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Global Entrepreneurship and Development Index 2017

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Global Entrepreneurship and Development Index 2017

Springer

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Foreword: A Compass for Strengthening Entrepreneurship Ecosystems

There is not a nation on earth that does not seek to nurture its doers, innovators, and makers of things. However, 2017 brings a new importance and sense of urgency to the development of one global entrepreneurship ecosystem.

At the Global Entrepreneurship Network (GEN), we have the privilege of guiding extensive global verticals and platforms around entrepreneurship research, policy approaches to start and scale new businesses and grassroots entrepreneurial support programs. GEN also connects communities of mentors, investors, and founders who are working hard to keep pace with their rivals and new dynamic startup communities. Over the past 12 months, we have observed three important trends.

First, the world is now wide awake to the notion of digital disruption. We are exiting an era of innovation defined by simple, on-demand consumer convenience apps and entering a chapter about the much more difficult process of disrupting highly regulated industries.

Thanks in part to programs like Global Entrepreneurship Week and Startup Weekend, the last 10 years have delivered a huge global army of enthusiastic nascent entrepreneurs organized in vibrant communities—but policymakers have been slower in responding. Early adoptors such as Airbnb and Uber disrupted long-standing traditional industries while local, state, and federal policymakers around the world were caught off guard in understanding the public policy implications of such dramatic innovation.

This is just the tip of the iceberg of the digital disruption revolution unfolding.

Creating a new generation of globally competitive traditional industries will require a willingness of companies to either self-disrupt or deeply engage with the novices working on doing what they do better, faster, and cheaper. In addition, it will require a whole new approach from government—which brings us to our second trend in 2017.

The promise of jobs, economic growth, and the optimism and hope that entrepreneurs bring to government efforts to create opportunity and prosperity for their citizens has generated an extraordinary increase in attention from all levels of government in empowering their entrepreneurial ecosystems.

At GEN Global, this explosion of public sector interest in high-growth entrepreneurship has fueled exciting new developments such as a 3-year agreement with the US government to form a policy staff secretariat to host a ministerial summit on entrepreneurial growth each March, the expansion of GEN's Startup Nations communities of startup savvy policy advisors, and the development of an international research community to fill the gaps in data and knowledge identified by decision makers looking for smarter policy instruments. In 2017, we expect to see the emergence of working groups that seek to anticipate and tackle likely policy dilemmas fueled by new disruptive technologies and incumbent displacements.

Similarly, entrepreneurs will increasingly focus on becoming more familiar with public policy as they enter highly regulated industries that simply do not operate effectively without clear collaboration between those setting the incentives and those disrupting the markets they were established to help thrive.

Finally, an anti-globalization sentiment is emerging as the most dominant case for accelerating our efforts at developing one global entrepreneurial ecosystem. I have traveled to more than 100 nations and spoken to entrepreneurs, investors, public policy leaders, and hundreds of private sector organizations enabling them. They are remarkable in their common language, vision, and values. They are almost all generous, optimistic, open, smart, and global.

But whether you see rising nationalism driving Brexit, Putin's Russia, America's flirtation with Trumpism, or other signals from countries tightening their borders and increasing their intolerance of free markets, the democratization of entrepreneurship has never been more important. Only through knowledge sharing and crowdsourcing can we really attack our common challenges as a planet.

One important force remains. It is still an interdependent global economy. Nations care about being competitive and they will remain keen to engage with others and learn how to remain economically relevant and dynamic. The Global Entrepreneurship and Development Index offers a means of comparing apples to apples and is an important element in guiding decision makers as they seek to build stronger entrepreneurial ecosystems that deliver the global prosperity we all seek.

Washington, DC Jonathan Ortmans

Preface

We have made major changes to the 2017 version of this report. First, we have developed a powerful new conceptual approach to measuring the global entrepreneurial ecosystem that goes beyond calculating an Index to explore additional phenomena that are present in entrepreneurship ecosystems. This is presented in the next section.

Second, we have updated the institutional structure of the Index to reflect better data as it becomes available, updating nine institutional variables as seen below. Two of the most important pillars are Human Capital and Technology Absorption.[1] Countries need to be able to absorb technology from other countries in order to innovate and grow—digital technologies are at the forefront of economic growth. The new structure of the GEI is shown in Table 1. The variables listed in red are all new and are fully explained in Chap. 6. The Index's measurement lens is now much sharper. We have not updated any of the individual-level variables, keeping the same GEM survey variables.

In order to better understand technology absorption, we have included a more in-depth examination of digital technology and its impact in shaping both the entrepreneurial ecosystem and the global economy in general. We introduce four measures of the digital entrepreneurial ecosystem to start a discussion of technological change in more than 75 countries. This is presented in Chap. 2.

Arlington, VA — Zoltán J. Ács
Pécs, Hungary — László Szerb
Washington, DC — Ainsley Lloyd

[1] An absorptive capacity theory of knowledge spillover entrepreneurship. H Qian, ZJ Acs—Small Business Economics, 2013.

Table 1 The structure of the GEI

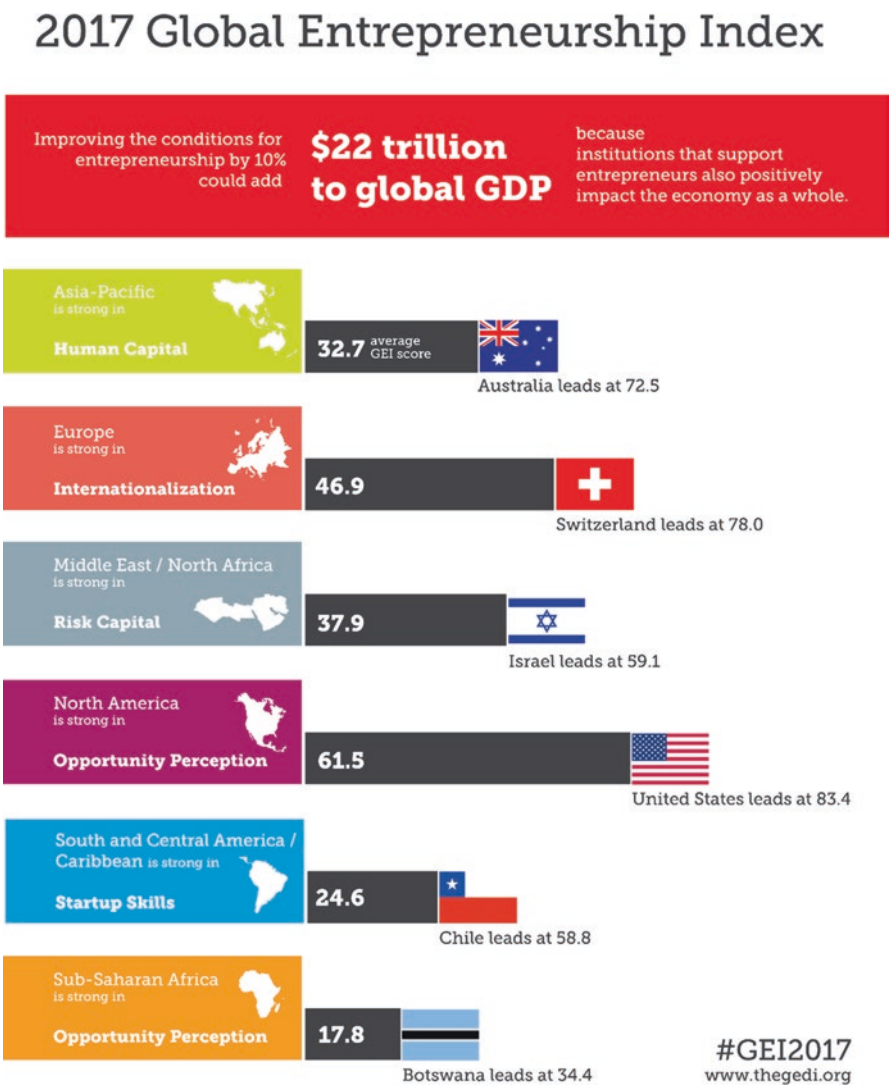
GLOBAL ENTREPRENEURSHIP AND DEVELOPMENT INDEX	Sub-indexes	Pillars	Variables (ind./inst.)
	ATTITUDES SUB-INDEX	OPPORTUNITY PERCEPTION	*OPPORTUNITY RECOGNITION*
			FREEDOM (ECONOMIC FREEDOM *PROPERTY RIGHTS)
		STARTUP SKILLS	*SKILL PERCEPTION*
			EDUCATION (TERTIARY EDUCATION*QUALITY OF EDUCATION)
		RISK ACCEPTANCE	*RISK PERCEPTION*
			COUNTRY RISK
		NETWORKING	*KNOW ENTREPRENEURS*
			AGGLOMERATION (URBANIZATION*INFRASTUCTURE)
		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)
		COMPETITION	*COMPETITORS*
			COMPETETIVNESS (MARKET DOMINANCE*REGULATION)
	ASPIRATION SUB-INDEX	PRODUCT INNOVATION	*NEW PRODUCT*
			TECH TRANSFER
		PROCESS INNOVATION	*NEW TECHLOLOGY*
			SCIENCE (GERD*(AVERAGEQUALITY OF SCIENTIFICAL INSTITUTIONS +AVAILABILITY OF SCIENTISTS AND ENGENEERS))
		HIGH GROWTH	*GAZELLE*
			FINANCE AND STRATEGY (VENTURE CAPITAL*BUSINESS SOPHISTICATION)
		INTERNATIONALIZATION	*EXPORT*
			ECONOMIC COMPLEXITY
		RISK CAPITAL	*INFORMAL INVESTMENT*
			DEPTH OF CAPITAL MARKET

About the Global Entrepreneurship and Development Institute

The Global Entrepreneurship and Development Institute (GEDI) 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, 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.

Zoltán J. Ács
Founder and President, The GEDI Institute

Global Entrepreneurship in 2017



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Mapping the Global Entrepreneurial Ecosystem

1.1 Introduction

When the unemployment rate in the United States was 10% during the great recession it was considered a catastrophe. However, the unemployment rate in most MENA countries is close to 30% 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.

1.2 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.

Z.J. Acs et al., *Global Entrepreneurship and Development Index 2017*,
SpringerBriefs in Economics, DOI 10.1007/978-3-319-65903-9_1

The Global Entrepreneurship Monitor refers to most of the former category of people as necessity entrepreneurs. They have no other option in the labor market for making money. That is why the TEA (total early-stage entrepreneurial activity) is negatively correlated with economic growth, economic freedom, and global competitiveness. The greater TEA the worse your economy is—Uganda has the highest TEA rate in the world but few would argue that Uganda is more entrepreneurial than the United States. The TEA therefore does not measure entrepreneurship quality but rather entrepreneurship *quantity*, and in so doing captures primarily self-employment. We are concerned with entrepreneurship *quality*: the opportunity driven entrepreneur who generates commercial success. Our definition of entrepreneurship is about high growth, scalability and serious job creation. This point is not new. It has been made by Daniel Eisenberg, Peter Drucker, William Baumol and Schumpeter more than a century ago. Entrepreneurship is about job creation and growth through innovation. Good policy can only be generated through focusing the discussion on innovative, growth-oriented entrepreneurship, not the self-employment captured by GEM's TEA rate.

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 1400 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.

1.3 Entrepreneurial Ecosystem Elements

Ever since the time of Schumpeter the concepts of entrepreneurship and innovation have been intertwined with economic development. The Global Entrepreneurship and Development 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

[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).

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. 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.

1.4 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

[5] Acs, Szerb and Autio, National Systems of Entrepreneurship: Measurement and Policy, Research Policy, (2014b:479).

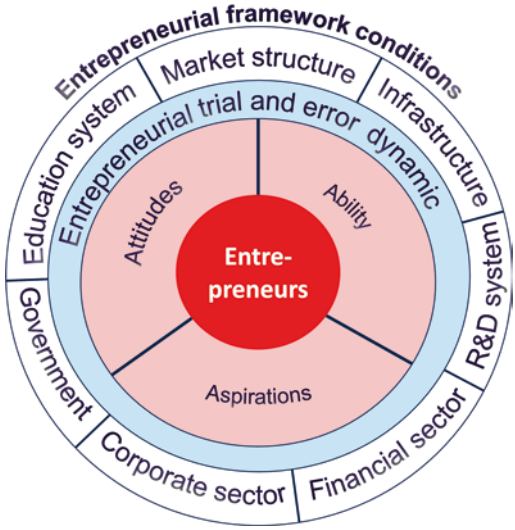

Fig. 1.1 The entrepreneurial ecosystem configuration

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 Fig. 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.

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.

[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.

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.

1.5 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.

1.6 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

[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.

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.

1.7 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

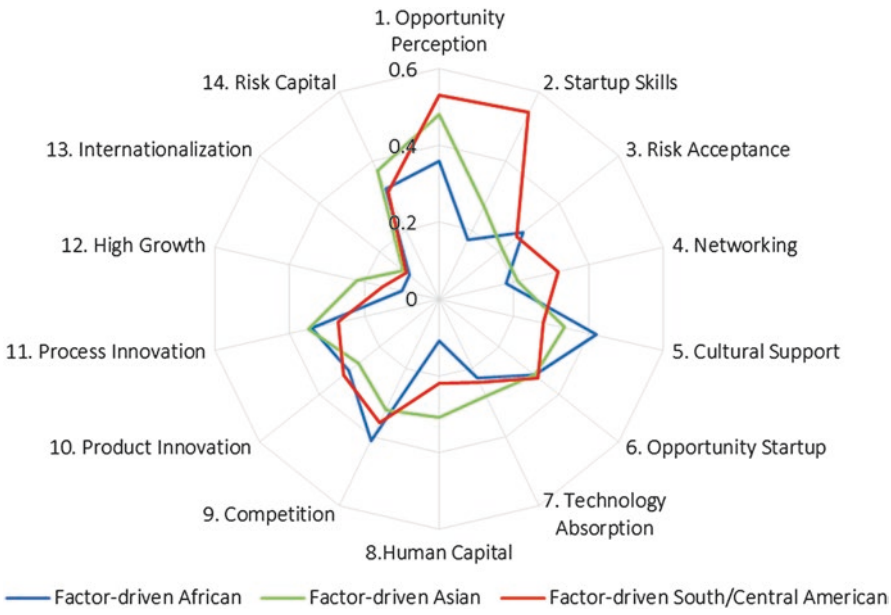

Fig. 1.2 Factor driven economies at the pillar level

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. Risk capital is always hard but not impossible even in factor driven economies.

Zauber Software Boutique and Labs was founded by six engineering students who launched the firm after graduating from Argentina's top technical university. In 5 years, the company has grown to more than 40 employees in Argentina and Silicon Valley. The firm not only delivers innovative products and services for its clients, but also functions as a laboratory to experiment and grow at the leading edge of its industry, entering markets such as social media and mobile telephony. Zauber's innovative approach to web and software development has led to a growing list of international clients, venture funding, and the spinoff of a separate venture-funded firm based on products developed in-house.

Three of the founders worked full time out of a basement to start the firm, while the other three kept traditional jobs to provide cash flow for initial operations. Within 4 months the firm had enough cash flow from operations to hire its first two employees. Zauber continued to self-finance and grow organically until its daily deal e-commerce website, Cupoint, raised $700,000 in late 2011. Shortly thereafter, in April 2012, Zauber Lab received a $1 million equity investment. The company is now poised to grow beyond its 45 employees.[8]

[8] Acs Z., and P. Correa 2014, The World Bank and GEDI, Identifying the Obstacles to High-Impact Entrepreneurship in Latin America and the Caribbean.

1.8 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.[9]

1.9 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.[10]

While there may be multiple coherent patterns for complementary features, what typically does not work is a "mix and match" (Roberts, 2004, p. 39) among elements of different systems and sub systems. Thus, the concept of bottlenecks as the main causes for a mismatch or lack of gains from complementary is a key feature of the framework. Since economies differ according these bottlenecks, they also differ in their entrepreneurial ecosystem and thus measures of performance.

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.

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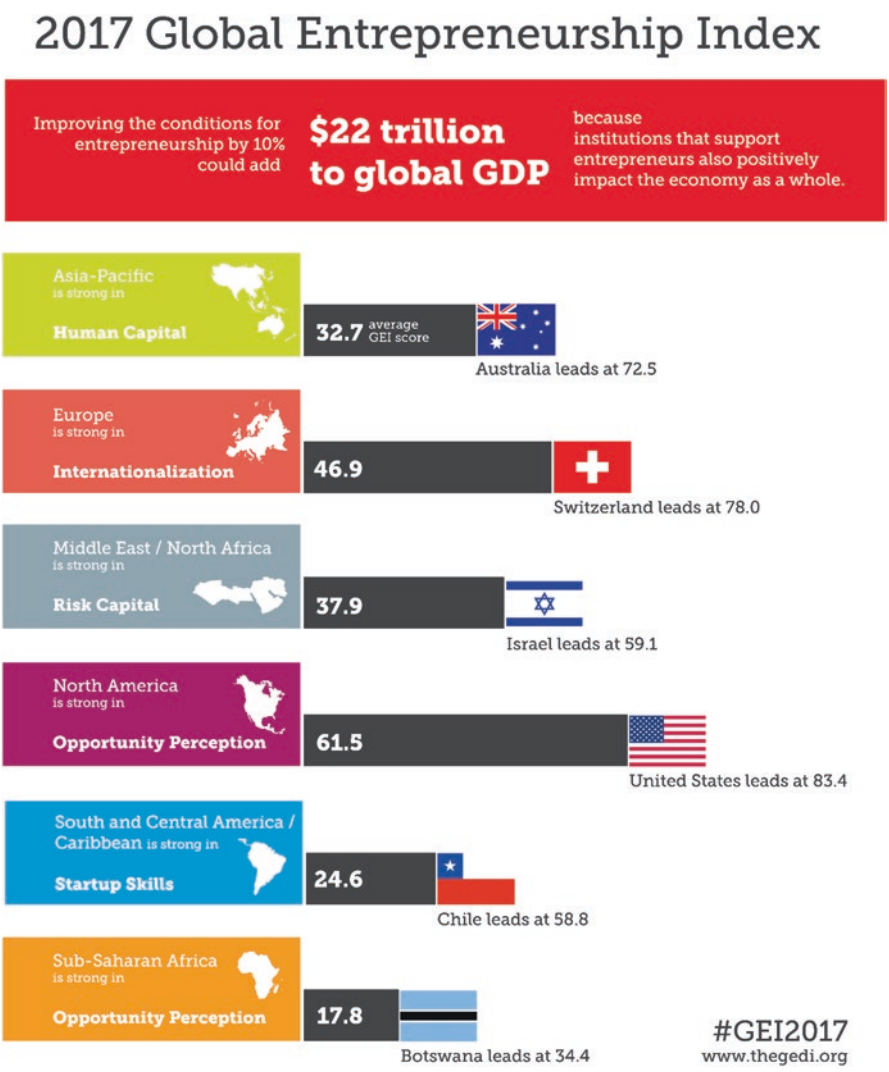
[9] This trend is reflected in the continuing decline in the cost of computing, the rise of open-source software, the move to the 'cloud' and the emergence of huge datacenters where companies such as Amazon, Google, and Facebook are designing their own approaches.

[10] Autio and Levie, 2015.


