	60	34.1
Jordan	29.4	63	73	30.6	59	28.8	62	28.9
Iran	29.4	64	69	32.4	51	25.5	71	30.3
Costa Rica	28.8	65	37	23.3	85	24.0	77	39.1
Lebanon	28.8	66	68	24.3	81	31.8	56	30.3
Serbia	28.6	67	47	22.6	86	26.9	67	36.2
Morocco	28.3	68	70	27.0	68	28.2	64	29.7
Peru	27.7	69	42	25.1	75	20.6	89	37.4
Mexico	27.1	70	67	25.0	78	25.9	70	30.4
Georgia	26.2	71	79	29.2	63	22.3	83	27.2
Belize	26.2	72	97	28.9	64	27.7	65	22.0
Vietnam	26.0	73	89	27.0	69	27.1	66	23.9
Argentina	26.0	74	82	27.9	66	24.4	75	25.7
Indonesia	26.0	75	63	28.4	65	17.2	102	32.3
Panama	25.5	76	46	18.7	102	21.6	85	36.2
Ukraine	25.2	77	92	27.0	70	25.1	73	23.4
India	25.1	78	95	23.6	84	28.9	61	22.7
Jamaica	24.8	79	55	25.1	76	14.6	112	34.6
Russia	24.8	80	80	27.6	67	19.6	93	27.0
Egypt	24.6	81	115	26.6	72	30.5	59	16.8
Armenia	24.3	82	96	31.7	55	18.9	96	22.5
Gabon	23.8	83	90	20.9	91	26.7	68	23.6
Dominican Republic	23.6	84	60	15.9	112	21.2	87	33.6
Macedonia	23.1	85	83	20.3	94	24.1	76	25.0
Philippines	23.0	86	76	21.6	88	19.5	94	27.9
Albania	22.5	87	94	25.9	74	19.0	95	22.7
Algeria	22.4	88	66	19.8	98	16.2	105	31.0
Bolivia	22.1	89	84	15.6	116	26.0	69	24.6
Trinidad and Tobago	21.7	90	77	23.8	83	13.5	116	27.8
Ghana	21.6	91	72	20.3	95	15.0	110	29.4
Nigeria	20.8	92	93	21.3	89	17.7	101	23.3
Senegal	20.3	93	75	14.3	127	18.4	98	28.2

Moldova	20.2	94	117	24.8	79	20.0	92	15.8
Rwanda	20.0	95	78	16.6	109	15.8	107	27.6
Kenya	19.8	96	111	20.0	96	21.1	88	18.2
Bosnia and Herzegovina	19.5	97	129	24.2	82	21.5	86	12.7
Tajikistan	19.4	98	127	21.6	87	22.9	82	13.7
Kyrgyz Republic	19.2	99	113	20.9	92	18.7	97	18.0
Côte d'Ivoire	19.1	100	86	15.2	120	18.1	100	24.1
Sri Lanka	19.1	101	120	18.6	103	23.5	79	15.2
Lao PDR	19.1	102	123	19.2	101	23.5	80	14.6
Swaziland	18.8	103	103	14.9	122	21.8	84	19.7
Guatemala	18.7	104	99	16.3	110	18.3	99	21.5
Ecuador	18.5	105	91	19.2	100	12.8	117	23.5
Suriname	18.4	106	88	21.2	90	9.9	131	23.9
Myanmar	18.1	107	126	20.0	97	20.4	91	13.9
Cambodia	17.7	108	134	18.4	104	23.3	81	11.3
Pakistan	17.3	109	132	15.8	114	24.0	78	12.2
Tanzania	17.3	110	114	18.0	106	15.8	108	18.0
Ethiopia	17.2	111	124	20.4	93	16.6	104	14.5
Honduras	17.2	112	100	14.5	125	16.8	103	20.2
Gambia. The	17.1	113	102	19.4	99	12.3	121	19.7
Libya	16.6	114	128	24.7	80	11.9	125	13.3
Paraguay	16.6	115	106	17.0	107	13.5	115	19.3
Zambia	16.3	116	107	15.8	113	14.1	114	18.9
Guyana	16.3	117	110	18.3	105	12.2	123	18.3
Brazil	16.1	118	85	15.6	117	8.3	134	24.5
Nicaragua	16.1	119	108	15.0	121	14.6	111	18.8
El Salvador	15.7	120	98	16.7	108	8.4	133	22.0
Cameroon	15.6	121	109	15.5	119	12.6	119	18.8
Guinea	15.5	122	121	15.9	111	15.7	109	15.0
Mali	15.3	123	118	15.7	115	14.3	113	15.7
Angola	15.1	124	122	14.4	126	16.2	106	14.6
Uganda	14.8	125	101	14.8	123	9.9	130	19.7
Liberia	14.8	126	116	15.6	118	12.2	124	16.7
Burkina Faso	13.4	127	112	12.7	130	9.6	132	18.1
Benin	13.3	128	104	12.5	131	7.9	135	19.6
Venezuela	13.1	129	105	7.9	135	12.3	122	19.3
Mozambique	12.8	130	131	13.5	128	12.6	120	12.2
Sierra Leone	12.7	131	130	13.0	129	12.7	118	12.5
Bangladesh	12.5	132	119	14.7	124	7.6	137	15.3
Malawi	11.6	133	133	12.2	132	10.6	127	12.0
Mauritania	10.5	134	125	7.1	137	10.0	129	14.3
Burundi	10.2	135	135	10.7	134	11.3	126	8.6
Madagascar	9.1	136	136	11.0	133	7.8	136	8.6
Chad	8.8	137	137	7.7	136	10.4	128	8.3