2017 Global Entrepreneurship Index
Improving the conditions for entrepreneurship by 10% could add
$22 trillion to global GDP
because institutions that support entrepreneurs also positively impact the economy as a whole.
Asia-Pacific is strong in Human Capital
32.7 average GEI score
Australia leads at 72.5
Europe is strong in Internationalization
46.9
Switzerland leads at 78.0
Middle East / North Africa is strong in Risk Capital
37.9
Israel leads at 59.1
North America is strong in Opportunity Perception
61.5
United States leads at 83.4
South and Central America / Caribbean is strong in Startup Skills
24.6
Chile leads at 58.8
Sub-Saharan Africa is strong in Opportunity Perception
17.8
Botswana leads at 34.4
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Chapter 2
Entrepreneurship and the Future of Global Prosperity

2.1 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 to market economies, enterprise and entrepreneurship become increasingly 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."[1]

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.[2] 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.

[1] Woolridge, 2009.

[2] Leibenstein, 1968.

Z.J. Acs et al., *Global Entrepreneurship and Development Index 2017*,
SpringerBriefs in Economics, DOI 10.1007/978-3-319-65903-9_2

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).[3] 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.

2.2 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 (Fig. 2.1).

The top ten countries for 2017 show a pattern similar to last year's—high-income, mostly European nations. The top countries are the United States, Switzerland, Canada, Sweden, Denmark, Iceland, Australia, United Kingdom, Ireland and the Netherlands. The major surprise this year is the movement of Switzerland from eighth place to second; the United States that remains first for the third year in a row. 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.

2.2.1 Top Ten Countries

The results show that the No. 1 rank could have gone to any of the top eight nations with the exception of the United Kingdom and the Netherlands (Table 2.1, Fig. 2.2). We see that Switzerland has a confidence interval almost similar to the United States.

[3] https://www.youtube.com/watch?v=hjNc_BScn-s.

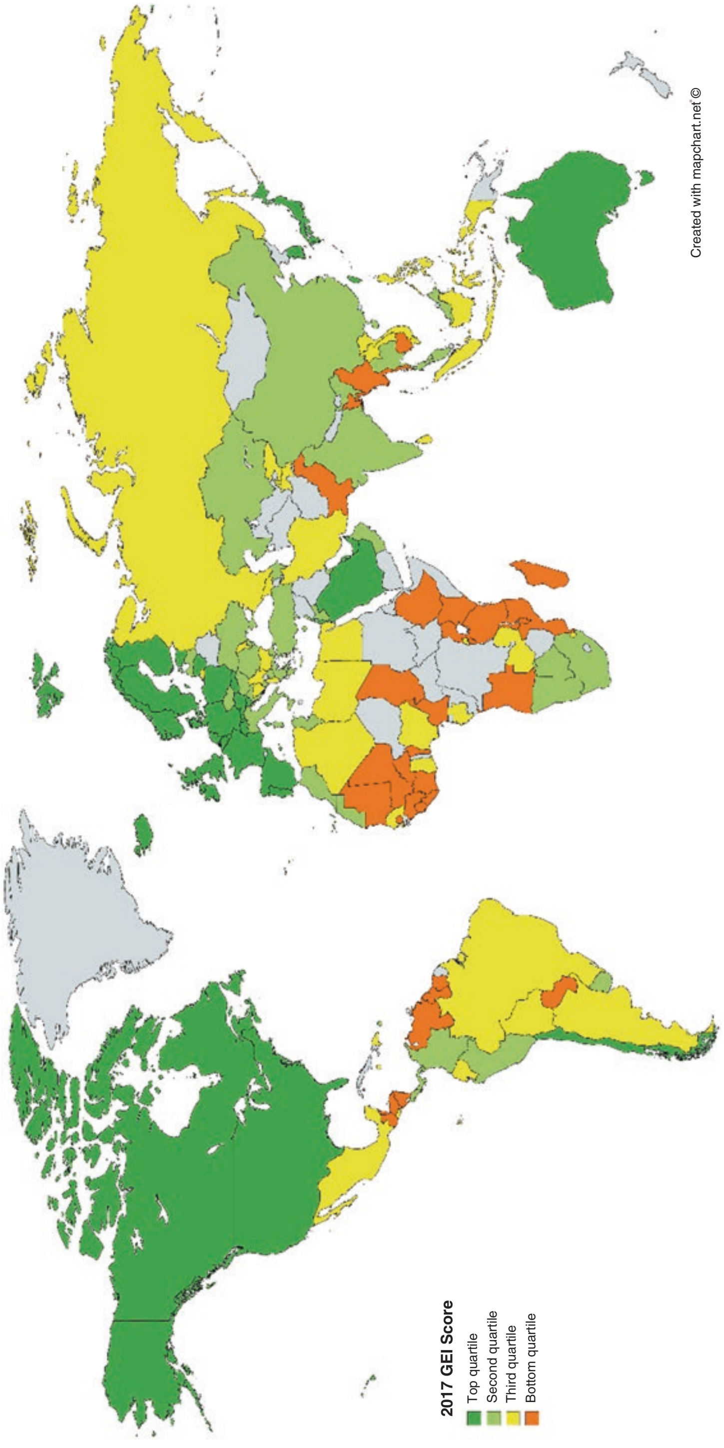


Fig. 2.1 Global entrepreneurship and development index map

Table 2.1 Top ten countries in the GEI

Country	GEI 2017 lower limit	GEI 2017 upper limit	GEI 2017	Rank 2017	GEI 2016	Rank 2016
United States	77.6	89.1	83.4	1	1	United States
Switzerland	68.9	87.0	78.0	2	8	Switzerland
Canada	70.3	80.9	75.6	3	2	Canada
Sweden	68.2	82.8	75.5	4	5	Sweden
Denmark	64.6	83.6	74.1	5	4	Denmark
Iceland	63.1	83.9	73.5	6	7	Iceland
Australia	66.3	78.7	72.5	7	3	Australia
United Kingdom	66.2	76.4	71.3	8	9	United Kingdom
Ireland	63.4	78.6	71.0	9	12	Ireland
Netherlands	60.3	75.2	67.8	10	13	Netherlands

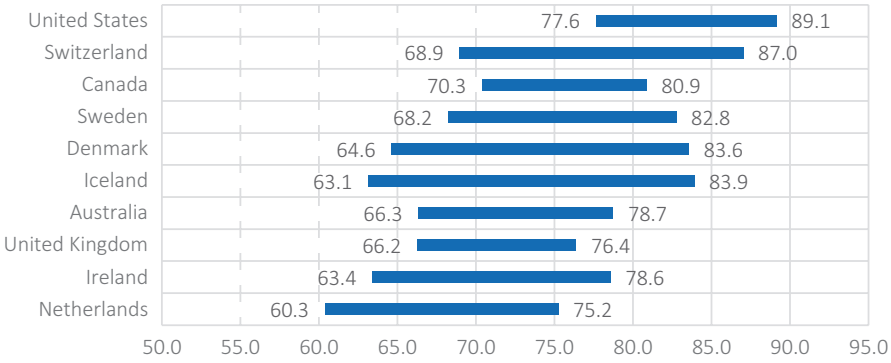


Fig. 2.2 Confidence intervals for top ten scores

2.3 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).

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 China, Singapore, Hong Kong, and Japan. Switzerland, which ranked fourth in the European region and eighth overall last year, now comes in first in Europe. Chile ranks first in South and Central America and the Caribbean (16th overall), 19 places ahead of the next highest scorer in the

Table 2.2 Top scores by region

World rank	Country	Region	GDP per capita PPP	Individual variables	Institutional variables	GEI
1	United States	North America	$52,676	78.4	93.9	83.4
2	Switzerland	Europe	$54,933	67.5	93.3	78.0
7	Australia	Asia-Pacific	$42,149	72.4	81.7	72.5
17	Israel	Middle East/North Africa	$31,092	72.1	78.5	59.1
18	Chile	South and Central America/Caribbean	$21,302	77.3	66.9	58.8
52	Botswana	Sub-Saharan Africa	$15,286	66.1	46.2	34.4

region—Puerto Rico, at 35th. Israel is 17th overall and tops the MENA region, just ahead of UAE at 21st. In Sub-Saharan Africa, Botswana is the leader at 52nd, ranking ahead of nine European nations.

2.4 Biggest Gains

Here we show the biggest losers. Note, again, that for the comparison we had to recalculate the 2016 edition scores to fit to the changes we have done in the 2017 edition. Table 2.4 shows the biggest losers in the 2016 version of GEDI relative to the 2017 edition. The losers took about the same hits as compared to the gainers with Belize and Puerto Rico—both are from the South and Central America/Caribbean region—looking over 6.5 and 5.2 points in their scores, respectively. There are three European countries, Hungary, Norway and Greece amongst the largest losers. Since six out of the ten biggest gainers are also from Europe, it is an indication of an increased polarization of Europe's entrepreneurial development. The two leading African countries, Botswana and South Africa are also losing ground together with three Asian countries Taiwan, Thailand and Malaysia

What countries are gaining the most in the global ecosystem? This time the answer is not based on a straightforward comparison of the 2016 edition results, because of the change in the institutional pillar components from the 2016 to the 2017 edition. So we had to recalculate the 2016 edition scores to fit to the new 2017 version, and report these result here. Table 2.3 shows the countries that made the greatest gains on the GEDI scores from 2016 to 2017. The ten countries that made the greatest gains changed rankings from a high of 6 places to a low of −1(!). Switzerland and the United Kingdom increased 5.5 points followed by China with 4.0 points. Despite Ireland improved by 3.4 it dropped one place in ranking because the United Kingdom improved even more. United States's GEI score also increased by 1.7 but the gap between the EU and the US have lessened because of the notable progress of several EU countries. In fact, six out of the ten gainers are found in Europe, one in Asia (China), and two in North America (Mexico, US).

Table 2.3 Biggest gains in GEI score from 2016 to 2017

Country	Score 2017	Score 2016	Difference in scores	Differences in rank
Switzerland	78.0	72.4	5.5	3
United Kingdom	71.3	65.8	5.5	2
China	36.3	32.2	4.0	6
Ireland	71.3	67.6	3.4	−1
Finland	66.9	63.8	3.2	0
Belgium	63.0	60.3	2.7	1
Mexico	25.7	23.0	2.6	6
Germany	64.9	62.5	2.4	3
Slovakia	44.1	41.9	2.2	1
United States	83.4	81.7	1.7	0

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

Table 2.4 Biggest declines in GEI score from 2016 to 2017

Country	Score 2017	Score 2016	Difference in scores	Differences in rank
Belize	16.6	23.1	−6.5	−12
Puerto Rico	40.6	45.8	−5.2	−3
Hungary	36.3	40.4	−4.1	−3
Norway	55.9	59.2	−3.4	−3
Taiwan	60.7	63.5	−2.9	−3
Greece	34.6	36.3	−1.7	−3
Thailand	27.1	28.5	−1.4	0
Botswana	34.4	35.6	−1.2	−3
South Africa	32.6	33.9	−1.2	−1
Malaysia	33.4	34.6	−1.2	−3

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

2.5 Biggest Declines

Here we show the biggest losers. Note, again, that for the comparison we had to recalculate the 2016 edition scores to fit to the changes we have done in the 2017 edition. Table 2.4 shows the biggest losers in the 2016 version of GEDI relative to the 2017 edition. The losers took about the same hits as compared to the gainers with Belize and Puerto Rico - both are from the South and Central America/ Caribbean region - looking over 6.5 and 5.2 points in their scores, respectively. There are three European countries, Hungary, Norway and Greece amongst the largest losers. Since six out of the ten biggest gainers are also from Europe, it is an indication of an increased polarization of Europe's entrepreneurial development. The two leading African countries, Botswana and South Africa are also losing ground together with three Asian countries Taiwan, Thailand and Malaysia.

2.5.1 The Role of Entrepreneurship in Global Prosperity

Last year we explored how entrepreneurship correlates with global prosperity. That is, do the things that most of the world is striving for—a better environment, economic growth, and world peace—coincide with individual initiative? Entrepreneurship is widely understood as a means of "growing the pie"—that is, increasing economic activity to create more jobs and produce more income for more people, rather than merely transferring wealth from one group to another.

We explored the relationship between the GEI and each of our comparator variables: GDP per capita (PPP); income equality (GINI); digital evolution (The Digital Evolution Index, Tufts); environmental performance (Yale Environmental Performance Index); economic freedom (Heritage Foundation Index of Economic Freedom); and peace (Institute for Economics and Peace Global Peace Index).

We found that the most common economic measure, GDP, correlates relatively highly with the Global Entrepreneurship and Development Index. However, with an R-squared of (0.58), there is clearly more to entrepreneurship than income levels alone. We also found that entrepreneurship correlates weakly positively with income equality, another common measure of concern.

As we moved into narrower indicators of specific aspects of prosperity, we found the highest correlations between entrepreneurship and digital evolution and environmental performance (both 0.72). Less closely correlated are economic freedom (0.51) and peace (0.34).

One of the strongest relationships was between entrepreneurship and the digital revolution. While this at first brush might seem surprising if we think a little harder it makes sense. We are in a digital revolution that is transforming every industry around the world and entrepreneurs are creating new companies that are carrying this out. Trying to understand the leading forces of development in the twenty-first century without digital technologies would be the same as explaining the nineteenth century industrial revolution without talking about the steam engines.[4]

A new entrepreneurial company type is at the heart of a growing debate on how to understand the digital economy. Ever since the launch of Uber, Snapchat and AirBnB and the earlier success of Google, Amazon, and Facebook, a new breed of company has emerged that uses digital technology, entrepreneurship and innovation to upend industries on a global scale.[5] The core competencies of these companies are that they depend on the Internet for both factor market inputs and product market outcomes and would not exist without the Internet. While Walmart would not be as efficient without the Internet it would survive because it has a physical location. Amazon on the other hand could not function since it has no physical outlet. These new companies are startups in many ways. They are young, only a few years old in some cases, but they grow very quickly especially in terms of users.

[4] For a more in depth understanding of the digital economy visit our website: thegedi.org.

[5] 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.

Table 2.5 GEI correlated variables with R-squared coefficients

Correlated variables	R-squared
GEI vs. GDP per capita	0.62
GEI vs. DEI	0.79
GDP vs. digital citizenship	0.45
GDP vs. digital governance	0.43
GDP vs. digital marketplace	0.40
GDP vs. digital business	0.20

So it is no surprise that entrepreneurship and digitalization correlate. This year we decided to probe this question further on the importance of the digital entrepreneurial ecosystem. Table 2.5 shows the correlates first for entrepreneurship vs digitalization and for GDP vs digital citizenship, digital governance, digital marketplace and digital business. We find very strong results for the emergence of a digital entrepreneurial ecosystem. It appears that a digital ecosystem is being created rapidly around the world and that a digital business model is following not far behind.

2.5.2 Does Entrepreneurship Make a Country Rich?

The first question we explore is, **"Does productive high-impact entrepreneurship make countries rich?"** The data show that high-income countries tend to have better entrepreneurship ecosystems, and vice versa with a correlation of 0.62. The sign is also positive. There is no rich country with very low or no entrepreneurship. However, many other factors are also at play in the GDP game. Namely, countries with high mineral wealth (the Gulf States and Norway) have very high GDP compared to their entrepreneurship scores. Singapore and Hong Kong also have very high income levels compared to their (still high) entrepreneurship scores, a reflection of their high urbanization and concentrated economic activity (Fig. 2.3).

This suggests that entrepreneurship doesn't necessarily make a country rich but, rather, that there is more than one path to wealth. It is also true that high incomes are not enough to foster entrepreneurship; economic structure and cultural qualities are also important factors of a healthy entrepreneurship ecosystem. However, the relationship observed does indicate that improvements to GDP could be brought about by changes that improve GEI scores. Based on the above relationship, if every country in the GEI raised its score by 10%, it could add $22 trillion to global GDP.[6] The country by country breakdown of this total is shown in Table 2.6 below.

[6] We agree that correlation is not the same as causation, which is why we say that a 10% global increase in GEI *could* add $22 trillion. However, it does stand to reason that such changes, and the changes to institutions that they represent, could add such a large amount to global productivity, since the institutions that support entrepreneurship also support a variety of other economic and non-economic activities.

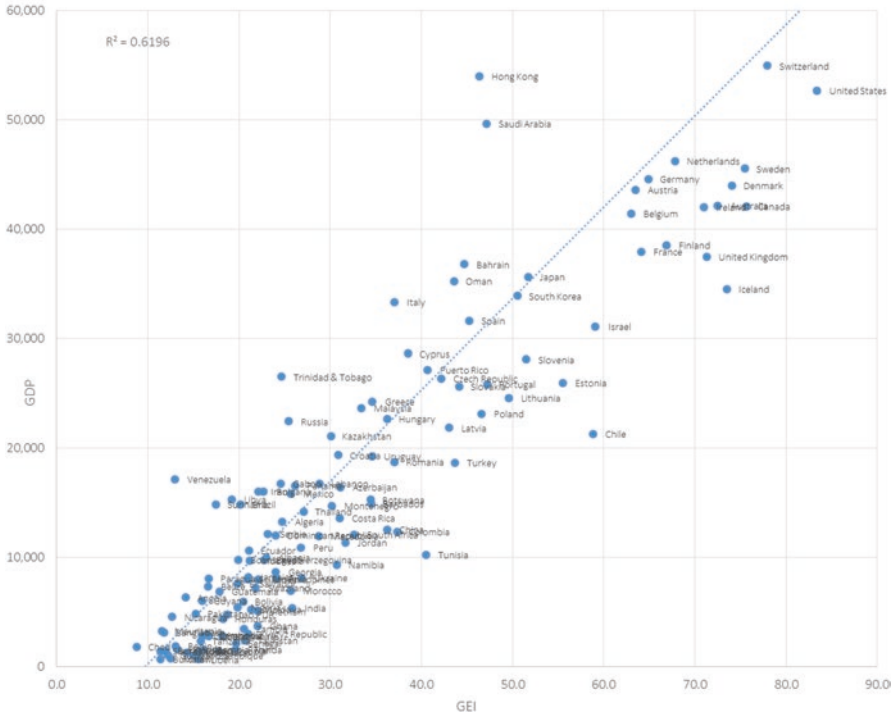


Fig. 2.3 GEI vs. GDP

2.5.3 Is Entrepreneurship Related to the Digital Ecosystem?

The second question is, **"What is the relationship between entrepreneurship and the digital ecosystem?"** The answer seems to be that there is a strong relationship between entrepreneurship and digital technology. The correlation is 0.79 and the sign is positive. In other words entrepreneurship and digital technology seem to move in the same direction. If we think about it, it is almost impossible to start a productive business without digital tools! You can't even buy an airline ticket without a computer! China while low on digital ecosystem does better at entrepreneurship. Malaysia does poorly at entrepreneurship, great at digital innovation. Latvia and Lithuania are better at digital. France, Germany, Austria—better at entrepreneurship. In general they're very closely related—innovation breeds innovation—policies that allow for innovation in one area allow for innovation in other areas—e.g. a good digital environment empowers entrepreneurs too (Fig. 2.4).

To better understand the digital ecosystem we further explore four areas of the digital entrepreneurship ecosystem: Digital Infrastructure Governance; Digital Users Citizenship; Digital Entrepreneurship; and Digital Marketplace.