Table A.2. Entrepreneurial Attitudes Sub-Index and Pillar Values for Countries, 2019

Countries	ATT	Opportunity Perception	Startup Skills	Risk Acceptanc e	Networking	Cultural Support
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United States	83.53	1.000	1.000	0.931	0.610	0.841
Netherlands	82.29	0.805	0.961	0.949	0.878	1.000
Canada	78.05	0.908	0.834	0.657	0.711	0.984
Iceland	77.85	0.684	0.964	0.918	1.000	0.623
Denmark	75.48	0.999	0.722	0.759	0.611	0.889
Finland	74.50	0.595	0.967	0.784	0.841	0.825
Australia	74.11	0.796	1.000	0.744	0.652	0.736
United Kingdom	73.52	0.749	0.586	0.876	0.649	0.919
Switzerland	72.24	0.714	0.717	0.904	0.586	0.769
Hong Kong	68.44	1.000	0.595	0.457	1.000	0.683
Estonia	67.97	0.665	0.899	0.921	0.408	0.828
Korea	67.80	0.519	1.000	1.000	1.000	0.478
Chile	67.78	0.590	0.921	1.000	0.727	0.656
Sweden	67.14	0.949	0.454	0.689	0.706	0.844
Ireland	65.62	0.766	0.917	0.823	0.354	0.812
Israel	63.96	0.734	0.624	0.477	1.000	0.707
Austria	63.82	0.642	0.914	0.674	0.545	0.687
Norway	63.72	0.789	0.563	1.000	0.486	1.000
Germany	57.79	0.488	0.637	0.715	0.377	0.861
France	56.85	0.363	0.537	0.809	0.638	0.676
Saudi Arabia	56.80	0.717	0.981	0.468	1.000	0.476
United Arab Emirates	56.63	0.529	0.550	0.303	1.000	1.000
Slovenia	56.53	0.416	1.000	0.915	0.339	0.523
Poland	55.40	0.583	0.809	0.540	0.502	0.544
Taiwan	53.20	0.373	0.525	0.577	0.689	0.595
Spain	51.83	0.376	0.820	0.688	0.635	0.332
Belgium	49.80	0.516	0.611	0.561	0.343	0.547
Puerto Rico	48.29	0.527	0.731	0.991	0.328	0.224
Portugal	46.84	0.285	0.655	0.661	0.336	0.566
Cyprus	46.31	0.490	0.575	0.427	0.441	0.503
Botswana	45.64	0.584	0.269	0.761	0.353	0.685
Luxembourg	45.56	0.552	0.150	0.540	0.761	0.692
Qatar	43.03	0.587	0.166	0.347	0.674	0.701
Malaysia	41.54	0.604	0.391	0.438	0.637	0.313
Colombia	40.86	0.632	0.641	0.310	0.490	0.281
Barbados	40.06	0.441	1.000	0.204	0.208	0.629
Costa Rica	39.10	0.335	0.670	0.337	0.525	0.452
Uruguay	38.66	0.429	0.423	0.357	0.588	0.521
Singapore	38.44	0.502	0.035	0.812	0.447	0.722
Latvia	38.24	0.482	0.656	0.185	0.369	0.406
Italy	37.90	0.324	0.401	0.515	0.312	0.417
Peru	37.40	0.551	0.333	0.417	0.567	0.249
China	36.76	0.327	0.270	0.447	0.506	0.336
Bahrain	36.51	0.603	0.468	0.228	0.495	0.281
Slovakia	36.36	0.291	0.437	0.614	0.256	0.294
Panama	36.21	0.369	0.280	0.501	0.708	0.225
Serbia	36.15	0.301	1.000	0.171	0.419	0.266
Hungary	36.12	0.381	0.323	0.575	0.276	0.301
Lithuania	35.54	0.423	0.475	0.155	0.387	0.491