Table 2.6 Predicted increase in GDP with 10% improvement in GEI

Countries	2017 GEI	Additional GDP in billions with 10% GEI increase
Albania	23.0	$6.65
Algeria	24.7	$98.75
Angola	14.1	$31.27
Argentina	22.2	$92.83
Armenia	22.1	$6.61
Australia	72.5	$170.33
Austria	63.5	$54.16
Azerbaijan	31.1	$29.65
Bahrain	44.7	$6.01
Bangladesh	11.8	$186.57
Barbados	34.5	$0.99
Belgium	63.0	$70.70
Belize	16.6	$0.56
Benin	13.0	$13.82
Bolivia	20.4	$22.17
Bosnia and Herzegovina	19.9	$7.63
Botswana	34.4	$7.01
Brazil	20.1	$406.54
Brunei Darussalam	33.9	$1.43
Bulgaria	22.7	$16.40
Burkina Faso	11.9	$20.79
Burundi	11.4	$11.93
Cambodia	16.5	$25.38
Cameroon	16.0	$36.42
Canada	75.6	$268.69
Chad	8.8	$11.58
Chile	58.8	$104.59
China	36.3	$4945.98
Colombia	37.3	$182.70
Costa Rica	31.0	$15.31
Côte d'Ivoire	16.6	$34.62
Croatia	30.8	$13.07
Cyprus	38.5	$4.44
Czech Republic	42.2	$44.35
Denmark	74.1	$41.77
Dominican Republic	24.0	$25.25
Ecuador	21.1	$33.67
Egypt	22.7	$189.63
El Salvador	19.8	$12.66
Estonia	55.5	$7.30
Ethiopia	17.8	$171.60
Finland	66.9	$36.56

(continued)

Table 2.6 (continued)

Countries	2017 GEI	Additional GDP in billions with 10% GEI increase
France	64.1	$424.30
Gabon	24.6	$4.21
Gambia	16.1	$3.07
Georgia	24.0	$10.83
Germany	64.9	$524.71
Ghana	22.0	$58.30
Greece	34.6	$37.94
Guatemala	17.9	$28.37
Guinea	12.1	$14.63
Guyana	15.9	$1.28
Honduras	18.2	$15.06
Hong Kong	46.4	$33.59
Hungary	36.3	$35.75
Iceland	73.5	$2.41
India	25.8	$3273.44
Indonesia	21.2	$534.70
Iran	22.1	$173.43
Ireland	71.0	$32.73
Israel	59.1	$48.54
Italy	37.0	$227.11
Jamaica	21.0	$5.71
Japan	51.7	$657.54
Jordan	31.7	$20.95
Kazakhstan	30.1	$52.00
Kenya	18.2	$82.87
Korea	50.5	$254.79
Kuwait	42.5	$11.66
Kyrgyz Republic	21.0	$12.26
Lao PDR	18.7	$12.91
Latvia	43.0	$8.56
Lebanon	28.8	$12.99
Liberia	15.6	$6.85
Libya	19.2	$12.01
Lithuania	49.6	$14.53
Luxembourg	58.1	$3.27
Macedonia	28.7	$6.06
Madagascar	14.3	$33.67
Malawi	12.5	$21.02
Malaysia	33.4	$100.96
Mali	15.6	$24.68
Mauritania	11.6	$4.61
Mexico	25.7	$317.91

(continued)

Table 2.6 (continued)

Countries	2017 GEI	Additional GDP in billions with 10% GEI increase
Moldova	21.3	$7.58
Montenegro	30.2	$1.88
Morocco	25.7	$86.01
Mozambique	15.1	$40.00
Myanmar	15.6	$84.06
Namibia	30.7	$7.20
Netherlands	67.8	$114.25
Nicaragua	12.7	$7.82
Nigeria	19.9	$354.44
Norway	55.9	$28.70
Oman	43.6	$17.12
Pakistan	15.2	$281.79
Panama	26.2	$10.27
Paraguay	16.7	$11.53
Peru	26.8	$82.35
Philippines	24.1	$241.09
Poland	46.6	$177.13
Portugal	47.2	$49.09
Puerto Rico	40.6	$14.42
Qatar	58.0	$12.57
Romania	37.1	$73.78
Russia	25.4	$365.71
Rwanda	19.6	$23.74
Saudi Arabia	47.2	$138.50
Senegal	19.7	$28.59
Serbia	23.1	$16.49
Singapore	52.2	$28.55
Sierra Leone	11.4	$7.08
Slovakia	44.1	$23.90
Slovenia	51.5	$10.62
South Africa	32.6	$176.29
Spain	45.3	$210.00
Sri Lanka	20.9	$43.20
Suriname	17.5	$0.95
Swaziland	21.8	$2.77
Sweden	75.5	$73.12
Switzerland	78.0	$63.86
Taiwan	60.7	$142.19
Tajikistan	20.7	$17.19
Tanzania	15.8	$80.06
Thailand	27.1	$181.86
Trinidad and Tobago	24.6	$3.31

(continued)

Table 2.6 (continued)

Countries	2017 GEI	Additional GDP in billions with 10% GEI increase
Tunisia	40.5	$44.57
Turkey	43.7	$331.30
Uganda	13.2	$51.29
Ukraine	26.9	$121.90
United Arab Emirates	58.8	$55.54
United Kingdom	71.3	$459.91
United States	83.4	$2658.22
Uruguay	34.6	$11.82
Venezuela	13.0	$40.02
Vietnam	22.0	$200.00
Zambia	20.5	$30.87
Total		$21,977.09

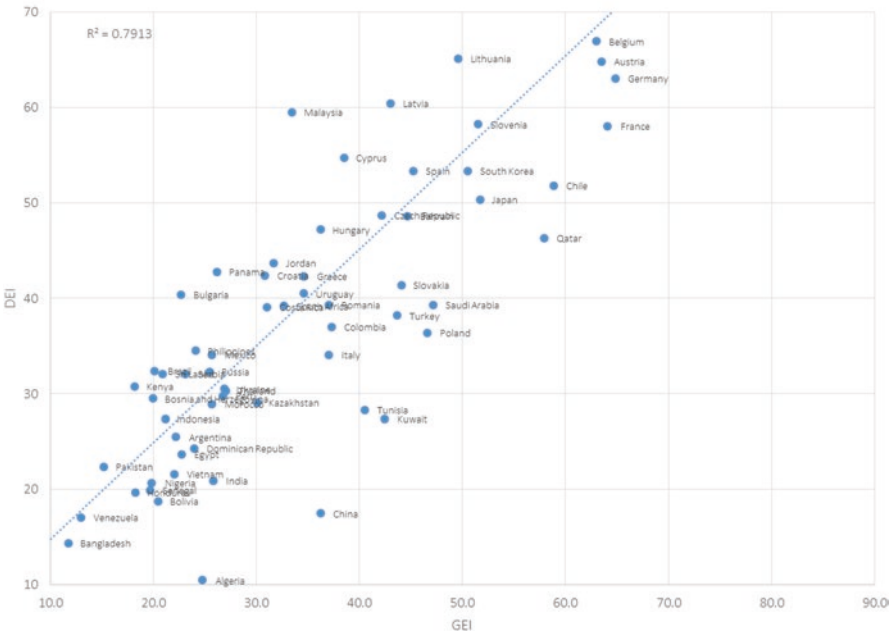


Fig. 2.4 GEI vs. DEI

Four qualifications:

- First, digital entrepreneurship includes any agent that is engaged in any sort of venture be it commercial, social, government, or corporate that uses digital technologies. In others words, the focus is on digital venturing across all social, economic and political activities.

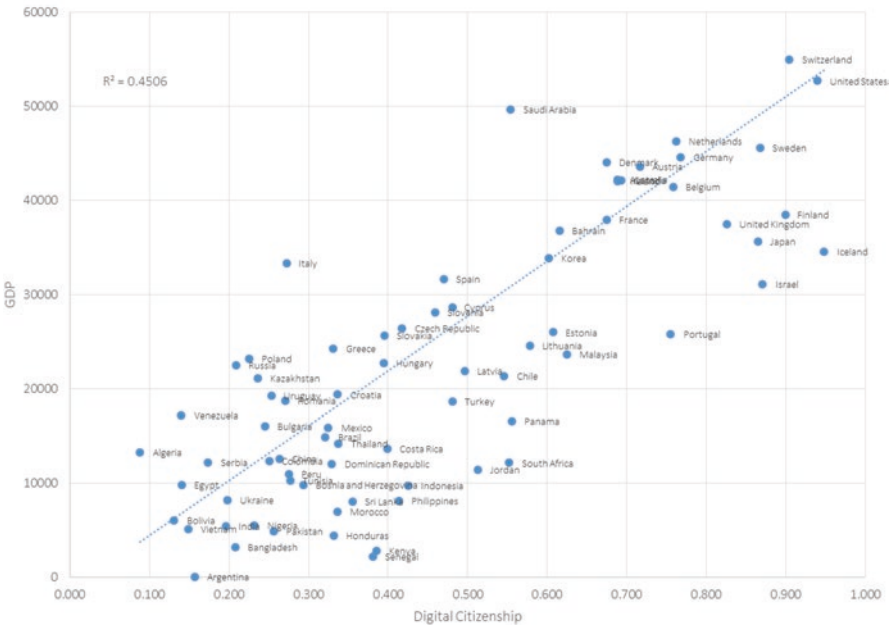


Fig. 2.5 Digital Citizenship vs. GDP

- Second, the digital marketplace includes all aspects of user and agent outcomes: e-social network-based businesses, e-commerce, e-health, e-education and e-government.
- Third, the existence of agents (entrepreneurs) and users (people using the Internet) creates a dynamic whereby companies need to develop business models that integrates millions of users. It is only through this integration that digital business comes to life. The integration of users who do not buy anything but provide data to companies that in turn sell advertising space (e.g., Facebook) is one aspect of this interaction that takes place in the digital marketplace.
- Fourth, the outcome of the digital entrepreneurial ecosystem is a sustainable ecosystem.

2.5.4 Does This Relationship Vary Among the Sub-components of the Digital Entrepreneurship Ecosystem?

2.5.4.1 Measures: Technology Availability and Absorption

Figure 2.5 shows the relationship between digital citizenship and GDP. The correlation is 0.45 and the sign is positive. In other words both the level of GDP and digital citizenship move in the same direction. Saudi Arabia and Italy are way behind in

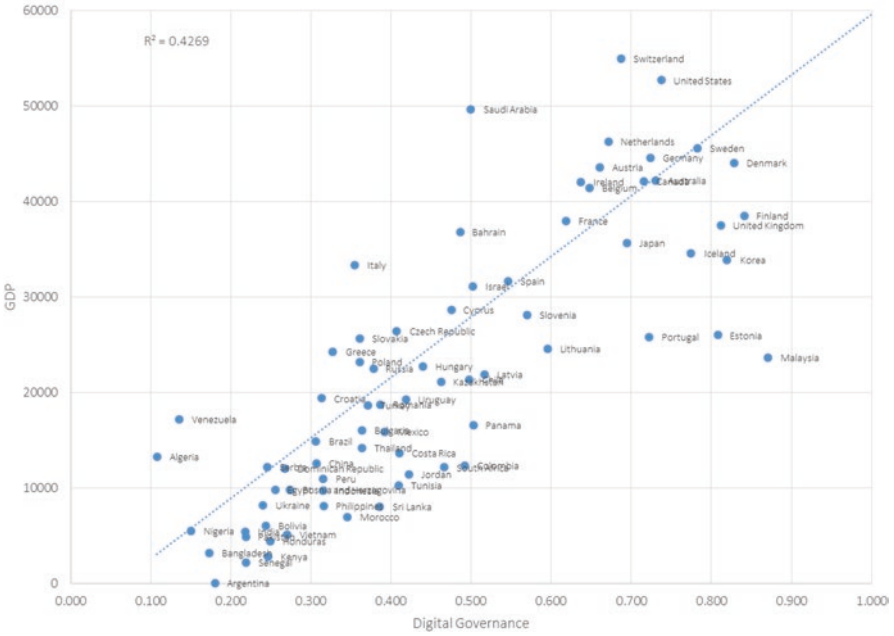


Fig. 2.6 Digital Governance vs. GDP

their digital citizenship scores. Portugal, South Africa, Israel, Iceland are way ahead. We see that countries that are rich such as the United States and Switzerland have good digital citizens. Egypt, Ukraine and Argentina score very low on both.

2.5.4.2 Measures: Business Freedom and ICT Laws

Figure 2.6 shows the relationship between digital governance and GDP. Countries with good governance seem to be richer with a correlation of 0.42 and the sign is again positive. Switzerland, the U.S., Saudi Arabia, Italy, Venezuela, Algeria have relatively lower digital governance but GDP is higher—likely a legacy of prior wealth that will be difficult to maintain without better digital governance. Malaysia and Estonia stand out, reasonable considering both are trying to attract more of the tech industry, meaning it makes sense to establish a good policy environment.

2.5.4.3 Measures: e-Education

Figure 2.7 shows the relationship between digital marketplace and GDP. While it only measures one aspect of the digital marketplace, it is an important one. The correlation is 0.40 and positive. This is a strong relationship. How well are people using digital technologies? Japan does not do very well in the digital marketplace. Why is

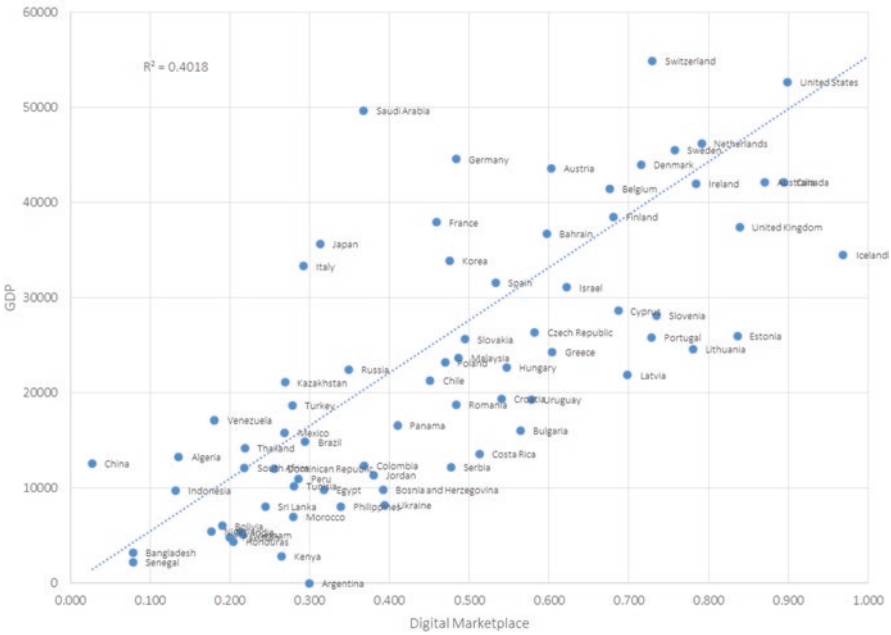


Fig. 2.7 Digital Marketplace vs. GDP

the United Kingdom so much better at the digital marketplace than Japan? It does better on other indicators. Iceland, Estonia and Lithuania do well. These countries have fully embraced digital technologies.

2.5.4.4 Measures: Digital Startups and the Impact of ICT

Finally, we look at the relationship between digital business and GDP. The question is what is the role of digital startups in GDP? The correlation between GDP and digital business is rather weak at 0.19 but positive. Digital business measures how well countries do at starting digital businesses. We see that the United States, Canada, Israel, Estonia and the United Kingdom do very well. They are all very focused on innovation. Most of MENA do badly (except Jordan). Sweden, Denmark, and the Netherlands do poorly vis a vis GDP—interesting because they do well in GEI. They may not be keeping pace with the evolution of the economy, thus we would expect their GEI scores to decline over time because they're not innovating in new (digital) areas (Fig. 2.8).

A few observations: GDP is correlated with all aspects of the digital entrepreneurial ecosystem, though some aspects are stronger than others.

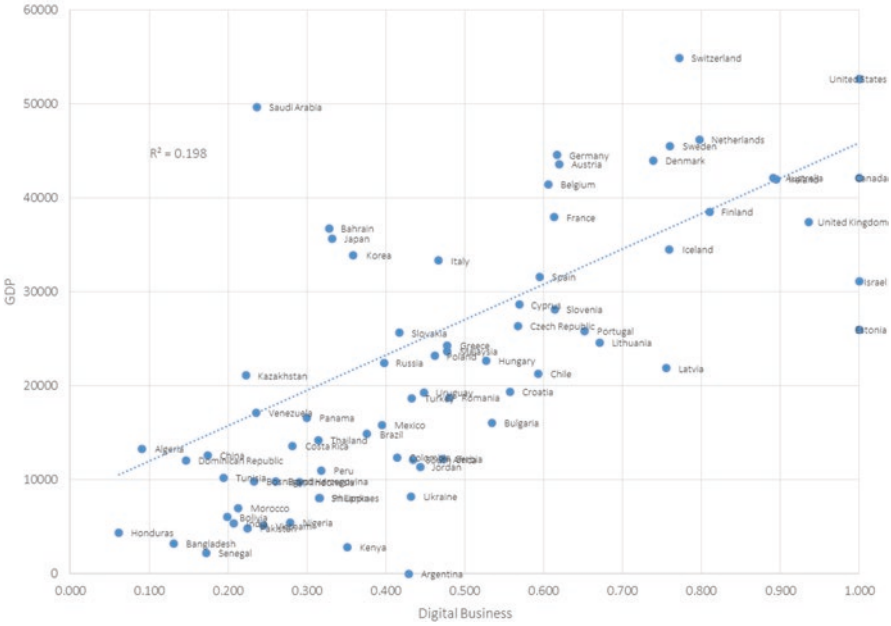


Fig. 2.8 Digital Business vs. GDP

Chapter 3
The Global Entrepreneurship and Development Index

3.1 Introduction

The modern temple of the entrepreneurial ecosystem is like many temples of the ancient world: both are held up by pillars. Like the pillars of ancient temples—made of sand and limestone held together by cement—the pillars of the economic ecosystem are made of individuals and institutions that are held together by the "cement" of incentives created by institutions that influence the behavior of people. The entrepreneurial ecosystem rests on these pillars of development, which hold up three large building blocks consisting of attitudes toward entrepreneurship, entrepreneurial abilities, and entrepreneurial aspirations. The pillars must be of similar height and strength for a fully developed economy to flourish, and they need constant attention, continuous improvement, and careful maintenance.

In this chapter, we fully explain the Global Entrepreneurship and Development Index. We start by discussing the relationship between entrepreneurship and development, followed by the 14 pillars of entrepreneurship. Country rankings and values are reported in terms of the GEI and these 14 pillars. We then present the three sub-indices of attitudes, abilities, and aspirations. Finally, we analyze and compare the different countries and country groups included in the GEI.

3.2 The S-Shaped Curve

As countries develop more and more, people leave self-employment and join organizations. This is true in every country over the centuries. For example, a country in which most people are self-employed will likely reveal a country that is struggling or poor economically. Therefore, the quantity of entrepreneurship declines as countries develop. For example, the level of self-employment in the United States declined from 80% in 1800 to less than 10% today. In most countries that are developed we

Z.J. Acs et al., *Global Entrepreneurship and Development Index 2017*,
SpringerBriefs in Economics, DOI 10.1007/978-3-319-65903-9_3

see the same trend today. They shift from quantity to quality as entrepreneurs become more innovative. In Fig. 3.1 we compare the level of development as measured by the GDP of a country and the level of self-employment. The correlation between GDP and self-employment is 0.21 (TEA) and the sign is negative. In other words as self-employment goes down as a country becomes richer.

However, many indices including the Global Entrepreneurship Monitor still stress the quantity of entrepreneurship and suggest that more self-employment is good for a country when in fact it is not.[1] We can illustrate this with the diamond below. We correlate three of the leading measures of economic development globally: Global Competitive Index, Index of Economic Freedom and the Ease of Doing Business. If the TEA index measured an economic good then it should correlate positively with development measures. If however, we need less of TEA (a quantity measure) then the sign should be negative.

As we can see in Fig. 3.2, the TEA index is negatively correlated with the index of economic freedom (−0.27). This means that less economic freedom gives you more self-employed because entrepreneurs can't build larger businesses. TEA is also negatively correlated with the ease of doing business (−0.57). This means that the harder it is to start a growing business the more people will stay self-employed. Finally, TEA is negatively correlated (−0.46) with the global competitiveness index. This means that the less competitive your country is internationally, the more people will become self-employed. This means that the amount of TEA in a country in negatively correlated with growth and prosperity. Countries in general need less TEA not more. This diamond is a flawed GEM.

How do we move from a quantity measure to a quality measure of entrepreneurship? One clue comes when we take a slightly different cut of the TEA index. GEM measures both opportunity entrepreneurship and necessity entrepreneurship. The first is about growing a business and the other one is about being self-employed because you cannot find a job or cannot grow a business. When we look at the ratio of opportunity to necessity entrepreneurship, the ranking of countries follows a clear development path. Countries that have low necessity entrepreneurship are more developed and countries that have a high level of necessity entrepreneurship have a low level of development. For example, Brazil is at the bottom and Denmark is at the top (Fig. 3.3).

This suggests that the relationship between entrepreneurship and economic development is positive, more is better, and that the curve is most likely an S-shaped curve and not a U-shaped or L-shaped curve (Fig. 3.4).

The S-shaped curve addresses two important questions about entrepreneurship. First, the intersection of the S-curve with the vertical axis suggests that if individuals in a country are very poor they may be in a poverty trap, where the chances for increasing income or wealth are limited. The S-shape of this curve represents the source of poverty. For those in the poverty trap, tomorrow's income will be less than today's, and any attempt to get out of this trap may result in even less future income, which helps to explain why the poor, and poor countries, are so little involved in entrepreneurship.[2]

[1] Marcotte, 2013.

[2] Sachs 2005, Banerjee & Duflo, 2012.

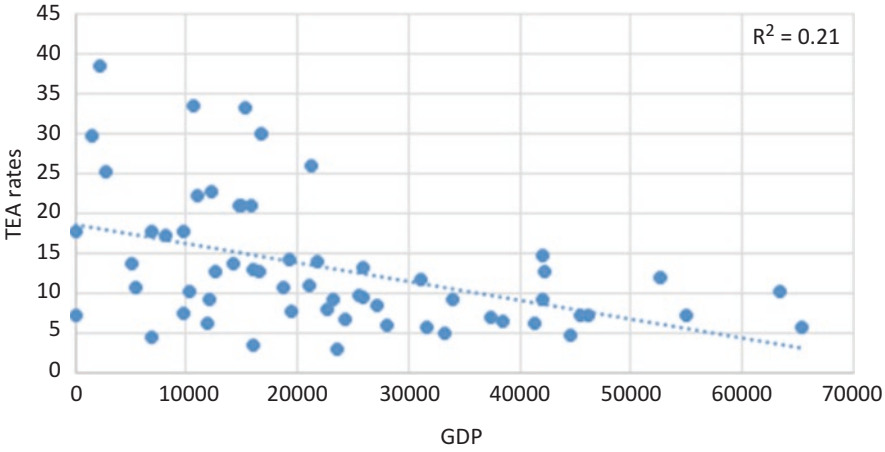
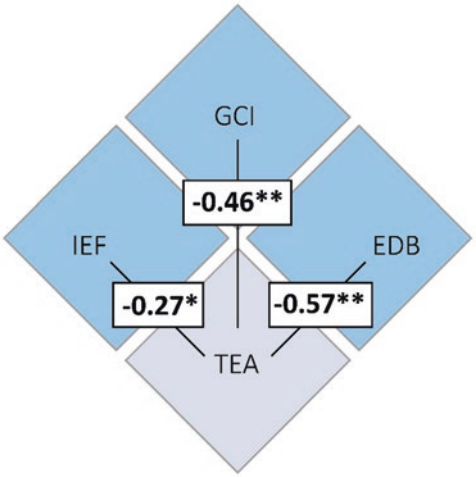


Fig. 3.1 GDP vs. TEA

Fig. 3.2 TEA is negatively correlated with development measures



The S-shaped curve also addresses the question of how much productive entrepreneurship there is in countries at different stages of development and how rapidly it grows. The other side of the S-curve, where it rises at a decreasing rate until it levels off, represents a situation where tomorrow's income is greater than today's, so entrepreneurial activity is possible.[3] How quickly countries modernize depends

[3] Leibenstein 1968, Baumol, 1990, Acs & Virgil 2011.

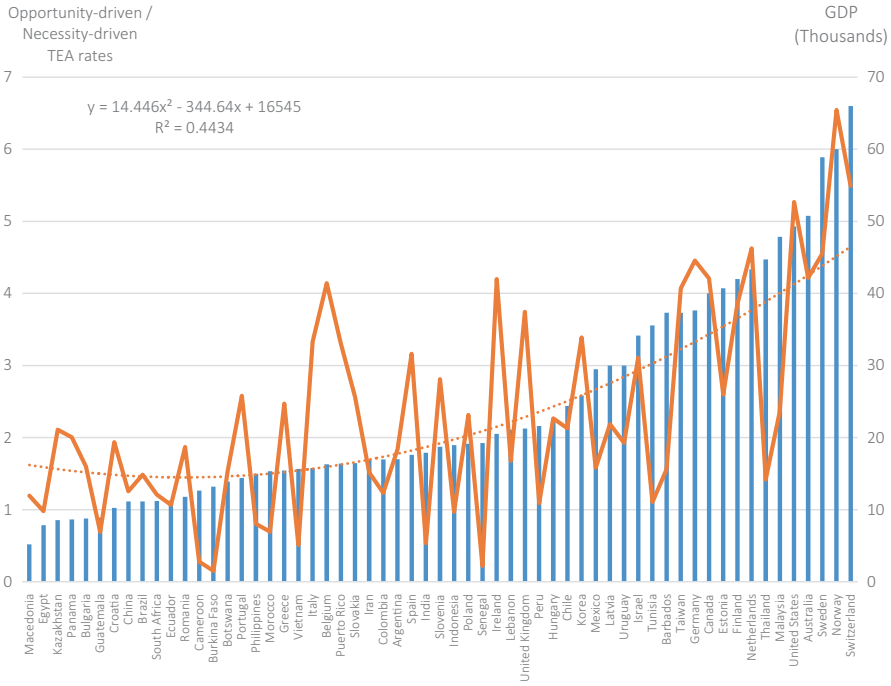


Fig. 3.3 Opportunity TEA and GDP

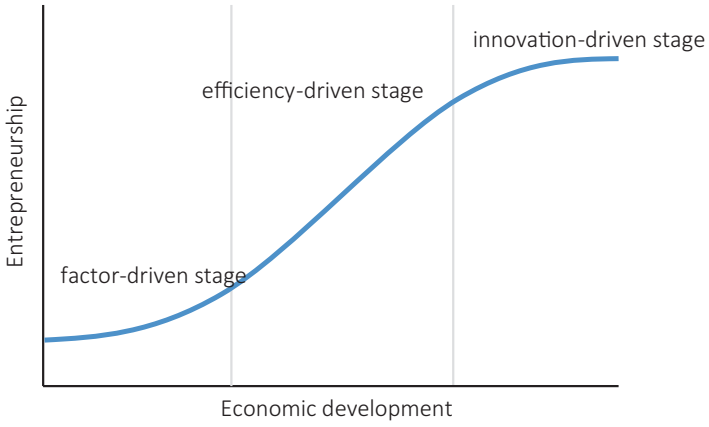


Fig. 3.4 The S-curve of entrepreneurship

on the rise of this curve. The area above the curve is the "valley of backwardness," and being able to come out of the valley depends on improving a nation's institutions. As institutions become stronger, destructive and unproductive activities decline, and more entrepreneurial activity is shifted toward productive entrepreneurship, thus strengthening economic development.[4]

The "valley of backwardness" above the S-curve can only be eliminated by building better institutions and changing a society's incentive structure, all of which require good government and governance. Our assumption of uncertain political economies means that destructive entrepreneurship is most likely to occur in developing countries with some degree of political instability, although it occurs in some form across most countries. As these unstable countries tend to rely on primary and secondary economic industries, inputs for activities in the tertiary and quaternary sectors are not of immediate relevance.

The second source of backwardness is unproductive entrepreneurship, where we only take from one group and give to another. This form of rent seeking is prevalent in many developed and developing countries. If rent seeking by governments and other groups persist, entrepreneurs will be reluctant to make the long-term investment in time and money to create productive, high-impact firms. If countries have extractive economies where only a few benefit at the expense of others, development will not take place.

Therefore, we emphasize the effect productive entrepreneurship can have on the creation of social value as activity shifts out of destructive and unproductive entrepreneurship. In today's interconnected world, we need to improve institutions and be able to measure this progress. The Global Entrepreneurship Ecosystem concept that we introduce focuses on the quality of entrepreneurship and not quantity. Only the former has a positive relationship with global prosperity.

As we can see in Fig. 3.5 the GEI is positively correlated with economic freedom (0.74), positively correlated with the ease of doing business (0.68) and positively correlated with the level of development (0.88). This diamond is a real gem.

3.2.1 The 14 Pillars of an Entrepreneurial Ecosystem

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.[5] 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

[4] Acemoglu & Johnson, 2005; Acs et al., 2009.

[5] 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.

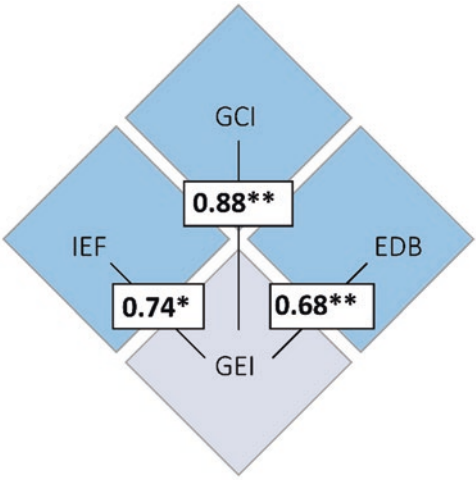


Fig. 3.5 GEI is positively correlated with development measures

of development.[6] 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.

[6] Baumol, 1990; Vivarelli 2013, Thurik et al. 2013.

3.2.1.1 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 a successful opportunity exploitation and no one is confiscating or stealing their property or business.[7] Both institutional components are vital for individuals to become entrepreneurs and not employees of another business or the state.[8]

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% increase in less than a decade. People all over the world see education as a pathway out of poverty.[9]

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.[10]

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

[7] Bjørnskov & Foss 2010, Goel et al. 2015.

[8] Bhola, Verheul, Thurik, & Grilo, 2006. Tumasjan & Braun 2012, Autio et al. (2014).

[9] Papagiannidis & Li, 2005; Dutta, Li, & Merenda 2011, Ibrahim & Mas'ud, 2016.

[10] Caliendo, Fossen, & Kritikos, 2009. Vieider et al. 2015.

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 2 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).[11]

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.[12]

3.2.1.2 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.[13]

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.[14]

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[11] Shane & Cable, 2003; Mian and Hattab 2013, Audretsch et al. 2015.

[12] Guiso, Sapienza, & Zingales, 2015, Lee et al. 2011, Dutta & Sobel 2016.

[13] Da Rin et al. 2011, Asoni, & Sanandaji 2014, Belitski et al. 2016.

[14] Coad & Rao, 2008. García-Morales et al. 2014.

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.[15]

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.[16]

3.2.1.3 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.[17]

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 5 years old. However, most entrepreneurial businesses do not just apply new technology,

[15] Bates, 1990. Qian 2016.

[16] Baumol, Litan, & Schramm, 2007. Calcagno & Sobel 2014.

[17] Autio et al. 2014; Grimpe, & Hussinger 2013, Audretsch et al. 2014b.

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 capital [18]

Pillar 12: *High Growth*. High Growth is a combined measure of the percentage of high-growth businesses that intend to employ at least ten people and plan to grow more than 50% in 5 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.[19]

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.[20]

Pillar 14: *Risk Capital*. The availability of risk finance, particularly equity rather than debt, is an essential precondition for fulfilling entrepreneurial aspirations that

[18] Stam & Wennberg, 2009. Audretsch et al. 2014a, Garud et al. 2014.

[19] Acs, Parsons, & Tracy, 2008, Gompers & Lerner, 2004, Croce et al. 2013, Wright & Stigliani 2013.

[20] De Clercq, Sapienza, & Crijns, 2005; McDougall-Covin et al. 2014.

are beyond an individual entrepreneur's personal financial resources.[21] 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.

3.3 The Global Entrepreneurship and Development Index, 2017 Rankings

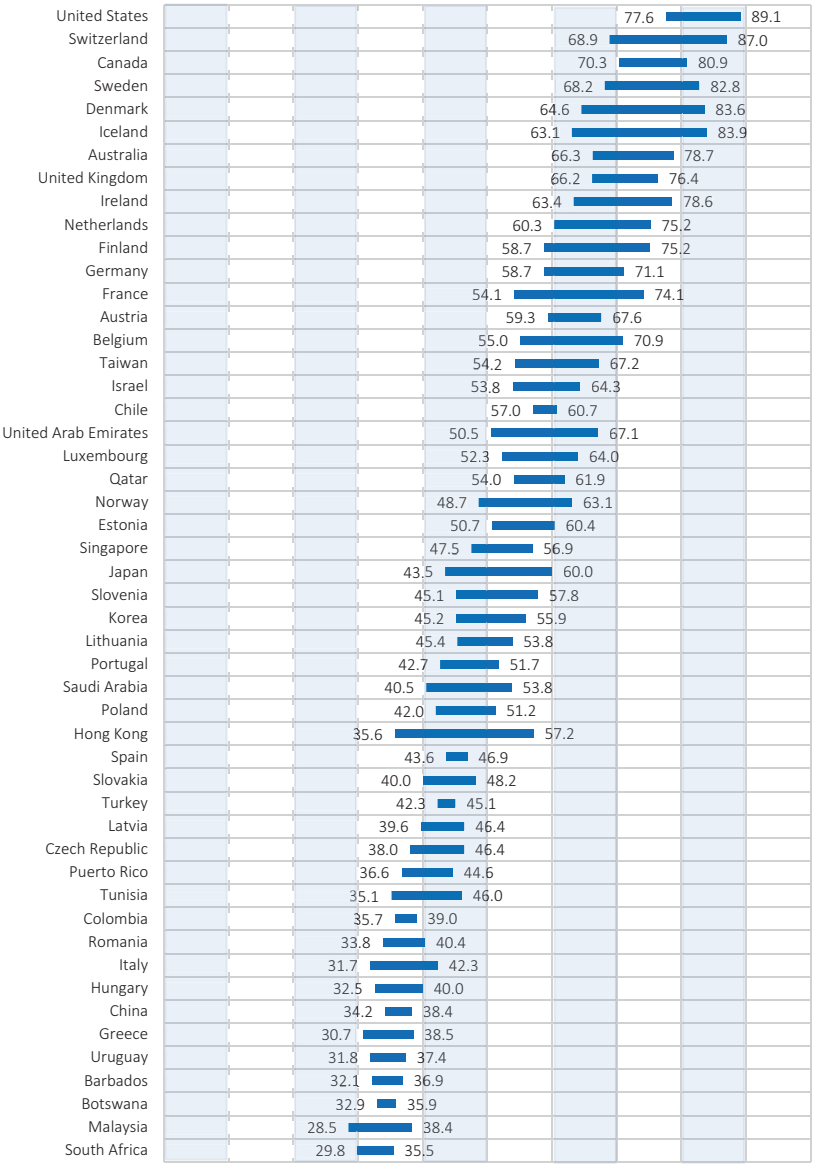
In this section, we report the rankings of the 137 countries on the Global Entrepreneurship and Development Index and its three sub-indices. We also provide confidence intervals for the GEI's. The confidence intervals calculations are based on the Global Entrepreneurship Monitor (GEM) Total Early-Phased Entrepreneurial Activity (TEA) confidence intervals. 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 34 countries where we use 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. The big surprise this year is the rise of Switzerland to second place, primarily driven by the aspiration index with very strong scores in high-growth firms, product innovation and process innovation. Three of the five Nordic countries, Denmark, Iceland, and Sweden, are in the top ten and effectively tied with the United States. Taiwan, the highest Asian country, is in 16th place, and Singapore is 24th, which virtually ties it with Japan. While the Netherlands rises to the tenth-place position just behind the United Kingdom 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 eighth among the top ten countries. The other large European countries rank in the middle:

[21] Groh, Liechtenstein, & Lieser, 2012, Lee et al. 2011.

Table 3.1 The Global Entrepreneurship and Development Index rank of all countries with confidence intervals, 2017



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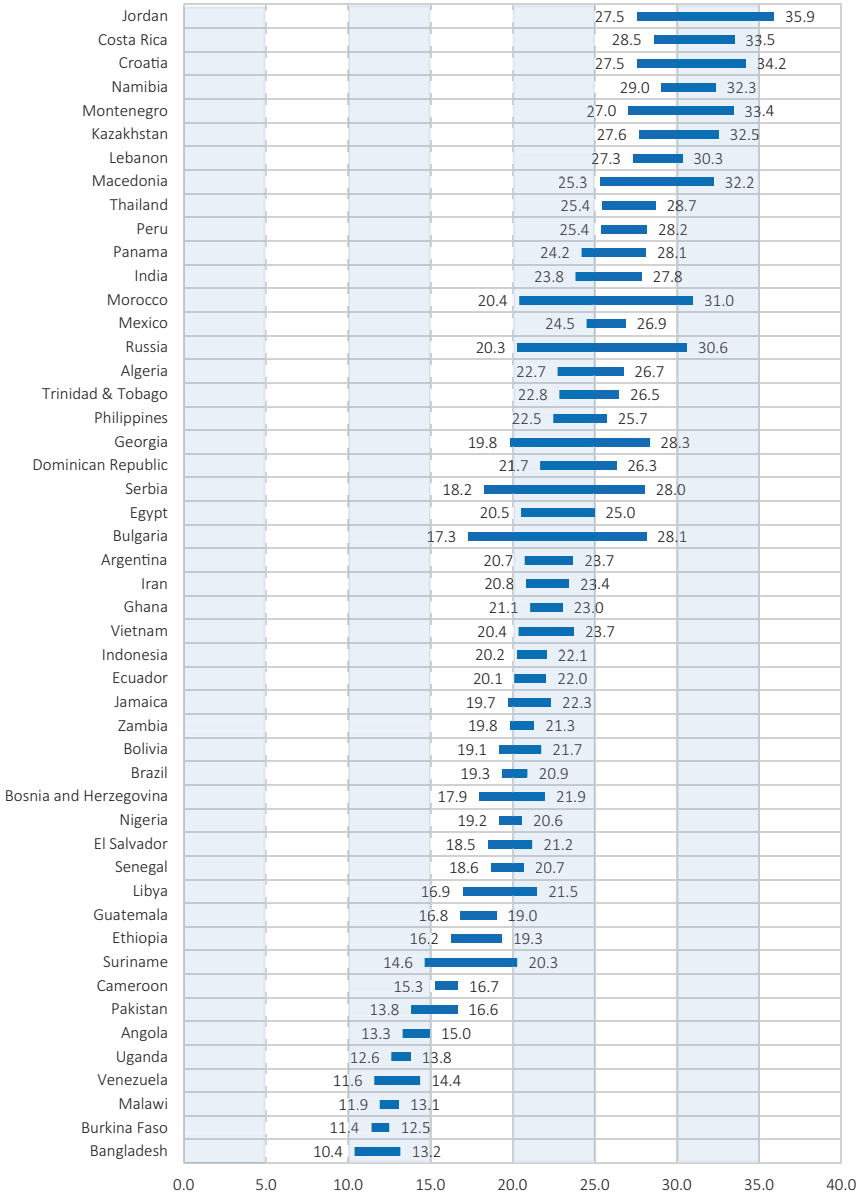

Germany is 12th, France is 13th, and Spain is 32nd followed by Italy in 48th place. While the UK, France, and Germany are relatively well balanced over the 14 pillars, Poland, Spain, and Italy are entrepreneurially less efficient. A likely explanation for the EU countries' relatively weak economic performance over the last decade is their low level of entrepreneurship; the same applies to Japan, which took 30th place. While the gap between the US and the leading European countries declined, Europe is still struggling to create new billion dollar companies.