Brunei Darussalam	35.25	0.451	0.210	0.415	0.362	0.562
Montenegro	35.19	0.411	0.833	0.015	0.631	0.429
Oman	35.18	0.448	0.341	0.228	0.409	0.390
Czech Republic	34.68	0.389	0.587	0.722	0.259	0.094
Romania	34.66	0.400	0.523	0.245	0.205	0.453
Jamaica	34.60	0.714	0.410	0.083	0.370	0.486
Turkey	34.58	0.354	0.804	0.146	0.325	0.326
Namibia	34.09	0.826	0.087	0.261	0.425	0.444
Greece	33.82	0.145	1.000	0.211	0.301	0.365
Kazakhstan	33.63	0.617	0.557	0.089	0.488	0.221
Dominican Republic	33.57	0.412	0.487	0.262	0.521	0.272
Kuwait	33.26	0.439	0.165	0.491	0.454	0.320
Bulgaria	32.39	0.278	0.489	0.285	0.418	0.272
Indonesia	32.34	0.348	0.318	0.237	0.680	0.301
Croatia	31.96	0.271	0.698	0.203	0.300	0.283
Japan	31.39	0.181	0.152	0.691	0.368	0.339
Algeria	31.05	0.274	0.387	0.248	0.510	0.289
Mexico	30.41	0.397	0.208	0.444	0.562	0.100
Lebanon	30.29	0.327	0.757	0.017	0.623	0.221
Iran	30.26	0.222	0.851	0.049	0.636	0.170
Morocco	29.70	0.265	0.283	0.272	0.438	0.301
Tunisia	29.59	0.385	0.403	0.117	0.469	0.345
Ghana	29.39	0.531	0.215	0.086	0.384	0.445
Jordan	28.91	0.325	0.332	0.122	0.405	0.492
Thailand	28.85	0.396	0.387	0.163	0.263	0.296
Senegal	28.21	0.365	0.150	0.236	0.302	0.556
Philippines	27.93	0.389	0.427	0.344	0.191	0.279
Trinidad and Tobago	27.82	0.636	0.180	0.540	0.034	0.358
Rwanda	27.62	0.858	0.107	0.092	0.216	0.548
Georgia	27.17	0.462	0.302	0.067	0.161	0.573
Russia	27.03	0.199	0.469	0.195	0.553	0.163
South Africa	26.29	0.459	0.079	0.242	0.298	0.376
Argentina	25.69	0.225	0.617	0.061	0.382	0.198
Macedonia	24.96	0.485	0.419	0.113	0.264	0.201
Bolivia	24.58	0.193	0.375	0.128	0.384	0.243
Brazil	24.52	0.349	0.322	0.113	0.576	0.114
Côte d'Ivoire	24.06	0.353	0.130	0.092	0.480	0.274
Azerbaijan	23.95	0.444	0.234	0.141	0.198	0.231
Suriname	23.94	0.407	0.129	0.104	0.412	0.336
Vietnam	23.88	0.426	0.252	0.076	0.291	0.255
Gabon	23.62	0.364	0.086	0.081	0.568	0.230
Ecuador	23.50	0.258	0.487	0.072	0.358	0.168
Ukraine	23.42	0.197	0.710	0.012	0.338	0.188
Nigeria	23.32	0.686	0.104	0.103	0.271	0.167
Albania	22.74	0.204	0.527	0.063	0.218	0.256
India	22.71	0.325	0.229	0.383	0.135	0.177
Armenia	22.46	0.295	0.381	0.057	0.251	0.247

Belize	21.99	0.377	0.266	0.019	0.285	0.309
El Salvador	21.96	0.271	0.224	0.121	0.402	0.206
Guatemala	21.49	0.314	0.147	0.246	0.261	0.234
Honduras	20.20	0.244	0.174	0.170	0.311	0.195
Uganda	19.72	0.741	0.044	0.110	0.077	0.228
Gambia. The	19.71	0.402	0.015	0.025	0.539	0.203
Swaziland	19.67	0.657	0.052	0.081	0.107	0.318
Benin	19.61	0.376	0.148	0.099	0.212	0.253
Venezuela	19.32	0.033	0.690	0.024	0.347	0.104
Paraguay	19.26	0.209	0.259	0.157	0.225	0.155
Zambia	18.93	0.447	0.023	0.099	0.247	0.263
Nicaragua	18.83	0.284	0.103	0.079	0.378	0.163
Cameroon	18.83	0.338	0.241	0.089	0.251	0.120
Guyana	18.27	0.371	0.165	0.112	0.121	0.262
Kenya	18.22	0.517	0.049	0.092	0.185	0.182
Burkina Faso	18.09	0.363	0.063	0.026	0.154	0.431
Kyrgyz Republic	18.05	0.399	0.296	0.020	0.153	0.169
Tanzania	17.97	0.435	0.028	0.092	0.184	0.274
Egypt	16.79	0.269	0.187	0.069	0.083	0.276
Liberia	16.66	0.323	0.096	0.025	0.261	0.214
Moldova	15.77	0.195	0.276	0.012	0.185	0.198
Mali	15.74	0.302	0.074	0.025	0.248	0.214
Bangladesh	15.30	0.411	0.048	0.049	0.113	0.242
Sri Lanka	15.17	0.378	0.155	0.068	0.058	0.163
Guinea	15.01	0.334	0.102	0.025	0.187	0.171
Angola	14.60	0.356	0.038	0.058	0.246	0.099
Lao PDR	14.56	0.290	0.131	0.008	0.191	0.188
Ethiopia	14.52	0.325	0.056	0.018	0.085	0.332
Mauritania	14.31	0.282	0.038	0.025	0.277	0.182
Myanmar	13.89	0.322	0.089	0.031	0.111	0.198
Tajikistan	13.71	0.274	0.246	0.020	0.121	0.100
Libya	13.31	0.060	0.472	0.019	0.121	0.103
Bosnia and Herzegovina	12.71	0.148	0.128	0.017	0.115	0.276
Sierra Leone	12.47	0.217	0.015	0.025	0.218	0.203
Mozambique	12.25	0.269	0.053	0.025	0.159	0.151
Pakistan	12.21	0.232	0.064	0.022	0.136	0.199
Malawi	11.99	0.453	0.006	0.028	0.060	0.150
Cambodia	11.25	0.315	0.082	0.031	0.082	0.111
Burundi	8.64	0.232	0.046	0.025	0.041	0.122
Madagascar	8.63	0.132	0.034	0.015	0.108	0.168
Chad	8.26	0.215	0.025	0.025	0.074	0.105

Table A.3. Entrepreneurial Abilities Sub-Index and Pillar Values for Countries, 2019

Countries	ABT	Opportunity Startup	Technology Absorption	Human Capital	Competition
Denmark	90.14	1.000	1.000	1.000	0.999
United States	89.67	0.850	0.948	1.000	1.000

Switzerland	85.63	0.908	0.821	0.886	0.997
Canada	83.77	0.929	0.900	0.988	0.754
United Kingdom	82.63	0.894	1.000	0.746	0.821
Australia	80.08	0.891	1.000	0.997	0.613
Ireland	79.13	0.975	0.891	0.922	0.930
Sweden	77.05	1.000	1.000	0.639	0.842
Netherlands	74.45	0.971	0.988	0.451	0.887
Iceland	71.04	1.000	1.000	0.502	0.553
Germany	68.21	0.808	0.820	0.566	0.793
Belgium	67.43	0.591	0.829	0.764	0.817
France	66.78	0.679	0.841	0.678	0.718
Austria	65.09	0.887	0.923	0.362	0.745
Luxembourg	65.04	0.989	0.965	0.601	0.872
Hong Kong	64.66	0.801	0.604	0.936	0.430
Finland	64.59	1.000	0.822	0.461	0.481
Israel	62.58	0.616	1.000	0.864	0.345
Japan	61.43	0.729	0.737	0.938	0.704
Norway	60.73	1.000	0.733	0.449	0.680
Singapore	58.14	1.000	0.727	1.000	0.630
Taiwan	58.02	0.605	0.749	0.727	0.382
Slovenia	57.64	0.559	1.000	0.520	0.478
Puerto Rico	56.01	0.638	0.302	1.000	0.719
Chile	53.33	0.591	0.582	0.615	0.466
Qatar	52.36	0.714	0.380	0.859	0.547
United Arab Emirates	51.72	0.661	0.233	0.942	0.563
Estonia	50.77	0.529	0.442	0.559	0.527
Spain	50.75	0.611	0.694	0.441	0.432
Cyprus	49.33	0.680	0.347	0.664	0.446
Hungary	48.66	0.470	0.858	0.540	0.272
Bahrain	47.58	0.632	0.364	0.904	0.449
Poland	47.17	0.596	0.623	0.450	0.310
Lithuania	46.90	0.537	0.549	0.797	0.305
Portugal	46.74	0.644	0.544	0.335	0.448
Korea	46.34	0.609	0.418	0.601	0.311
Czech Republic	42.64	0.555	0.707	0.381	0.384
Latvia	42.54	0.608	0.407	0.529	0.333
Oman	42.38	0.610	0.341	0.635	0.254
Italy	40.49	0.422	0.705	0.232	0.385
Slovakia	40.48	0.381	0.711	0.370	0.260
Greece	39.56	0.466	0.485	0.469	0.340
Brunei					
Darussalam	39.43	0.593	0.300	0.705	0.274
Malaysia	39.21	0.553	0.123	0.577	0.572
Kuwait	37.96	0.603	0.325	0.626	0.226
Tunisia	36.01	0.371	0.625	0.494	0.255
China	34.17	0.262	0.265	0.522	0.352
Romania	33.70	0.287	0.452	0.396	0.264
Turkey	33.19	0.315	0.471	0.325	0.304
Azerbaijan	33.17	0.241	0.281	0.548	0.367