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 (Table 3.2).

3.4 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

Table 3.2 The Global Entrepreneurship and Development Index rank of all countries, 2017

Global rank	Country	Score
1	United States	83.4
2	Switzerland	78.0
3	Canada	75.6
4	Sweden	75.5
5	Denmark	74.1
6	Iceland	73.5
7	Australia	72.5
8	United Kingdom	71.3
9	Ireland	71.0
10	Netherlands	67.8
11	Finland	66.9
12	Germany	64.9
13	France	64.1
14	Austria	63.5
15	Belgium	63.0
16	Taiwan	60.7
17	Israel	59.1
18	Chile	58.8
19	United Arab Emirates	58.8
20	Luxembourg	58.1
21	Qatar	58.0
22	Norway	55.9
23	Estonia	55.5
24	Singapore	52.2
25	Japan	51.7
26	Slovenia	51.5
27	Korea	50.5
28	Lithuania	49.6
29	Portugal	47.2
30	Saudi Arabia	47.2
31	Poland	46.6
32	Hong Kong	46.4
33	Spain	45.3
34	Bahrain	44.7
35	Slovakia	44.1
36	Turkey	43.7
37	Oman	43.6
38	Latvia	43.0
39	Kuwait	42.5
40	Czech Republic	42.2

(continued)

Table 3.2 (continued)

Global rank	Country	Score
41	Puerto Rico	40.6
42	Tunisia	40.5
43	Cyprus	38.5
44	Colombia	37.3
45	Romania	37.1
46	Italy	37.0
47	Hungary	36.3
48	China	36.3
49	Greece	34.6
50	Uruguay	34.6
51	Barbados	34.5
52	Botswana	34.4
53	Brunei Darussalam	33.9
54	Malaysia	33.4
55	South Africa	32.6
56	Jordan	31.7
57	Azerbaijan	31.1
58	Costa Rica	31.0
59	Croatia	30.8
60	Namibia	30.7
61	Montenegro	30.2
62	Kazakhstan	30.1
63	Lebanon	28.8
64	Macedonia	28.7
65	Thailand	27.1
66	Ukraine	26.9
67	Peru	26.8
68	Panama	26.2
69	India	25.8
70	Morocco	25.7
71	Mexico	25.7
72	Russia	25.4
73	Algeria	24.7
74	Trinidad & Tobago	24.6
75	Gabon	24.6
76	Philippines	24.1
77	Georgia	24.0
78	Dominican Republic	24.0
79	Serbia	23.1
80	Albania	23.0
81	Egypt	22.7

(continued)

Global rank	Country	Score
82	Bulgaria	22.7
83	Argentina	22.2
84	Armenia	22.1
85	Iran	22.1
86	Ghana	22.0
87	Vietnam	22.0
88	Swaziland	21.8
89	Moldova	21.3
90	Indonesia	21.2
91	Ecuador	21.1
92	Kyrgyz Republic	21.0
93	Jamaica	21.0
94	Sri Lanka	20.9
95	Tajikistan	20.7
96	Zambia	20.5
97	Bolivia	20.4
98	Brazil	20.1
99	Bosnia and Herzegovina	19.9
100	Nigeria	19.9
101	El Salvador	19.8
102	Senegal	19.7
103	Rwanda	19.6
104	Libya	19.2
105	Lao PDR	18.7
106	Honduras	18.2
107	Kenya	18.2
108	Guatemala	17.9
109	Ethiopia	17.8
110	Suriname	17.5
111	Paraguay	16.7
112	Côte d'Ivoire	16.6
113	Belize	16.6
114	Cambodia	16.5
115	Gambia, The	16.1
116	Cameroon	16.0
117	Guyana	15.9
118	Tanzania	15.8
119	Mali	15.6
120	Myanmar	15.6
121	Liberia	15.6
122	Pakistan	15.2

(continued)

Table 3.2 (continued)

Global rank	Country	Score
123	Mozambique	15.1
124	Madagascar	14.3
125	Angola	14.1
126	Uganda	13.2
127	Benin	13.0
128	Venezuela	13.0
129	Nicaragua	12.7
130	Malawi	12.5
131	Guinea	12.1
132	Burkina Faso	11.9
133	Bangladesh	11.8
134	Mauritania	11.6
135	Sierra Leone	11.4
136	Burundi	11.4
137	Chad	8.8

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 entre-

preneurial aspirations, while entrepreneurial aspirations and abilities also influence entrepreneurial attitudes.

Figure 3.6 shows the relationship between the GEI, the three sub-indices, and national per capita wealth, based on purchasing power parity GDP. In all the figures, we provide the associated trend line and R-squared values. All the trend lines are based on third-degree polynomial equations.

The overall Index shows a good fit and a positive relationship between development and entrepreneurship. The two move in the same direction, with an $R^2 = 0.81$, which implies a close, strong relationship between entrepreneurship and economic development. Unlike other entrepreneurship measures that find an L-shaped (self-employment rate) or a U-shaped (Total Early-Phase Entrepreneurial Activity index) relationship between entrepreneurship and development, we find a mild S-shaped relationship.

The relationship between the Entrepreneurial Attitudes sub-index (ATT) and development is shown in the top right figure. The relationship is similar to the logarithmic function, implying that overall entrepreneurship attitudes increase as

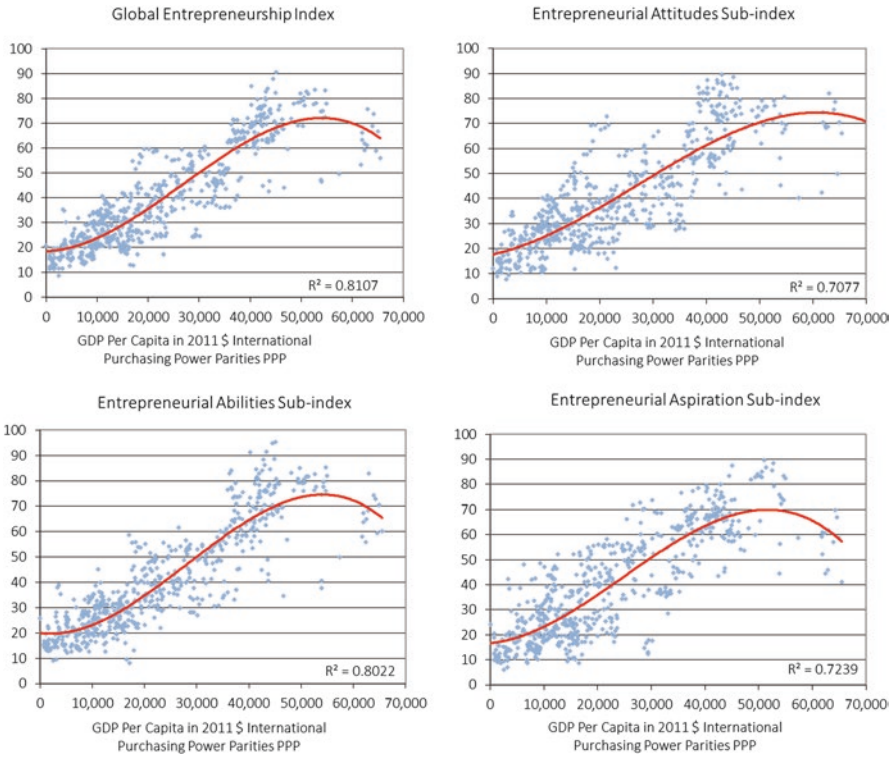

Fig. 3.6 The three sub-indices in terms of per capita real GDP (2013–2015, all data included). Number of observations = 399

a country develops. The explanatory power, based on the $R^2 = 0.70$, shows a significant, strong correlation between ATT and per capita GDP.

The lower-left figure contains the Entrepreneurial Abilities sub-index (ABT) values in terms of economic development. The explanatory power, $R^2 = 0.80$, is the highest among the three sub-indices, implying a close and strong relationship between entrepreneurial abilities and development.

The trend of the Entrepreneurial Aspirations sub-index (ASP) is probably no surprise. The explanatory power of $R^2 = 0.72$ is significant and strong.

Table 3.3 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 11th in attitudes, 2nd in aspirations, and 3rd in abilities, as it is more interested in high-impact entrepreneurship than in replicative activities. Chile represents a more unbalanced case, ranking 18th in the overall Index slipping three places, 8th in attitudes, 29th in

Table 3.3 The Global Entrepreneurship and Development Index and sub-index ranks of the first 25 countries, 2017

Countries	GEI	GEI rank	ATT	ATT rank	ABT	ABT rank	ASP	ASP rank
United States	83.4	1	79.1	2	82.6	2	88.4	1
Switzerland	78.0	2	69.5	11	81.9	3	82.5	2
Canada	75.6	3	73.4	6	75.8	7	77.5	3
Sweden	75.5	4	73.4	5	79.1	5	73.9	5
Denmark	74.1	5	71.6	9	84.5	1	66.0	15
Iceland	73.5	6	81.4	1	68.5	10	70.6	8
Australia	72.5	7	73.2	7	73.6	8	70.8	7
United Kingdom	71.3	8	70.1	10	79.2	4	64.6	16
Ireland	71.0	9	63.7	14	78.2	6	70.9	6
Netherlands	67.8	10	76.6	4	65.7	14	61.0	20
Finland	66.9	11	78.3	3	56.3	20	66.2	14
Germany	64.9	12	59.4	16	66.6	13	68.6	9
France	64.1	13	56.7	17	67.3	11	68.3	11
Austria	63.5	14	65.1	13	66.8	12	58.5	22
Belgium	63.0	15	52.7	22	68.9	9	67.3	12
Taiwan	60.7	16	54.4	21	53.6	23	74.0	4
Israel	59.1	17	54.5	20	54.1	22	68.6	10
Chile	58.8	18	72.8	8	48.5	29	55.2	27
United Arab Emirates	58.8	19	49.9	25	59.4	18	67.0	13
Luxembourg	58.1	20	47.8	27	64.7	15	61.9	19
Qatar	58.0	21	55.9	19	55.6	21	62.3	18
Norway	55.9	22	66.2	12	60.2	17	41.2	44
Estonia	55.5	23	59.5	15	52.9	24	54.2	28
Singapore	52.2	24	37.9	42	58.3	19	60.5	21
Japan	51.7	25	30.8	59	61.1	16	63.3	17

abilities, and 27th 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 21st in the overall Index but performs poorly in attitudes and abilities. However, it ranks tenth in Aspirations, despite having poorer attitudes and abilities. For the "startup nation" it has an overall poor ranking in startup skills—at the bottom of the top 25 countries.

Tables 3.4, 3.5, 3.6 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 ranks and the pillar values for all 132 countries can be found in the Appendices.

Table 3.4 Entrepreneurial attitudes sub-index and pillar values for the first 25 countries, 2017[a]

Countries	ATT	Opportunity perception	Startup skills	Risk acceptance	Networking	Cultural support
Iceland	81.4	0.948	1.000	0.903	1.000	0.640
United States	79.1	0.850	1.000	0.984	0.529	0.877
Finland	78.3	0.914	0.943	0.750	0.986	0.905
Netherlands	76.6	0.870	0.902	0.817	0.765	1.000
Sweden	73.4	1.000	0.509	0.750	0.738	0.896
Canada	73.4	1.000	0.733	0.755	0.525	0.848
Australia	73.2	0.955	1.000	0.678	0.509	0.748
Chile	72.8	0.930	0.925	1.000	0.771	0.703
Denmark	71.6	1.000	0.634	0.736	0.674	0.923
United Kingdom	70.1	0.835	0.583	0.844	0.506	0.913
Switzerland	69.5	0.759	0.723	0.893	0.529	0.683
Norway	66.2	1.000	0.594	0.985	0.485	1.000
Austria	65.1	0.815	0.844	0.692	0.574	0.691
Ireland	63.7	0.664	0.904	0.738	0.391	0.743
Estonia	59.5	0.896	0.669	0.584	0.533	0.573
Germany	59.4	0.761	0.569	0.624	0.381	0.832
France	56.7	0.469	0.451	0.680	0.649	0.646
Saudi Arabia	56.3	0.549	0.865	0.481	0.784	0.693
Qatar	55.9	0.784	0.253	0.466	0.797	0.986
Israel	54.5	0.712	0.494	0.474	0.789	0.644
Taiwan	54.4	0.562	0.447	0.594	0.597	0.599
Belgium	52.7	0.711	0.592	0.549	0.346	0.563
Portugal	50.3	0.451	0.661	0.627	0.366	0.533
Slovenia	50.0	0.296	0.837	0.793	0.332	0.486
United Arab Emirates	49.9	0.504	0.330	0.353	0.687	0.791

[a]Pillar values are the normalized pillar scores after the average pillar correction

Table 3.5 Entrepreneurial abilities sub-index and pillar values for the first 25 countries, 2017[a]

Countries	ABT	Opportunity startup	Technology absorption	Human capital	Competition
Denmark	84.5	1.000	1.000	1.000	0.978
United States	82.6	0.766	0.812	1.000	0.970
Switzerland	81.9	0.918	0.899	0.775	0.898
United Kingdom	79.2	0.892	0.984	0.752	0.759
Sweden	79.1	0.946	1.000	0.627	0.828
Ireland	78.2	0.907	0.801	0.926	0.920
Canada	75.8	0.975	0.607	0.920	0.707
Australia	73.6	0.880	0.774	0.937	0.526
Belgium	68.9	0.565	0.876	0.808	0.850
Iceland	68.5	1.000	1.000	0.495	0.476
France	67.3	0.605	0.941	0.549	0.758
Austria	66.8	0.821	0.892	0.530	0.767
Germany	66.6	0.763	0.789	0.452	0.921
Netherlands	65.7	0.965	0.765	0.380	0.806
Luxembourg	64.7	1.000	0.814	0.578	0.983
Japan	61.1	0.592	0.969	1.000	0.580
Norway	60.2	1.000	0.758	0.404	0.680
United Arab Emirates	59.4	0.790	0.324	1.000	0.570
Singapore	58.3	1.000	0.741	1.000	0.638
Finland	56.3	1.000	0.601	0.457	0.379
Qatar	55.6	0.668	0.244	0.857	0.833
Israel	54.1	0.644	1.000	0.738	0.217
Taiwan	53.6	0.702	0.454	0.694	0.385
Estonia	52.9	0.591	0.500	0.523	0.609
Puerto Rico	52.4	0.552	0.266	1.000	0.833

[a]Pillar values are the normalized pillar scores after the average pillar correction

3.4.1 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.

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

Table 3.6 Entrepreneurial aspirations sub-index and pillar values for the first 25 countries, 2017[a]

Countries	ASP	Product innovation	Process innovation	High growth	Internationalization	Risk capital
United States	88.4	0.909	0.932	1.000	1.000	1.000
Switzerland	82.5	0.971	0.877	0.611	1.000	1.000
Canada	77.5	0.788	0.657	0.693	0.977	1.000
Taiwan	74.0	1.000	0.769	1.000	0.512	0.929
Sweden	73.9	0.806	1.000	0.611	0.868	0.622
Ireland	70.9	0.842	0.756	0.833	0.827	0.630
Australia	70.8	0.587	0.765	0.654	0.721	0.964
Iceland	70.6	0.684	0.869	0.625	0.952	0.604
Germany	68.6	0.757	0.841	0.607	0.779	0.758
Israel	68.6	1.000	1.000	0.798	0.602	0.908
France	68.3	0.650	0.891	0.590	0.721	0.747
Belgium	67.3	0.858	0.916	0.508	0.886	0.614
United Arab Emirates	67.0	0.829	0.457	1.000	0.582	1.000
Finland	66.2	0.792	0.867	0.648	0.683	0.591
Denmark	66.0	1.000	0.727	0.544	0.394	1.000
United Kingdom	64.6	0.646	0.712	0.741	0.636	0.560
Japan	63.3	1.000	1.000	1.000	0.600	0.554
Qatar	62.3	0.767	0.528	1.000	0.459	0.972
Luxembourg	61.9	1.000	0.620	0.500	1.000	0.861
Netherlands	61.0	0.666	0.787	0.506	0.612	0.656
Singapore	60.5	0.659	1.000	1.000	1.000	0.807
Austria	58.5	0.739	0.710	0.328	0.843	0.585
Korea	58.2	0.913	0.946	0.377	0.423	0.769
Slovakia	56.5	0.497	0.533	0.625	1.000	0.574
Hong Kong	56.2	1.000	0.429	0.921	0.503	0.758

[a]Pillar values are the normalized pillar scores after the average pillar correction

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. Iceland leads in the Attitudes sub index, followed by the United States Finland, Netherlands, Sweden, Canada, Australia, Chile, Denmark and the United Kingdom. Japan has the lowest attitudes toward entrepreneurship as families do not encourage entrepreneurship for young people. Chile's eighth place is a very strong showing for a South American country. Factor-driven African and Asian countries, including Swaziland, Mali, Sierra Leone, Ethiopia, Bangladesh, Pakistan, Malawi, Chad, and Burundi, are at the bottom.

3.4.2 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 Opportunity startups. The US ranks second and is relatively weak in Opportunity Startup and Technology Absorption. Switzerland is stronger than the U.S. in two pillars, Opportunity Startups and Technology Absorption, but very weak in Human Capital. The United Kingdom ranks fourth, with a significantly lower Entrepreneurial Abilities score than Denmark, the United States and Switzerland. Sweden is strong in Opportunity Startup and Technology Absorption, but low on Human Capital. The first four countries are followed by Ireland, Canada, Australia, Belgium and Iceland.

3.4.3 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 5 years old, (3) have sales in foreign markets, (4) plan to employ at least ten people, and (5) have greater than 50% growth over the next 5 years. The Finance variable captures the informal venture capital potential, as well as the development of capital, venture capital, and credit markets, which is vital for innovative startups and high-growth firms.

The United States leads in the Entrepreneurial Aspirations sub-index. While showing some weakness in Product and Process Innovation, it is very strong in High Growth, Internationalization and Risk Capital. Switzerland is second, with a strong showing in Internationalization and Risk Capital, followed by Canada, Taiwan, Sweden, Ireland, Australia, Iceland and, Germany, which round out the top ten.

3.5 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 and Development 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.

While the GEI represents the contextual features of entrepreneurship, it is also possible to analyze changes in entrepreneurship and its components in terms of development. We presented the relationship between Index values and development, as measured by per capita GDP. While previous studies found that entrepreneurship, measured primarily in terms of activities, has a U- or L-shaped relationship with national per capita income, we noticed a linear, mildly S-shaped relationship, which indicates that entrepreneurship is more prevalent in richer countries. This finding fits more accurately with our present knowledge of the nature of the entrepreneurial ecosystem than U- or L-shaped relationships between the variables. The final ranking, with Nordic and Anglo-Saxon countries at the top and developing countries at the bottom, also reflects what we expect development trends to look like.

In the final part of the chapter, we compared certain factors between some important countries and country groups. The pillar-level analysis provides a proper tool for showing the real differences and variations in entrepreneurship, which is found to vary substantially not only across countries with different levels of development but also among countries with similar per capita GDP. The United States is the leading entrepreneurial country: its GEI score increased from 2016 to 2017 edition, and it is still number one not only in the GEI, but also in two of three subindices. While the leading countries have similar entrepreneurial features, European nations and the gap between the European Union and the United States closed somewhat, the differences within the European Union are increasing. It is particularly evident in the PIIGS (Portugal, Italy, Ireland, Greece and Spain), which lag far behind the larger EU countries and the Nordic fringe. Latin America will also require a substantial increase in entrepreneurship to reach levels comparable to those of North America. Comparing the developing countries shows that the configuration of the 14 pillars is similar in shape but at different levels across the three main regions of the world. A detailed examination of entrepreneurship and the change in its components over the phases of development is the focus of the following chapter.

Chapter 4
Country and Country Group Performance

4.1 Introduction

In this section, we compare the entrepreneurial performance of countries within regions. As we have already seen, the entrepreneurial performance of countries can vary widely across the world. This is because, for example, countries in different stages of development may exhibit similar features, whereas differences across stages of development are usually larger. The significant differences between stages of economic development mean that not much can be learned by comparing a rich country like the United States to a poor country such as Zambia because the economic conditions in these two countries are so different. It makes much more sense to compare countries to similar nations, as this allows meaningful comparisons and helps us make better sense of the patterns we see in the data.

We have grouped the 137 countries into six groups according to their location and level of development (Table 4.1). We analyze the entrepreneurial performance of different country groups as compared to the world average (the unweighted average of the 137 countries for each of the GEI pillars). In addition, we take a close look at three countries in each country group: one at the top, one at the middle, and one at the bottom of the regional ranking.

4.2 Sub-Saharan Africa

Africa is the second largest continent by area and the largest if measured by number of countries. Africa's individual countries and economies exhibit considerable heterogeneity, with significant cultural and economic differences between the North and the South, and between the East and the West.

In this analysis, we look at Sub-Saharan African countries. North African countries are analyzed as part of the Middle East and North Africa Region. As we can see

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Table 4.1 Country groups analyzed in this chapter

Asia-Pacific	Europe		Middle East/ North Africa	North America	South and Central America/Caribbean	Sub-Saharan Africa	
Australia	Albania	Lithuania	Algeria	Canada	Argentina	Angola	Madagascar
Azerbaijan	Armenia	Luxembourg	Bahrain	Mexico	Barbados	Benin	Malawi
Bangladesh	Austria	Macedonia	Egypt	United	Belize	Botswana	Mali
Brunei Darussalam	Belgium	Moldova	Iran	States	Bolivia	Burkina Faso	Mauritania
Cambodia	Bosnia and	Montenegro	Israel		Brazil	Burundi	Mozambique
China	Herzegovina	Netherlands	Jordan		Chile	Cameroon	Namibia
Hong Kong	Bulgaria	Norway	Kuwait		Colombia	Chad	Nigeria
India	Croatia	Poland	Lebanon		Costa Rica	Côte d'Ivoire	Rwanda
Indonesia	Cyprus	Portugal	Libya		Dominican Republic	Ethiopia	Senegal
Japan	Czech Republic	Romania	Morocco		Ecuador	Gabon	Sierra Leone
Kazakhstan	Denmark	Russia	Oman		El Salvador	Gambia, The	South Africa
Korea	Estonia	Serbia	Qatar		Guatemala	Ghana	Swaziland
Kyrgyz Republic	Finland	Slovakia	Saudi Arabia		Guyana	Guinea	Tanzania
Lao PDR	France	Slovenia	Tunisia		Honduras	Kenya	Uganda
Malaysia	Georgia	Spain	United Arab		Jamaica	Liberia	Zambia
Myanmar	Germany	Sweden	Emirates		Nicaragua		
Pakistan	Greece	Switzerland			Panama		
Philippines	Hungary	Turkey			Paraguay		
Singapore	Iceland	Ukraine			Peru		
Sri Lanka	Ireland	United			Puerto Rico		
Taiwan	Italy	Kingdom			Suriname		
Tajikistan	Latvia				Trinidad & Tobago		
Thailand					Uruguay		
Vietnam					Venezuela		

Table 4.2 GEI ranking of the Sub-Saharan African countries

GEI rank	Country	ATT	ABT	ASP	GEI
52	Botswana	47.5	32.3	23.5	34.4
55	South Africa	28.8	31.2	38.0	32.6
60	Namibia	33.0	28.3	30.7	30.7
75	Gabon	25.3	22.6	25.9	24.6
86	Ghana	33.3	19.1	13.8	22.0
88	Swaziland	19.8	20.4	25.2	21.8
96	Zambia	23.9	19.4	18.4	20.5
100	Nigeria	21.6	20.1	17.9	19.9
102	Senegal	26.7	14.0	18.2	19.7
103	Rwanda	21.5	21.7	15.7	19.6
107	Kenya	15.2	19.4	19.9	18.2
109	Ethiopia	14.5	22.7	16.1	17.8
112	Côte d'Ivoire	21.4	14.3	14.3	16.6
115	Gambia, The	18.1	17.5	12.7	16.1
116	Cameroon	17.8	15.2	14.9	16.0
118	Tanzania	15.0	17.1	15.3	15.8
119	Mali	15.8	15.4	15.8	15.6
121	Liberia	19.2	15.3	12.3	15.6
123	Mozambique	16.4	15.0	14.0	15.1
124	Madagascar	16.1	15.2	11.6	14.3
125	Angola	12.2	13.4	16.7	14.1
126	Uganda	14.4	15.7	9.6	13.2
127	Benin	17.2	13.2	8.8	13.0
130	Malawi	10.6	14.3	12.5	12.5
131	Guinea	11.1	14.2	11.1	12.1
132	Burkina Faso	12.5	14.1	9.2	11.9
134	Mauritania	15.5	9.4	9.8	11.6
135	Sierra Leone	10.4	12.8	11.0	11.4
136	Burundi	9.1	15.0	10.0	11.4
137	Chad	7.8	9.0	9.4	8.8
	Sub-Saharan Africa	19.1	17.6	16.1	17.6

in Table 4.2, this group includes some of the least developed countries. This is reflected in the countries' global GEI rankings and GEI scores. The leading country in this region, Botswana, achieves a GEI score of 34.4, which ranks it 52nd among the 137 countries analyzed in the global GEI ranking. At the bottom of the region is Chad, whose GEI score of 7.8 ranks it last among the GEI countries. A total of 27 out of the 30 Sub-Saharan countries are found in the bottom quartile of the global GEI ranking.

Generally speaking, there is not much difference in the average performance of the region's sub-indices, with Aspirations posting the lowest average score at 16.1 and Attitudes posting the highest average score at 19.1. However, even at this low

level of development, there are important differences between Attitudes, Abilities, and Aspirations within individual Sub-Saharan countries. Countries that depart from the regional pattern include leader Botswana, whose Attitudes score is almost 50% higher than its other scores. This is a much larger difference than average, and is also visible in Ghana, Senegal, Côte d'Ivoire, Benin and Mauritania. Other countries score highest in Abilities, differing from the regional tendency towards higher scores in Attitudes. These countries include Rwanda, Ethiopia, Tanzania, Uganda, Malawi, Guinea, Burkina Faso, Sierra Leone, and Burundi. Finally, some countries score highest in Aspirations—an uncommon pattern in Sub-Saharan Africa, and an uncommon phenomenon globally for lower income countries: South Africa, Gabon, Swaziland, Kenya, Angola and Chad. Thus, while the region has much catching up to do in all areas, different countries face distinctly different challenges (Fig. 4.1).

Table 4.2 confirms that, despite encouraging progress in recent years, Africa remains the least developed continent. This is also reflected in the analysis of individual GEI pillars, as shown in Fig. 4.2. With all countries combined, the African continent ranks below the world average for all pillars. Africa comes closest to the world average in Opportunity Perception, echoing the encouraging economic progress we have seen in the region in recent years. Other encouraging pillars are Networking and Cultural Support.

Because regional groups combine many countries, the resulting regional profiles tend to be more or less round. This mostly holds for Sub-Saharan Africa, too, with some notable exceptions. First, Sub-Saharan Africa seems to suffer from a clear bottleneck in Startup Skills. On the surface, this might appear inconsistent with the fact that Sub-Saharan African countries exhibit some of the highest self-employment rates in the world, but it is actually indicative of a quality problem, as most African self-employment is of low quality. While starting a necessity-driven self-employment activity is easy (e.g., setting up a fruit stand on a street corner), building a sophisticated startup is difficult. Education is required for more sophisticated activities. This is Africa's handicap, as its gross enrollment in tertiary education (the institutional

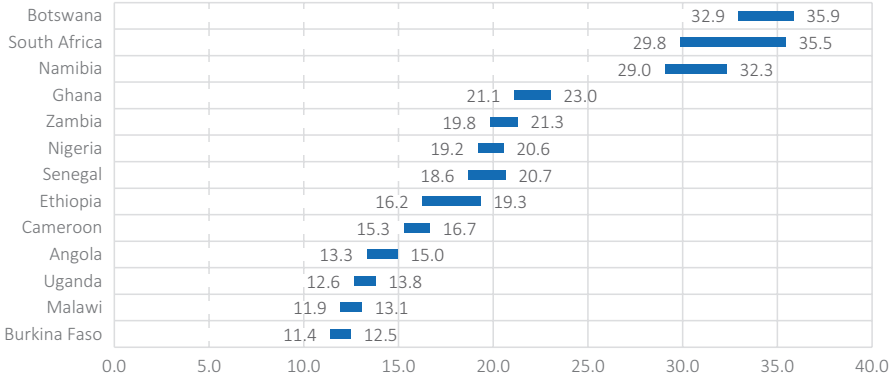

Fig. 4.1 Confidence intervals for Sub-Saharan African countries. **Countries with estimated individual data are not shown, as confidence intervals for these countries cannot be calculated

Fig. 4.2 Pillar-level comparison between Sub-Saharan Africa and the world average

component of the startup skills pillar) is the lowest of all regions. Other notable African weaknesses are found in Aspirations: the normalized values of Internationalization and Risk Capital are both well below 0.20.

Overall, entrepreneurship in Africa is held back by institutional factors—a pattern typical of developing countries. Of all the regions analyzed, Sub-Saharan Africa's mean score for institutional factors is the lowest, at 0.31. This compares to individual-level factors, for which Sub-Saharan Africa scores 0.60, more or less on par with other regions. Thus, to better exploit its entrepreneurial potential, Sub-Saharan African countries need to improve their institutional conditions for entrepreneurship.

In Fig. 4.3 we compare the profiles of two Sub-Saharan African countries and the West Africa region (Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Liberia, Mali, Mauritania, Nigeria, Senegal and Sierra Leone). Botswana is the best performer in Sub-Saharan Africa in entrepreneurship. South Africa is just behind Botswana, with its own distinct set of strengths and weaknesses. The West Africa region scores below both, but with a similar profile, an average score of 15.4, and a range from 11.4 to 22.0).

We see that the profiles of the three geographies are quite different. South Africa clearly stands apart from Botswana and West Africa for Competition and many of its Aspirations variables (notably, Product Innovation, Process Innovation, High Growth, and Internationalization). This signals that better institutions should create conditions in which aspirational entrepreneurial activity can flourish. On the other hand, South Africa is on par with West Africa for Networking and Risk Acceptance.

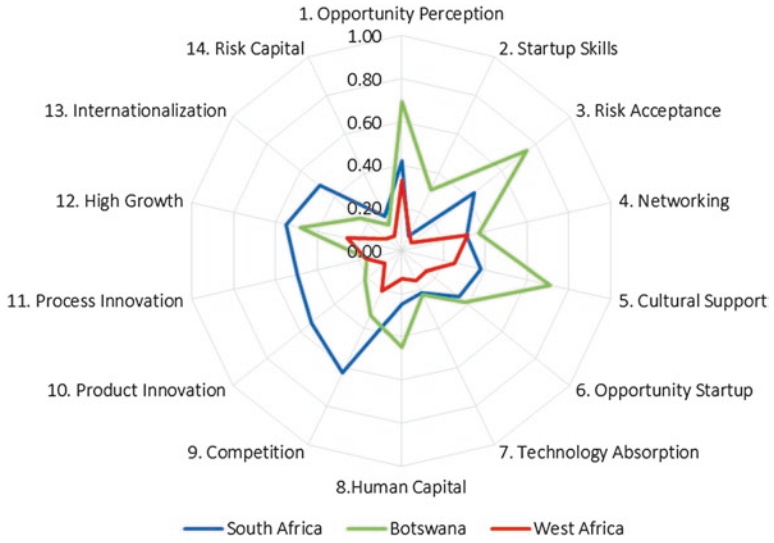

Fig. 4.3 Pillar-level comparison of South Africa, Botswana and the West Africa countries

For Botswana, the strongest aspects are Opportunity Perception, Risk Acceptance and Cultural Support. However, it is held back by bottlenecks in Risk Capital and Process Innovation. The uneven profile of Botswana (indicated by spikes vs. roundness) suggests that improving these two factors could quickly and significantly improve the country's performance.

West Africa's profile shows bright spots in Opportunity Perception, Networking, and High Growth, low scores across a number of other pillars indicate that there is significant work to be done to improve the foundations for entrepreneurship across the region.

The profiles are relatively uneven for all three geographic units—a pattern typical of developing economies. The uneven profiles suggest the existence of bottlenecks that hold back the countries' entrepreneurial performance. While even the leading country in the region faces significant individual bottlenecks, the positive news is that, by focusing on alleviating bottlenecks, these countries could achieve significant progress relative to the effort they expend. This contrasts with countries with rounder profiles, because in such countries the opportunities for quick wins tend to be fewer.

4.3 Middle East and North Africa (MENA)

The MENA region comprises 15 countries in Middle East and North Africa (Table 4.3). This region also exhibits a high-level of diversity. On the one end of the wealth scale are some of the richest countries in the world (as measured by GDP per

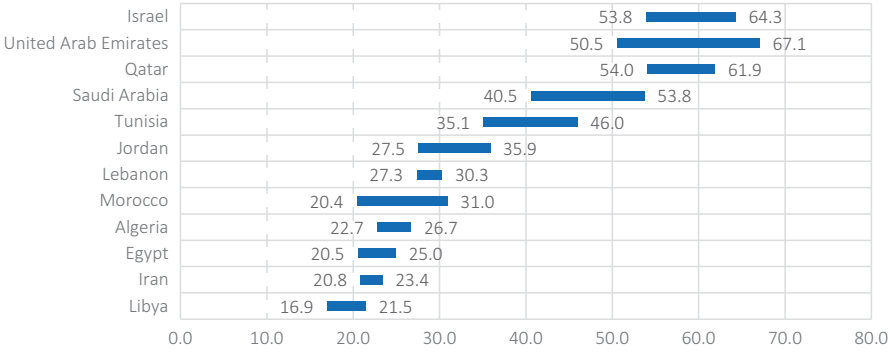

Fig. 4.4 Confidence intervals for the MENA countries. **Countries with estimated individual data are not shown, as confidence intervals for these countries cannot be calculated

capita), the oil-rich Persian Gulf economies. This region also includes several lower-income economies, some of which continue to experience turmoil from the events of the Arab Spring. This region is considerably more developed than Sub-Saharan Africa, with more than double the regional mean GEI score, and half of its countries are in the top 50% of the global GEI ranking (except for Jordan, Lebanon, Morocco, Algeria, Egypt, Iran, and Libya). The three sub-indices are quite evenly balanced; the highest mean score is observed for Aspirations, but the Attitudes and Abilities mean scores are almost at the same level. The leading entrepreneurial economy in this group is the Israel, followed closely by the UAE and Qatar. The lowest GEI scores are observed for Egypt, Iran, and Libya. The common feature shared by this bottom group of MENA countries is political turmoil that discourages entrepreneurial activity by creating uncertainty about future conditions (Fig. 4.4).

The most notable phenomenon affecting this region in recent years was the Arab Spring, the wave of popular revolutions that saw some of the region's autocrats thrown out of power—most spectacularly in Tunisia, Libya, and Egypt. In some countries, such as Bahrain, the ruling families have successfully resisted the popular uprisings, whereas the upheaval in Syria led to a violent civil conflict that threatens to undermine the stability of the entire region.

The Arab Spring phenomenon is noteworthy for our analysis because it emerged as a reaction against the ruling elites' monopolization of opportunity in a number of countries in the MENA region. The wave of upheavals was memorably started by the self-immolation of a street vendor in Tunisia, who was harassed by corrupt officials. In many countries, including Tunisia, Libya, and Egypt, the economies had become virtual private fiefdoms of the ruling elite, who monopolized entire economic sectors to the exclusion of the majority of the population. While much has been said about the democratic aspirations that were clearly an important motivation for the upheavals, it is useful to remember that the spark that ignited the Arab Spring had more to do with exclusion from opportunity than a deficit of democracy.

Fig. 4.5 Pillar-level comparison of MENA region and the world

In terms of the GEI pillars, the MENA region as a whole performs close to the world average (Fig. 4.5). Most pillar values are almost exactly at the world average or very close to it. The differences are found in Networking, Human Capital, High Growth and Risk Capital, where the MENA countries collectively perform better than the world average.

We next look at three countries that illustrate different categories within this region. The oil-rich United Arab Emirates is one of the world's wealthiest countries in terms of GDP per capita. Saudi Arabia, also a leader, has taken a different strategy towards global engagement and integration than the UAE. Israel, touted as the Startup Nation, is a regional high-tech hub.

In Fig. 4.6 we see that Israel is the top performer in the MENA region and a top performer globally for many pillars—notably, Technology Absorption, Process Innovation and Product Innovation. Based on this performance profile, Israel's global reputation for high-technology startup activity is supported by the data. However, the country still faces a significant bottleneck in Competition, indicating that the country is dominated by a relatively small number of firms, and that entrepreneurs are not seeking competitive niches as much as in leader countries.

The UAE, formerly the top scorer in the MENA countries, now sits just behind Israel. The UAE has world-leading scores in Human Capital, Risk Capital, and High Growth. For these pillars, the UAE's performance is a perfect 1, which reflects its financial wealth and also its high-quality human capital. The UAE's position as an important trading hub undoubtedly contributes to a high level of High Growth and Internationalization Aspirations in this country. Overall, the UAE exhibits a high level of Aspirations and a medium level of Attitudes and Abilities. The UAE's

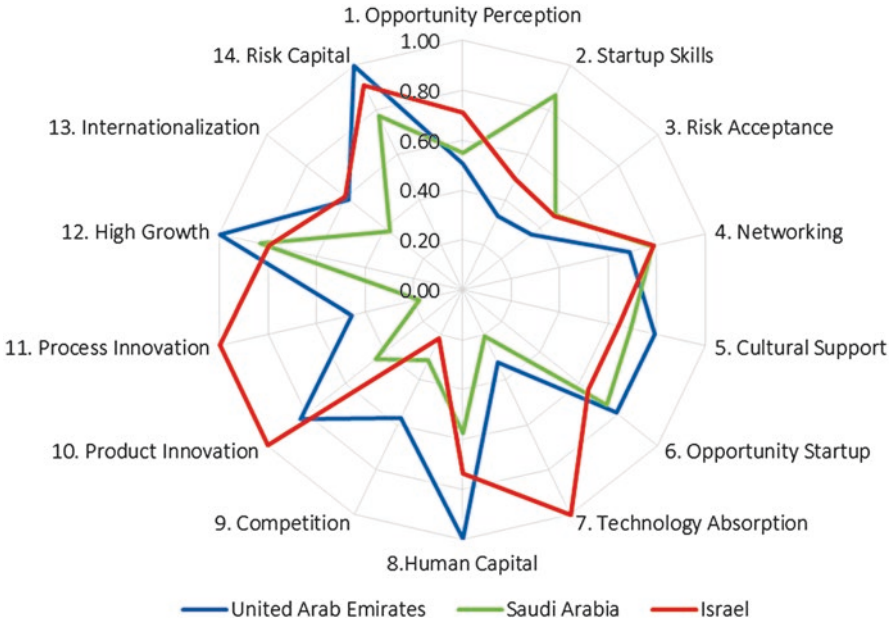

Fig. 4.6 Pillar-level comparison of the United Arab Emirates, Saudi Arabia, and Israel

bottlenecks relate to Startup Skills, Technology Absorption, and Risk Acceptance, suggesting that an investment in entrepreneurship training and research capacity could bring about further improvements in the UAE's entrepreneurial performance. Given the UAE's uneven overall profile, these improvements could be quite substantial.