Iran	32.36	0.225	0.502	0.522	0.268
Botswana	32.04	0.385	0.222	0.410	0.333
Croatia	31.84	0.377	0.532	0.177	0.289
Thailand	31.81	0.349	0.196	0.536	0.277
Armenia	31.65	0.174	0.324	0.676	0.320
Barbados	31.65	0.296	0.284	0.569	0.251
Uruguay	31.09	0.362	0.563	0.266	0.247
Kazakhstan	31.01	0.322	0.143	0.799	0.213
Jordan	30.63	0.341	0.437	0.304	0.327
Colombia	30.51	0.260	0.360	0.599	0.134
Saudi Arabia	29.81	0.472	0.154	0.344	0.307
South Africa	29.35	0.328	0.243	0.277	0.445
Georgia	29.18	0.220	0.307	0.577	0.222
Belize	28.91	0.371	0.255	0.330	0.384
Indonesia	28.41	0.355	0.411	0.241	0.258
Argentina	27.91	0.213	0.585	0.313	0.168
Russia	27.63	0.209	0.272	0.622	0.197
Morocco	27.05	0.463	0.351	0.145	0.189
Vietnam	27.04	0.376	0.145	0.466	0.214
Ukraine	26.99	0.276	0.317	0.509	0.168
Namibia	26.67	0.404	0.134	0.221	0.409
Egypt	26.65	0.159	0.256	0.467	0.297
Bulgaria	26.50	0.275	0.309	0.314	0.203
Albania	25.87	0.207	0.424	0.271	0.234
Peru	25.13	0.311	0.247	0.329	0.169
Jamaica	25.11	0.236	0.215	0.275	0.356
Montenegro	25.04	0.358	0.216	0.309	0.257
Mexico	25.00	0.296	0.212	0.189	0.363
Moldova	24.78	0.313	0.303	0.370	0.150
Libya	24.65	0.306	0.311	0.430	0.112
Lebanon	24.27	0.245	0.171	0.294	0.393
Bosnia and Herzegovina	24.19	0.189	0.396	0.243	0.270
Trinidad and Tobago	23.84	0.280	0.113	0.510	0.223
India	23.62	0.260	0.046	0.249	0.531
Costa Rica	23.33	0.391	0.072	0.205	0.357
Serbia	22.58	0.226	0.138	0.318	0.249
Tajikistan	21.63	0.000	0.243	0.590	0.228
Philippines	21.61	0.349	0.014	0.421	0.224
Nigeria	21.33	0.119	0.141	0.457	0.204
Suriname	21.23	0.308	0.017	0.368	0.282
Gabon	20.91	0.165	0.191	0.272	0.247
Kyrgyz Republic	20.89	0.000	0.211	0.679	0.165
Ethiopia	20.44	0.315	0.081	0.190	0.332
Macedonia	20.35	0.224	0.000	0.418	0.318
Ghana	20.34	0.275	0.133	0.116	0.336
Kenya	20.00	0.218	0.223	0.161	0.251
Myanmar	19.99	0.233	0.111	0.450	0.107
Algeria	19.83	0.212	0.097	0.328	0.192

Gambia. The	19.39	0.194	0.207	0.149	0.306
Ecuador	19.22	0.199	0.176	0.202	0.248
Lao PDR	19.16	0.000	0.144	0.479	0.290
Panama	18.70	0.178	0.105	0.236	0.250
Sri Lanka	18.58	0.146	0.046	0.307	0.313
Cambodia	18.41	0.000	0.149	0.488	0.238
Guyana	18.26	0.256	0.001	0.244	0.339
Tanzania	18.02	0.221	0.188	0.138	0.228
Paraguay	16.98	0.159	0.206	0.161	0.173
El Salvador	16.75	0.242	0.050	0.212	0.222
Rwanda	16.58	0.000	0.213	0.194	0.349
Guatemala	16.33	0.241	0.089	0.113	0.273
Guinea	15.91	0.121	0.204	0.170	0.183
Dominican Republic	15.90	0.146	0.054	0.357	0.128
Zambia	15.84	0.291	0.028	0.159	0.215
Pakistan	15.76	0.115	0.215	0.067	0.289
Mali	15.74	0.102	0.183	0.118	0.273
Bolivia	15.65	0.089	0.098	0.260	0.198
Brazil	15.63	0.094	0.145	0.077	0.393
Liberia	15.56	0.157	0.160	0.137	0.208
Cameroon	15.49	0.092	0.215	0.166	0.188
Côte d'Ivoire	15.21	0.076	0.203	0.132	0.216
Nicaragua	14.97	0.174	0.094	0.236	0.112
Swaziland	14.90	0.000	0.174	0.317	0.180
Uganda	14.80	0.332	0.048	0.097	0.161
Bangladesh	14.67	0.231	0.129	0.130	0.139
Honduras	14.45	0.159	0.104	0.170	0.171
Angola	14.41	0.218	0.135	0.202	0.054
Senegal	14.25	0.139	0.124	0.081	0.250
Mozambique	13.53	0.200	0.179	0.081	0.112
Sierra Leone	13.03	0.185	0.170	0.074	0.125
Burkina Faso	12.65	0.178	0.145	0.032	0.180
Benin	12.51	0.149	0.127	0.090	0.158
Malawi	12.23	0.201	0.025	0.049	0.263
Madagascar	11.02	0.205	0.081	0.070	0.113
Burundi	10.71	0.000	0.145	0.132	0.186
Venezuela	7.85	0.021	0.126	0.108	0.069
Chad	7.70	0.000	0.151	0.086	0.090
Mauritania	7.06	0.000	0.133	0.094	0.071

Table A.4. Entrepreneurial Aspirations Sub-Index and Pillar Values for Countries, 2019

Countries	ASP	Product Innovation	Process Innovation	High Growth	Internationalization	Risk Capital
Switzerland	88.61	0.752	1.000	0.988	1.000	1.000
United States	87.22	0.876	0.934	1.000	1.000	0.778
Canada	79.40	0.943	0.837	0.551	0.879	1.000
France	77.66	1.000	1.000	0.777	1.000	0.743
Israel	77.22	1.000	1.000	0.682	0.972	0.895