Saudi Arabia's profile is similar to that of the UAE, with the exception of the Startup Skills pillar, on which Saudi Arabia scores far higher, reflective of high rates of tertiary education. Bottleneck factors for Saudi Arabia include Technology Absorption, Process Innovation and Internationalization, consistent with expected outcomes for countries with isolationist policies.

4.4 Asia-Pacific

The Asia-Pacific region offers some of the greatest potential for economic growth analyzed here, as it contains the developing economic behemoths of China and India, a number of emerging economies such as Turkey, Malaysia, Thailand, Vietnam, and Indonesia, and well-established and mature economies such as Australia, Japan, Korea, and Singapore (Table 4.4, Fig. 4.7). On the other hand, this region also includes some of the poorest countries in the world, such as Cambodia, Myanmar, Laos, and Bangladesh. The economic potential of this region lies with its

Table 4.4 GEI ranking of the Asia-Pacific countries

GEI rank	Country	ATT	ABT	ASP	GEI
7	Australia	73.2	73.6	70.8	72.5
16	Taiwan	54.4	53.6	74.0	60.7
24	Singapore	37.9	58.3	60.5	52.2
25	Japan	30.8	61.1	63.3	51.7
27	Korea	45.1	48.2	58.2	50.5
32	Hong Kong	45.3	37.7	56.2	46.4
48	China	28.7	27.8	52.3	36.3
53	Brunei Darussalam	25.8	44.5	31.4	33.9
54	Malaysia	36.5	37.3	26.5	33.4
57	Azerbaijan	20.1	36.1	37.0	31.1
62	Kazakhstan	27.9	32.2	30.1	30.1
65	Thailand	28.4	28.6	24.1	27.1
69	India	20.4	25.3	31.8	25.8
76	Philippines	27.3	23.5	21.5	24.1
87	Vietnam	18.0	25.1	23.0	22.0
90	Indonesia	29.2	16.9	17.4	21.2
92	Kyrgyz Republic	14.9	28.1	20.0	21.0
94	Sri Lanka	16.5	22.2	24.1	20.9
95	Tajikistan	12.2	25.7	24.3	20.7
105	Lao PDR	12.7	26.4	17.1	18.7
114	Cambodia	9.4	26.5	13.5	16.5
120	Myanmar	10.5	18.9	17.5	15.6
122	Pakistan	12.9	13.2	19.6	15.2
133	Bangladesh	11.6	16.6	7.1	11.8
	Asia-Pacific	27.1	33.6	34.2	31.6

large and overall quite young population, notably in the developing Asian economies.

When the profiles of the Asia-Pacific countries are combined, the result is a relatively round profile of pillar scores that does not differ much from the world average, with the possible exceptions of Human Capital and Product Innovation (Fig. 4.8). However, this even pattern hides the fact that some countries in this group are global top performers, while others are global laggards.

The striking feature in this region is its diversity in terms of economic and entrepreneurship development. On the one hand, the region contains some of the world's leading entrepreneurial economies such as Australia (7th globally), Taiwan (16th), and Singapore (24th). On the other hand, the region also contains global laggards

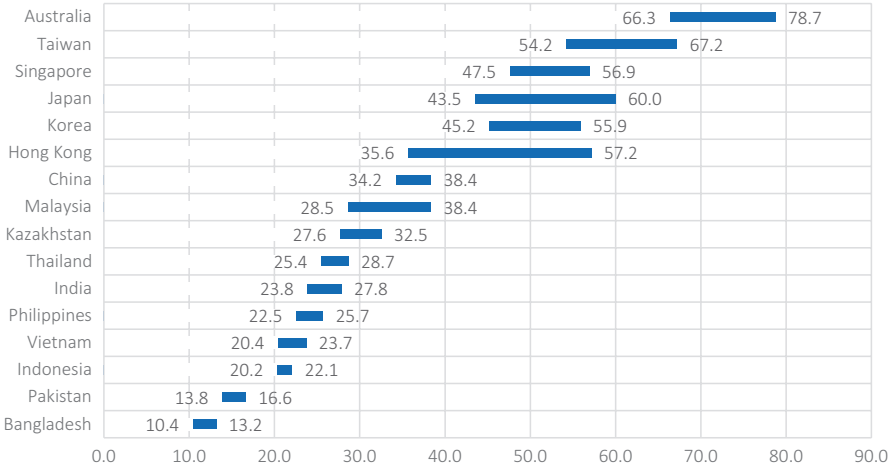

Fig. 4.7 Confidence intervals for Asia-Pacific countries. **Countries with estimated individual data are not shown, as confidence intervals for these countries cannot be calculated

Fig. 4.8 Pillar-level comparison of Asia and the world

such as Myanmar (120th), Pakistan (122nd), and Bangladesh (133rd). Interestingly, Korea and Japan do not rank at the top (4th and 5th in the region and 25th and 27th globally). This signals that the bulk of the innovative energy in these two countries is channeled through large, world-leading corporations. Even though both economies exhibit strong supply chains that include an important number of small- and

Fig. 4.9 Pillar-level comparison of China, India, and Hong Kong

medium-sized businesses, many of these (relative to the countries' innovative potential) content themselves with servicing local supply chains instead of seeking rapid global growth.

An interesting contrast is also observed between China and India. China's GEI score is almost 50% higher than India's, possibly suggesting that the bureaucratic red tape common in India constrains entrepreneurial activity in the country. This problem is common to all of the bottom-four countries in the Asia-Pacific group (i.e., Cambodia, Myanmar, Pakistan, and Bangladesh).

The Asia-Pacific region's weakest aspect is Attitudes toward entrepreneurship, whereas Abilities and Aspirations are almost at the same level with one another. However, there is great internal variance within the region: Australia's Attitudes score stands at 73.2, whereas Cambodia's Attitudes score, 9.4, is among the lowest in the global GEI ranking. There is similar variance across other sub-indices; for example, Aspirations scores range from Taiwan's high of 74.0 to Bangladesh's low of 7.1.

We take a closer look at three different economies in the region (Fig. 4.9). Hong Kong, China, and India are separated by roughly 10 GEI points each, Hong Kong at 46.4, China at 36.3, and India at 25.8. Despite this range of scores, each country has at least one pillar in which it outperforms the others.

Hong Kong's entrepreneurial profile is the strongest of the three nations, with high scores in Risk Acceptance, Networking, Human Capital, Product Innovation and High Growth. However, the country faces extreme bottlenecks in Startup Skills, Technology Absorption, and Competition. This suggests that, although Hong Kong's overall innovation performance is strong, some of the foundational aspects of a healthy entrepreneurship environment have fallen behind.

China's profile shows strengths in Aspirations—Product Innovation, Process Innovation, and Risk Capital. China also exhibits individual strengths within the other sub-indices, notably, Risk Acceptance and Networking. China's major bottlenecks appear to be in Opportunity Perception, and Startup Skills, with several other pillars just above these. Because of China's large size and great internal diversity, with an industrialized east coast and rural west, general policy prescriptions are not feasible for this country. Clearly, China needs to adopt a regionalized approach to developing its national entrepreneurship ecosystem as a network of regional entrepreneurial ecosystems. China's highly uneven GEI profile suggests that it has the potential to achieve major progress by focusing its policy effort on bottleneck areas.

Compared to Hong Kong and China, India's entrepreneurial ecosystem profile is considerably less developed. There are, however, a number of bright spots. In Competition, India performs more than twice as well as Hong Kong and China. India also scores well in Product Innovation and Process Innovation. This combination of factors shows that India has placed itself as a regional source of innovation. However, without improvements to its bottleneck factor, Technology Absorption, further progress will be hamstrung.

4.5 Europe

Europe is also a region with notable internal divides. The entrepreneurially mature Europe consists of the "old" Western and Northern European countries. These are some of the most developed and mature economies worldwide, which shows in the GEI rankings: Switzerland is ranked as the second most entrepreneurial economy globally, and seven of the top ten global performers are found in Northern and Western Europe. Moreover, 13 out of the top 20 entrepreneurial economies are from Western and Northern Europe, and all EU countries rank in the top 50% globally. These developed European economies exhibit traditional strengths in technology and innovation, and new European businesses can benefit from the EU's internal market and the high quality of its infrastructure and institutional set-up.

On the other hand, there is also a "developing Europe" that comprises the former centrally planned European economies. This region also includes Russia and Ukraine. Given its socialist history, developing Europe carries a legacy of an industry infrastructure biased toward heavy industries, a weak tradition of entrepreneurial activity, and, perhaps most importantly, a weak tradition of initiative and assumption of responsibility. While historically strong in human capital, developing Europe is held back by poor institutional conditions. Being inculcated primarily in industry structure and individual attitudes, the post-socialist legacy may prove surprisingly resilient and can perhaps ultimately be erased only through generational change (Table 4.5, Fig. 4.10).

A closer look at the European countries offers further notable observations. The Nordic countries (Sweden, Denmark, Iceland, Finland, and Norway) all rank in the

Table 4.5 GEI ranking of the European countries

GEI rank	Country	ATT	ABT	ASP	GEI
2	Switzerland	69.5	81.9	82.5	78.0
4	Sweden	73.4	79.1	73.9	75.5
5	Denmark	71.6	84.5	66.0	74.1
6	Iceland	81.4	68.5	70.6	73.5
8	United Kingdom	70.1	79.2	64.6	71.3
9	Ireland	63.7	78.2	70.9	71.0
10	Netherlands	76.6	65.7	61.0	67.8
11	Finland	78.3	56.3	66.2	66.9
12	Germany	59.4	66.6	68.6	64.9
13	France	56.7	67.3	68.3	64.1
14	Austria	65.1	66.8	58.5	63.5
15	Belgium	52.7	68.9	67.3	63.0
20	Luxembourg	47.8	64.7	61.9	58.1
22	Norway	66.2	60.2	41.2	55.9
23	Estonia	59.5	52.9	54.2	55.5
26	Slovenia	50.0	51.0	53.5	51.5
28	Lithuania	42.8	50.3	55.7	49.6
29	Portugal	50.3	44.4	47.0	47.2
31	Poland	45.1	42.0	52.8	46.6
33	Spain	49.6	48.5	37.6	45.3
35	Slovakia	37.8	38.0	56.5	44.1
36	Turkey	38.1	39.6	53.4	43.7
38	Latvia	36.5	47.9	44.6	43.0
40	Czech Republic	33.4	41.6	51.6	42.2
43	Cyprus	35.4	44.6	35.5	38.5
45	Romania	29.5	35.7	46.0	37.1
46	Italy	31.0	30.6	49.5	37.0
47	Hungary	29.2	38.4	41.2	36.3
49	Greece	32.1	35.8	36.0	34.6
59	Croatia	22.7	29.7	40.2	30.8
61	Montenegro	31.7	23.9	35.0	30.2
64	Macedonia	25.5	30.6	30.2	28.7
66	Ukraine	20.5	26.4	33.7	26.9
72	Russia	24.1	29.5	22.7	25.4

GEI rank	Country	ATT	ABT	ASP	GEI
77	Georgia	22.9	28.6	20.5	24.0
79	Serbia	26.6	18.7	24.0	23.1
80	Albania	24.5	24.2	20.2	23.0
82	Bulgaria	24.7	22.6	20.8	22.7
84	Armenia	18.7	27.8	19.9	22.1
89	Moldova	16.0	24.8	23.0	21.3
99	Bosnia and Herzegovina	11.9	22.5	25.5	19.9
	Europe	44.0	47.3	47.6	46.3

top 25 globally. The bottom performers in Europe are Bulgaria, Armenia, Moldova and Bosnia and Herzegovina.

In spite of Europe's heterogeneity, the combined pillar performance for this region is consistently above the world average (Fig. 4.11). The region's greatest strengths are found in Startup Skills, Technology Absorption, and Internationalization.

A closer look at three European entrepreneurial ecosystems reveals notable heterogeneity among European countries. Sweden, a regional leader, exhibits a strong all-around entrepreneurial profile. In contrast, Italy and Russia have much catching up to do, with their considerably more uneven profiles (Fig. 4.12).

Sweden has a strong entrepreneurial economy, and its GEI rankings are consistently at or close to the top in the world. This shows in its GEI profile, which is relatively round, suggesting a strong all-around performance. Denmark's greatest strengths are found in Opportunity Perception, Cultural Support, Opportunity Startup, Technology Absorption, and Process Innovation, where its scores are almost perfect. Startup Skills are Sweden's most important bottleneck. In addition, the scores for Human Capital, High Growth, and Risk Capital also could be improved.

In contrast, Italy exhibits both outstanding strengths and notable bottlenecks. Italy's strongest pillar is Product Innovation, wherein it outperforms even leader Sweden. The country also scores above Sweden in Risk Capital. However, severe bottlenecks in Human Capital and High Growth hold the country back. Italy performs worse than many countries with socialist legacies, such as the Baltic countries, Slovenia, the Czech Republic. This is an alarming situation, especially given that Italy's ranking appears to be on a downward trend. Italy's GEI score has collapsed from 57.6 in 2008 to 37.0 in the current ranking. Thus, in 6 years, Italy's GEI score has dropped by 20 points.

Russia's entrepreneurship profile exhibits similar unevenness. In spite of its extensive natural resources, the Russian entrepreneurial ecosystem is the fifth weakest in Europe. This suggests that, instead of being a source of strength, the resource abundance of the Russian economy can actually be a source of weakness, as it has

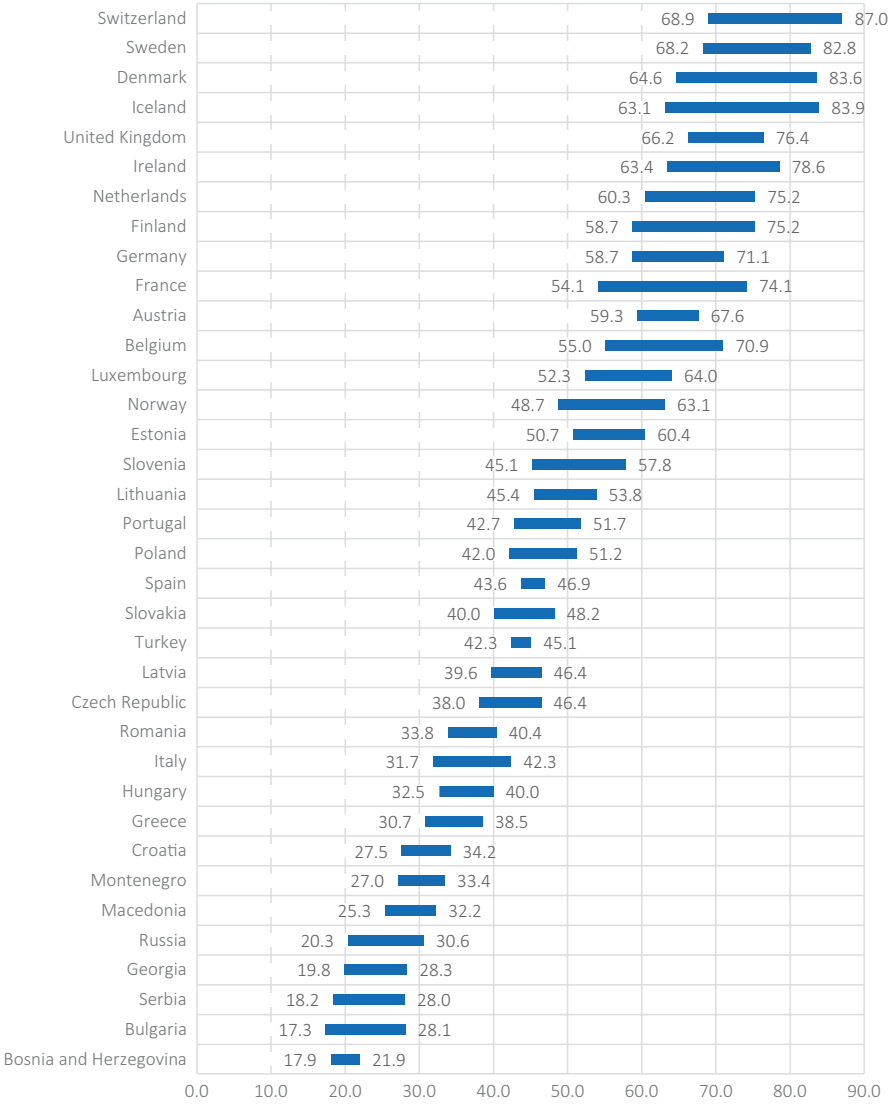

Fig. 4.10 Confidence intervals for the European countries. **Countries with estimated individual data are not shown, as confidence intervals for these countries cannot be calculated

led Russia to become increasingly dependent on the spot market price of oil for its economic wealth. Helped by the favorable development of oil prices until recently, this abundance has also allowed Russian politicians to fail to introduce the political and economic reforms needed to facilitate innovation and the diversification of the Russian industrial base. In fact, rather than diversifying, the Russian industrial base has become even more reliant on energy and raw materials. These developments

Fig. 4.11 Pillar-level comparison of Europe and the World

Fig. 4.12 Pillar-level comparison of Italy, Sweden and Russia

have resulted in an entrepreneurial profile that is highly uneven and lags behind most post-socialist countries. The outstanding Russian strength is Human Capital, followed by much weaker Networking and High Growth. These relative strengths are offset by bottlenecks in Opportunity Perception, Cultural Support, and Internationalization. Laden with post-socialist baggage, the Russian entrepreneurial ecosystem continues to exhibit many deficiencies, and the Russian economy's lack of diversification and dependence on energy and raw materials do not help with the prevailing governance structure. It appears that, to escape this dilemma, Russia needs to considerably strengthen its rule of law and economic and political institutions.

4.6 North America

In our analysis, North America includes the NAFTA countries: the US, Canada, and Mexico. Of these, the US and Canada are global leaders, ranking first and third in the global GEI ranking (Table 4.6, Fig. 4.13). In contrast, Mexico only ranks 71st, despite some positive progress in recent years. Whereas the profiles of the US and Canada show approximately equal strength for all sub-indices, Mexico appears to be strong in Attitudes, but its entrepreneurial performance is held back by weaknesses in Abilities and Aspirations.