United Kingdom	76.34	0.679	0.670	0.894	1.000	0.707
Taiwan	75.01	1.000	0.806	0.987	0.528	1.000
Germany	74.02	0.597	0.833	0.859	1.000	0.900
Denmark	72.34	0.986	0.704	0.618	0.521	1.000
Finland	71.37	0.854	0.764	0.699	1.000	0.510
Hong Kong	70.49	0.689	0.431	1.000	0.753	1.000
Iceland	70.05	0.693	0.792	0.704	0.923	0.544
Belgium	69.40	0.804	0.941	0.572	1.000	0.631
Ireland	69.00	0.792	0.624	0.811	1.000	0.636
Japan	67.14	0.779	1.000	0.960	1.000	0.722
China	66.65	1.000	0.790	0.837	0.422	0.964
Sweden	66.52	0.705	0.858	0.407	1.000	0.660
Austria	65.71	0.803	0.812	0.410	1.000	0.633
Australia	65.21	0.490	0.668	0.662	0.584	1.000
Luxembourg	63.71	1.000	0.616	0.638	0.996	0.915
Singapore	60.48	0.634	1.000	1.000	1.000	0.815
Netherlands	60.28	0.614	0.667	0.523	0.693	0.590
Korea	60.10	0.600	1.000	0.507	0.542	0.692
Qatar	59.39	0.837	0.548	1.000	0.576	0.731
Italy	57.00	0.838	0.667	0.335	0.883	0.598
Slovenia	55.44	0.502	0.814	0.468	1.000	0.313
Estonia	54.76	0.465	0.673	0.684	0.530	0.463
United Arab Emirates	54.13	0.622	0.601	0.952	0.339	0.586
Hungary	53.83	0.305	0.446	0.733	1.000	0.565
Chile	53.64	1.000	0.314	0.678	0.404	0.569
Oman	53.22	0.485	0.284	1.000	0.468	0.899
Czech Republic	53.06	0.559	0.672	0.626	1.000	0.546
Turkey	51.62	0.866	0.398	0.868	0.266	0.814
Slovakia	51.06	0.378	0.466	0.526	1.000	0.488
Lithuania	49.84	0.441	0.441	0.632	0.745	0.655
Romania	47.56	0.273	0.337	0.497	0.874	0.755
Bahrain	47.35	0.564	0.108	1.000	0.493	0.910
Poland	45.87	0.328	0.357	0.455	0.786	0.492
Portugal	45.25	0.299	0.562	0.415	0.627	0.471
Croatia	44.52	0.146	0.549	0.434	1.000	0.562
Norway	43.72	0.243	0.471	0.456	0.379	0.838
Puerto Rico	41.92	0.374	0.335	0.482	0.860	0.258
Cyprus	41.13	0.518	0.406	0.265	0.546	0.406
Kuwait	41.02	0.422	0.313	1.000	0.095	0.802
Thailand	39.92	0.479	0.427	0.579	0.317	0.380
Saudi Arabia	39.58	0.343	0.136	0.329	0.808	0.729
Malaysia	39.48	0.336	0.945	0.350	0.475	0.236
Azerbaijan	39.27	0.664	0.167	0.925	0.414	0.186
South Africa	39.19	0.511	0.525	0.611	0.529	0.162
Spain	38.06	0.291	0.521	0.279	0.310	0.566
Latvia	37.26	0.325	0.175	0.540	0.537	0.449
Tunisia	36.38	0.404	0.566	0.609	0.039	0.684
Montenegro	35.17	0.223	0.304	0.396	0.816	0.487
Brunei	34.93	0.403	0.094	0.492	0.648	0.391

Darussalam						
Greece	32.73	0.257	0.579	0.131	0.226	0.661
Lebanon	31.84	0.688	0.618	0.138	0.254	0.293
Bulgaria	31.28	0.135	0.545	0.313	0.309	0.396
Colombia	30.85	0.305	0.123	0.623	0.314	0.338
Egypt	30.50	0.265	0.454	0.438	0.192	0.366
Namibia	29.17	0.648	0.184	0.349	0.372	0.110
India	28.88	0.662	0.460	0.259	0.176	0.152
Jordan	28.79	0.576	0.396	0.279	0.037	0.425
Kazakhstan	28.28	0.279	0.156	0.450	0.310	0.350
Morocco	28.17	0.335	0.615	0.252	0.175	0.149
Belize	27.66	0.205	0.189	0.292	0.568	0.377
Vietnam	27.12	0.373	0.300	0.197	0.140	0.495
Serbia	26.93	0.296	0.530	0.254	0.132	0.229
Gabon	26.73	0.488	0.319	0.314	0.270	0.087
Bolivia	26.01	0.699	0.125	0.281	0.154	0.222
Mexico	25.88	0.362	0.298	0.224	0.368	0.133
Iran	25.45	0.203	0.193	0.532	0.171	0.341
Botswana	25.41	0.232	0.163	0.541	0.247	0.158
Ukraine	25.13	0.206	0.314	0.412	0.194	0.317
Barbados	24.91	0.347	0.106	0.194	0.503	0.199
Argentina	24.36	0.336	0.259	0.249	0.076	0.427
Macedonia	24.08	0.263	0.359	0.423	0.039	0.340
Costa Rica	24.04	0.360	0.367	0.301	0.111	0.169
Pakistan	23.98	0.389	0.197	0.538	0.194	0.084
Sri Lanka	23.49	0.504	0.190	0.183	0.310	0.133
Lao PDR	23.47	0.508	0.079	0.433	0.180	0.202
Cambodia	23.30	0.434	0.146	0.389	0.187	0.202
Tajikistan	22.87	0.267	0.126	0.455	0.206	0.274
Georgia	22.35	0.136	0.114	0.381	0.453	0.151
Swaziland	21.80	0.257	0.128	0.388	0.270	0.204
Panama	21.62	0.231	0.179	0.299	0.226	0.185
Bosnia and Herzegovina	21.55	0.087	0.192	0.231	0.449	0.266
Dominican Republic	21.18	0.217	0.189	0.347	0.313	0.085
Kenya	21.08	0.258	0.285	0.305	0.120	0.172
Peru	20.65	0.247	0.112	0.396	0.118	0.210
Uruguay	20.43	0.330	0.258	0.370	0.051	0.116
Myanmar	20.39	0.341	0.165	0.224	0.149	0.237
Moldova	20.03	0.143	0.204	0.359	0.209	0.200
Russia	19.61	0.153	0.358	0.356	0.036	0.187
Philippines	19.51	0.518	0.190	0.183	0.114	0.117
Albania	18.97	0.111	0.162	0.239	0.341	0.155
Armenia	18.91	0.124	0.145	0.380	0.247	0.121
Kyrgyz Republic	18.74	0.172	0.113	0.326	0.206	0.233
Senegal	18.44	0.055	0.455	0.386	0.082	0.064
Guatemala	18.34	0.732	0.053	0.286	0.012	0.077
Côte d'Ivoire	18.13	0.330	0.121	0.246	0.116	0.140
Nigeria	17.68	0.168	0.166	0.191	0.091	0.298

Indonesia	17.18	0.439	0.202	0.108	0.060	0.127
Honduras	16.84	0.324	0.037	0.320	0.122	0.119
Ethiopia	16.56	0.125	0.489	0.251	0.024	0.066
Algeria	16.23	0.177	0.098	0.239	0.172	0.142
Angola	16.21	0.201	0.130	0.113	0.194	0.219
Rwanda	15.81	0.238	0.120	0.307	0.134	0.079
Tanzania	15.78	0.198	0.166	0.241	0.104	0.132
Guinea	15.73	0.231	0.096	0.290	0.173	0.062
Ghana	15.04	0.124	0.205	0.160	0.102	0.176
Nicaragua	14.60	0.251	0.101	0.234	0.094	0.077
Jamaica	14.58	0.139	0.074	0.116	0.327	0.106
Mali	14.28	0.195	0.152	0.238	0.118	0.058
Zambia	14.09	0.093	0.146	0.046	0.406	0.091
Paraguay	13.49	0.167	0.086	0.236	0.074	0.130
Trinidad and Tobago	13.47	0.100	0.074	0.434	0.003	0.162
Ecuador	12.80	0.131	0.135	0.110	0.035	0.265
Sierra Leone	12.68	0.150	0.095	0.199	0.166	0.062
Cameroon	12.57	0.202	0.023	0.211	0.155	0.078
Mozambique	12.56	0.160	0.138	0.183	0.108	0.070
Gambia. The	12.29	0.171	0.083	0.238	0.102	0.062
Venezuela	12.26	0.128	0.294	0.149	0.034	0.056
Guyana	12.24	0.024	0.152	0.101	0.393	0.026
Liberia	12.18	0.159	0.070	0.231	0.122	0.062
Libya	11.92	0.175	0.086	0.270	0.000	0.123
Burundi	11.34	0.156	0.076	0.214	0.115	0.049
Malawi	10.61	0.353	0.143	0.016	0.054	0.029
Chad	10.42	0.141	0.099	0.158	0.108	0.049
Mauritania	10.02	0.121	0.097	0.158	0.099	0.055
Uganda	9.93	0.066	0.172	0.077	0.088	0.106
Suriname	9.92	0.050	0.074	0.048	0.352	0.026
Burkina Faso	9.59	0.167	0.093	0.130	0.069	0.039
El Salvador	8.45	0.088	0.028	0.182	0.029	0.112
Brazil	8.29	0.120	0.117	0.079	0.003	0.117
Benin	7.90	0.102	0.023	0.144	0.077	0.061
Madagascar	7.78	0.309	0.048	0.022	0.007	0.046
Bangladesh	7.60	0.032	0.143	0.133	0.014	0.075

1Endnotes

- 1 Acs Z., and P. Correa 2014, The World Bank and GEDI, Identifying the Obstacles to High-Impact Entrepreneurship in Latin America and the Caribbean
- 2 Stam 2015; Stam and Spiegel, 2015; Szerb, L., Acs, Z. J. Ortega-Argilés, R. and Komlosi, E, 2014; Acs, Autio and Szerb, 2014a; Autio et al 2014; Autio and Levie, 2015; Autio et al 2012.
- 3 Moore, 1993
- 4 (Mathews and Brueggemann, 2015, Chapter 14)
- 5 Acs, Szerb and Autio, National Systems of Entrepreneurship: Measurement and Policy, Research Policy, (2014b:479)
- 6 Stakeholder engagement is central for multi-polar policy-making and implementation. Deep stakeholder engagement can tap knowledge within the ecosystem and uncover hidden interactions and cause-effect chains.
- 7 While there is a small literature on entrepreneurship and economic growth our view is that high-impact firms cause economic growth because they shift the production function and replicative entrepreneurship is caused by economic growth and creates employment by replicating the existing production function .
- 8 This trend is reflected in the continuing decline in the cost of computing, the rise of open-source software, the move to the 'cloud' and the emergence of huge datacenters where companies such as Amazon, Google, and Facebook are designing their own approaches.
- 9 Autio and Levie, 2015.
- 10 Woolridge, 2009.
- 11 Leibenstein, 1968.
- 12 https://www.youtube.com/watch?v=hjNc_BScn-s
- 13 The Wall Street Journal (2014). 'Amazon Reports Loss Despite Strong Sales Growth'. Available at: <http://online.wsj.com/articles/amazon-reports-another-loss-despite-strong-sales-growth-1406233529>
- 14 Acs, Z.J., Autio, E., Szerb, L. (2014). National systems of entrepreneurship: Measurement issues and policy implications. Research Policy, 43 (3), 476-494.
- 15 Schumpeter, J.A. (1934). The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle. Cambridge, MA: Harvard University Press.
- 16 We agree that correlation and basic regression coefficients are not enough to determine causation, which is why we say that a 10% global increase in GEI could improve global productivity 0.22 points. But, it should be kept in mind that the said change in the GEI, and the changes to institutions that it represents, could add this amount to global productivity, since the institutions that support entrepreneurship also support a variety of other economic and non-economic activities.
- 17 Gartner (1990), Davidsson (2004), Wennekers and Thurik (1999),) and Godin, Clemens, and Veldhuis (2008), Zahra, et al (2014). Gupta and Gupta (2015) all identify several dimensions of entrepreneurship.
- 18 Baumol, 1990; Vivarelli 2013, Thurik et al 2013
- 19 Bjørnskov & Foss 2010, Goel et al 2015
- 20 Bhola, Verheul, Thurik, & Grilo, 2006. Tumasjan & Braun 2012, Autio et al (2014)
- 21 [Papagiannidis](#) & [Li](#), 2005; Dutta & Merenda 2011, Ibrahim & Mas'ud, 2016,
- 22 Caliendo, Fossen, & Kritikos, 2009. Vieider et al 2015
- 23 Shane & Cable, 2003; Mian and Hattab 2013, Audretsch et al 2015
- 24 Guiso, Sapienza, & Zingales, 2006., Lee et al 2011, Dutta & Sobel 2016
- 25 Da Rin et al 2011, Asoni, & Sanandaji 2014, Belitski et al 2016
- 26 Coad & Rao, 2008. García-Morales et al 2014
- 27 Bates, 1990. Qian 2016
- 28 Baumol, Litan, & Schramm, 2007. Calcagno & Sobel 2014
- 29 Autio et al 2014; Grimpe, & Hussinger 2013, Audretsch et al 2014b
- 30 Stam & Wennberg, 2009. Audretsch et al 2014a, Garud et al 2014
- 31 Acs, Parsons, & Tracy, 2008, Gompers & Lerner, 2004, Croce et al 2013, Wright & Stigliani 2013.
- 32 De Clercq, Sapienza, & Crijns, 2005; McDougall-Covin et al 2014
- 33 Groh, Liechtenstein, & Lieser, 2012. Lee et al 2015
- 34 See Acs & Szerb 2009, 2012; Acs, Szerb, & Autio 2013, 2014, 2016
- 35 See Acs, Szerb, & Autio, 2014 p. 480
- 36 Based on our experience, when a country eventually joins GEM, the actual data produced tends to be very similar to our estimates. We have collected those eleven countries that joined GEM over the 2012-2015 time period for which we previously estimated their data points. Out of the eleven countries GEI scores were within the 10% range of differences including Botswana, Burkina Faso, Estonia, Malawi, Namibia, Qatar and Senegal.

Three countries – Cameroon, El Salvador and Ethiopia - are within the 20% range, and the only large difference in calculation is Bulgaria. Bulgaria has proved to be a major outlier in the European Union, just as nearly every data set has outliers. It seems that we did provide fair estimations for all the African countries. When you evaluate these estimation results do not forget that all data collection has an error term since we use samples and not the full population. In fact the error term in Bulgaria, based on the Total Early-phased Entrepreneurial Activity (TEA), appears to be very high. For more information on the application of estimated data see our website <https://thegedi.org/the-value-of-estimation-creating-reference-points-for-countries-with-missing-data/>

37 For detailed policy analysis see Autio & Levie 2015, Estonia report 2015

38 Groh et al. 2012

39 Some may not consider the West Bank and Gaza Strip an independent country. Tonga and Vanuatu are tiny countries, and Yemen and Syria have been engaged in civil war over the last few years.

40 In order to check potential bias, the index was calculated without these countries; however, the GEI values and the rank order of the involved countries were basically unchanged.

41 OECD (2008).

42 The Kaiser-Meyer-Olkin measures for the original pillar values are 0.94 and 0.96 for the PFB-adjusted pillars, well above the critical value of 0.50. The Bartlett test is significant at the 0.000 level, excluding the possibility that the pillars are not interrelated.

43 We have calculated the c-alpha values for each of the three sub-indices. Using the PFB-adjusted pillar values, the c-alpha scores are 0.92 (ATT pillars), 0.91 (ABT pillars), and 0.93 (ASP pillars).

44 Acs, Rappai & Szerb 2011, Acs, Autio & Szerb 2014