Dominated by the US economy, the North American region exhibits traditional strength in entrepreneurship. This is illustrated by Fig. 4.14, which shows the GEI profile of the North American region compared against the world average. North America stands out as the strongest entrepreneurial ecosystem in the GEI analysis, with all pillars clearly above the world average. Particular strength is exhibited in Opportunity Perception, but the region performs strongly across all pillars. Overall, the profile of this region is relatively round, dominated by the US and Canada.

In Fig. 4.15 we compare all three countries in this region. The US is the leading entrepreneurial ecosystem in North America, and it also ranks first globally. A traditional hotspot for entrepreneurship, the US boasts strengths in all areas, the only possible exception being Networking. This could signal the highly individualistic US culture and suggests that Networking—which is an important requirement in the knowledge economy—is be an area where concentrated policy efforts could bring about the greatest returns.

Table 4.6 GEI ranking of the North American countries

GEI rank	Country	ATT	ABT	ASP	GEI
1	United States	79.1	82.6	88.4	83.4
3	Canada	73.4	75.8	77.5	75.6
71	Mexico	33.0	23.1	21.0	25.7
	North America average	61.8	60.5	62.3	61.5

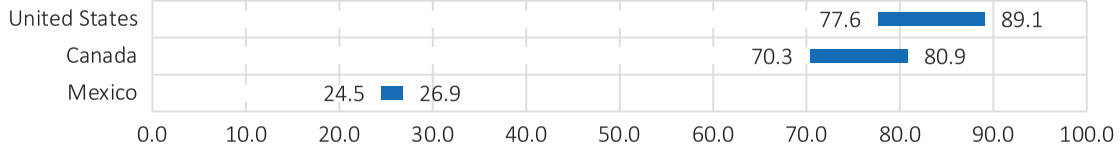

Fig. 4.13 Confidence intervals for the North American Countries

Fig. 4.14 Pillar-level comparison of North America and the World

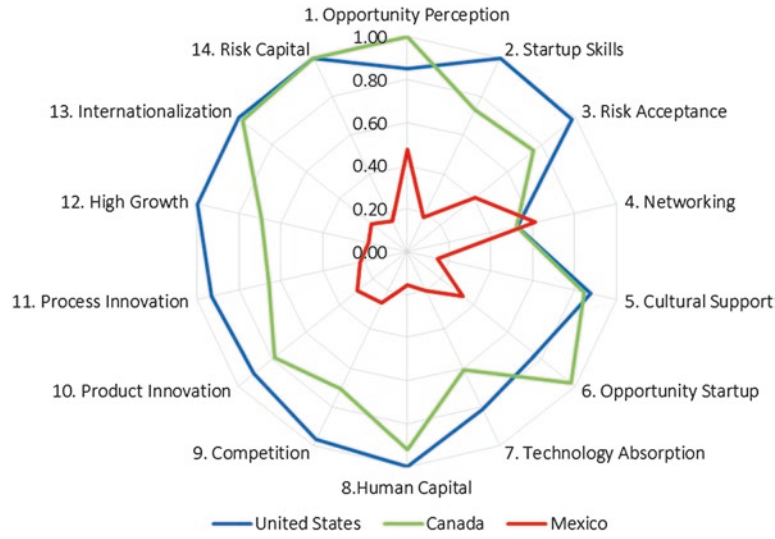

Fig. 4.15 Pillar-level comparison of the United States, Canada, and Mexico

Canada's entrepreneurial profile is quite similar to that of the US, which is reflected in the global ranking of the Canadian entrepreneurial ecosystem (third). Relative to the US, Canada exhibits some softness in Startup Skills, Risk Acceptance, Competition, Process Innovation, and High Growth. Thus it appears that Canada should invest further in entrepreneurship education and training, and in Innovation.

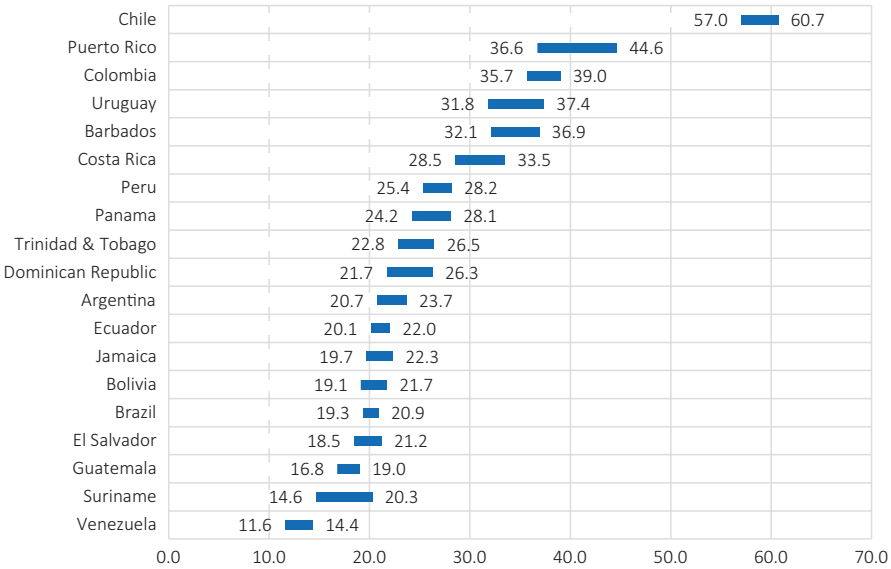

Fig. 4.16 Confidence intervals for South and Central American and Caribbean countries. **Countries with estimated individual data are not shown, as confidence intervals for these countries cannot be calculated

One strength of the Canadian economy is that it is close to a large market and can tap into the strengths of the US entrepreneurial ecosystem.

Mexico's entrepreneurial ecosystem is considerably less developed than that of the US and Canada. Although it exhibits strength in Opportunity Perception and to some degree in Networking, the Mexican entrepreneurial ecosystem suffers from clear bottlenecks in Startup Skills, Cultural Support, Human Capital, High Growth, and Risk Capital. Thus, whereas Mexico's strength is primarily in Attitudes, its bottlenecks are mostly concentrated in Aspirations; however, notable bottlenecks are also found in Attitudes and Abilities. It seems that Mexico would need a broad-based, coordinated policy program to address its bottlenecks without undermining its strengths.

4.7 South and Central America and Caribbean

In this analysis, the South and Central America and Caribbean region includes all Latin American economies except Mexico (Table 4.7, Fig. 4.16). Although considerably less developed than North America and developed Europe and Asia, this region offers considerable potential for entrepreneurial activity, thanks to its overall growing economy, improving governance, and young population. Many Latin American economies have recorded positive developments in recent years, although

Table 4.7 GEI ranking of the South and Central American and Caribbean countries

GEI rank	Country	ATT	ABT	ASP	GEI
18	Chile	72.8	48.5	55.2	58.8
41	Puerto Rico	41.0	52.4	28.6	40.6
44	Colombia	34.2	31.3	46.5	37.3
50	Uruguay	44.5	30.5	28.7	34.6
51	Barbados	47.1	34.1	22.4	34.5
58	Costa Rica	41.6	26.3	25.1	31.0
67	Peru	35.7	25.4	19.2	26.8
68	Panama	35.8	23.1	19.5	26.2
74	Trinidad and Tobago	29.1	27.0	17.7	24.6
78	Dominican Republic	30.2	19.8	22.0	24.0
83	Argentina	21.3	22.2	23.2	22.2
91	Ecuador	23.8	21.2	18.2	21.1
93	Jamaica	27.8	21.0	14.2	21.0
97	Bolivia	23.4	12.6	25.3	20.4
98	Brazil	29.2	17.5	13.6	20.1
101	El Salvador	25.1	19.5	14.9	19.8
106	Honduras	19.1	18.5	17.0	18.2
108	Guatemala	18.1	19.4	16.2	17.9
110	Suriname	19.8	22.4	10.1	17.5
111	Paraguay	20.5	16.1	13.4	16.7
113	Belize	22.2	16.5	11.2	16.6
117	Guyana	13.6	21.8	12.4	15.9
128	Venezuela	18.7	8.1	12.1	13.0
129	Nicaragua	12.2	14.9	11.0	12.7
	South and Central America/ Caribbean average	29.5	23.8	20.7	24.6

progress has been far from uniform. While some countries have instituted strong and open governance systems (e.g., Chile and Uruguay), the continent overall continues to suffer from poor governance that holds back its entrepreneurial potential.

In this region, the top performer is Chile, which is also the only country in the region that ranks in the top 20 in the global GEI ranking (16th). Puerto Rico and Colombia are behind Chile and close to one another, followed by Uruguay. It is notable that Brazil only ranks 15th among the 24 countries in this group, and indeed the country has dropped six points and as many ranks over last year. Note that the GEI ranking does not cover Cuba and Haiti, both of which would likely rank close to the bottom.

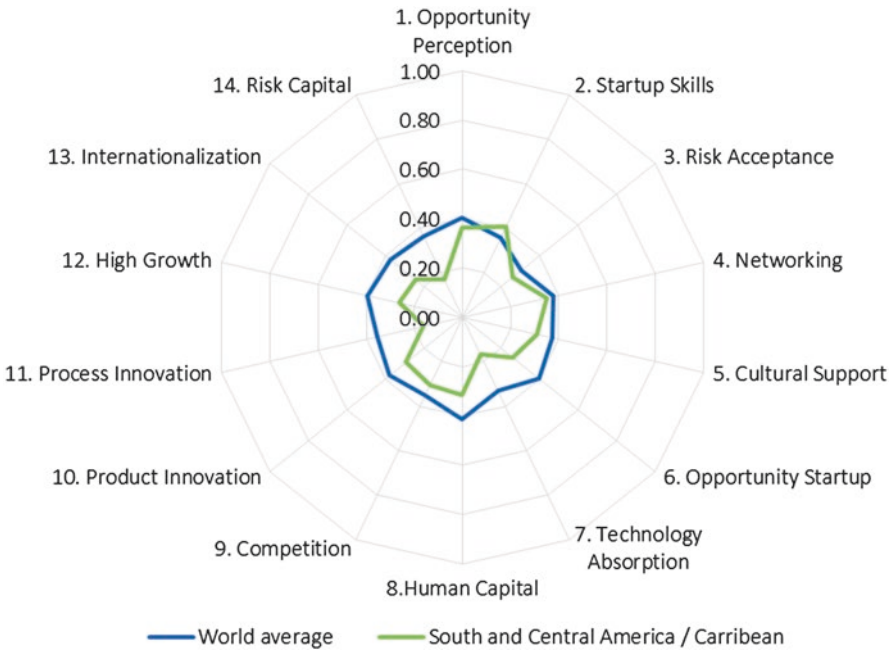

Fig. 4.17 Pillar-level comparison of South and Central American and Caribbean and the world

Collectively, the relative strengths in this group are found in Attitudes and Abilities, whereas the region's performance in Aspirations is relatively weak. The region thus faces a challenge in improving Aspirations and in instilling a more innovative, growth-oriented, and international outlook among its population of entrepreneurs. This challenge appears particularly acute in Brazil, which ranks near the bottom of the region in this regard. Like most countries in this region, Brazil should look to Chile and Colombia for inspiration on how to improve its scores in entrepreneurial aspirations.

As a group, the GEI profile of the South and Central American and Caribbean region is quite uneven (Fig. 4.17). The region exhibits strength that beats the world average in Startup Skills, but it is at or lags behind the world average in other pillars, notably in Process Innovation, Risk Capital, and Technology Absorption. In spite of these challenges, this region offers great potential for entrepreneurship, conditioned by its ability to strengthen its economic institutions and governance systems.

We look at three geographic units in this region: Chile, Puerto Rico and Colombia (Fig. 4.18). Chile boasts the strongest entrepreneurial ecosystem in this region, thanks perhaps to its strong, market-embracing governance systems. Globally, Chile is a standout for its high GEI score but relatively low (globally speaking) GDP per capita, which is clearly the smallest among the top 20 entrepreneurial economies in the GEI ranking. In fact, the second lowest GDP per capita in the top 20 is exhibited

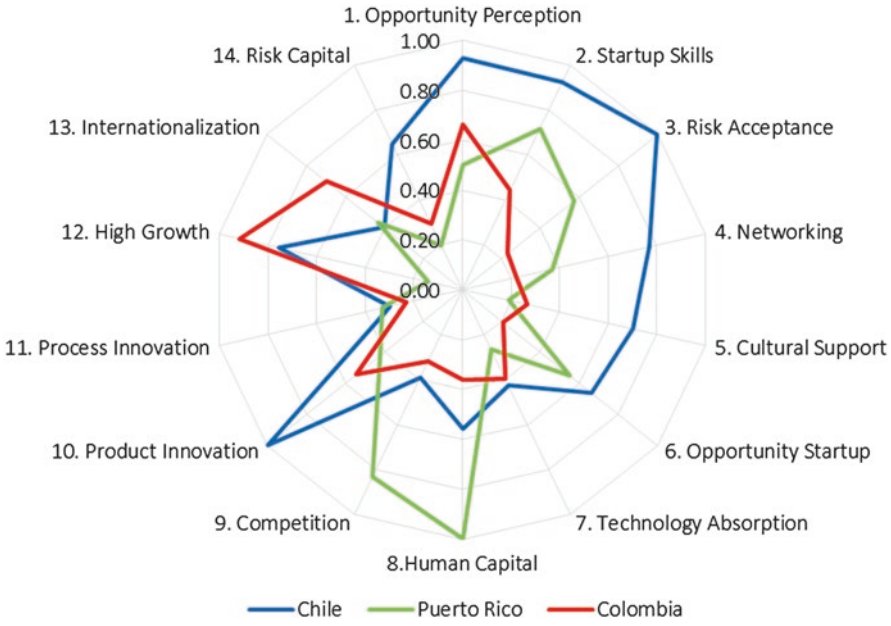

Fig. 4.18 Pillar-level comparison of Chile, Puerto Rico, and Colombia

by Israel, whose GDP per capita is more than 50% larger than that of Chile. This is a remarkable achievement, given that the quality of institutions tends to be strongly correlated with economic wealth, and the quality of institutions is also given considerable weight in the Index. Thus, Chile "punches above its weight" in entrepreneurship—an outcome that we attribute to the country's sound governance systems. The most important strengths of the Chilean system are Opportunity Perception, Startup Skills, Risk Acceptance and Product Innovation with the most important bottlenecks found in Process Innovation, Competition, and High Growth. Chile exhibits the greatest overall strength in Attitudes, followed by Aspirations and Abilities.

Colombia is another economic leader in this region, where it ranks 3rd; it ranks 44th in the overall GEI ranking. Colombia exhibits weaker governance systems, and economic and political institutions, than Chile. While Chile's political upheaval ended in the latter part of the twentieth century, Colombia's struggle with paramilitary and guerilla conflict has continued into the present. This instability prevents Colombia from rising higher in the rankings. Although the country exhibits strengths in Opportunity Perception, High Growth and Internationalization it also exhibits important weaknesses in Risk Acceptance, Opportunity Startup and Process Innovation. Colombia's spiky profile suggests that there are several bottlenecks it should make it a priority to address.

Puerto Rico exhibits a distinct set of strengths and weaknesses, as a result of governance that is partially derivative of US governance and partially unique to the island. Puerto Rico ranks second in the region for its entrepreneurial ecosystem,

bolstered by its favorable relationship with economic powerhouse the United States. In contrast with its peers, Puerto Rico shows strength in Human Capital and Competition, with its most important weaknesses in Cultural Support, High Growth and Risk Capital. The spiky profile of its entrepreneurial ecosystem suggests that Puerto Rico, like Colombia, could achieve considerable progress in entrepreneurship by addressing its systemic bottlenecks.

Chapter 5
Enhancing Entrepreneurial Ecosystems: A GEI Approach to Entrepreneurship Policy

5.1 Introduction

Facilitating entrepreneurship is high on many government policy agendas. Policies that support entrepreneurship have become increasingly sophisticated over time, as governments have moved from facilitating the creation of new firms toward supporting high-growth businesses. Many governments currently talk about support ecosystems that cover the entire life cycle of a new venture, from inception to early survival and growth to international expansion. Many governments have adopted a focus on high-growth firms, having learned that only a small fraction of all new firms end up creating the bulk of new jobs.

Unfortunately, although high-growth entrepreneurship and entrepreneurial ecosystems are high on many policy agendas, there is fairly little understanding of how policy can foster them most effectively. Most entrepreneurship policy playbooks remain stuck with old world policy approaches, which focus on identifying and fixing "market failures" and "structural failures." Such approaches, while effective in addressing well-specified market and structural failures, are hopelessly inadequate to deal with the complexities of entrepreneurial ecosystems.

A classic example of a market failure is the failure of businesses to invest in R&D. Because R&D is a risky and uncertain activity, many firms are tempted to wait, to let others to take the risk, and then quickly copy successful projects. But if everyone thought this way, no one would invest in R&D, and innovative activities would stagnate. Therefore, governments address this market failure by providing subsidies for R&D—in effect, participating in the downside risk while allowing firms to keep the upside returns.

In contrast to subsidizing specific activities, a structural failure policy would seek to build support services and structures that support new firm creation and growth. Examples of structural failure policies include, for example, the creation of science parks and business incubators to shelter and support startup ventures.

Z.J. Acs et al., *Global Entrepreneurship and Development Index 2017*,
SpringerBriefs in Economics, DOI 10.1007/978-3-319-65903-9_5

Both of these approaches fail to address the complexities of entrepreneurial ecosystems, which are too complex to allow easy identification of specific clean-cut market failures, such as insufficient investment in R&D. The "product" entrepreneurial ecosystems produce is innovative and high-growth new ventures. Creating high-growth new ventures is a far more complex undertaking than starting an R&D project. If we do not see a sufficient number of high-growth new ventures, where exactly is the market failure supposed to reside? The standard approach by governments, which is consistent with market failure thinking, is that there perhaps is not sufficient support funding available to start new, high-growth firms. However, as much as governments have provided subsidies to support new firm creation, the results have not been very encouraging.

As regards structural failure policies, how many more science parks can be built? After significant investment in building science parks and similar facilities, we have learned that these parks alone are not very effective in facilitating high-growth businesses. Again, to be effective, an entrepreneurial ecosystem policy needs to go beyond simply building walls and toward facilitating entire ecosystems.

Another major problem with both market failure and structural failure approaches is that they are top-down, where the policymaker analyzes, designs, and implements entrepreneurship policy. Top-down, however, is not a feasible approach in entrepreneurial ecosystems that consist of multiple independent stakeholders. In such situations, a policymaker cannot simply command and control, as you have no formal authority over ecosystem stakeholders. Instead, policymakers need to engage the various stakeholders and co-opt them as active participants and contributors to the policy intervention. In the following, we highlight distinctive characteristics of entrepreneurial ecosystems and elaborate related policy challenges. We then present the GEDI Stakeholder Approach to entrepreneurial ecosystem policy.

5.2 Entrepreneurial Ecosystems: Definitions and Policy Challenges

Entrepreneurial ecosystems are fundamentally interaction systems consisting of multiple, co-specialized, yet hierarchically independent stakeholders, many of which may not even know one another. Here, co-specialization means that different stakeholders play different roles—venture capitalists, research institutions, different supporting institutions, new ventures, established businesses, and so on. They offer complementary skills and services, and normally depend on others to accomplish their goals, which implies that team play is needed.

In the above, hierarchical independence means that there are no formal lines of command, unlike, say, within government agencies or industrial corporations. Everyone makes their own independent decisions and optimizes their own performance. Combined with co-specialization, this creates a mutual dependency dilemma: to accomplish your goals you must depend on others, yet you cannot tell others what to do. Cooperation is therefore required. This limits the usability of traditional

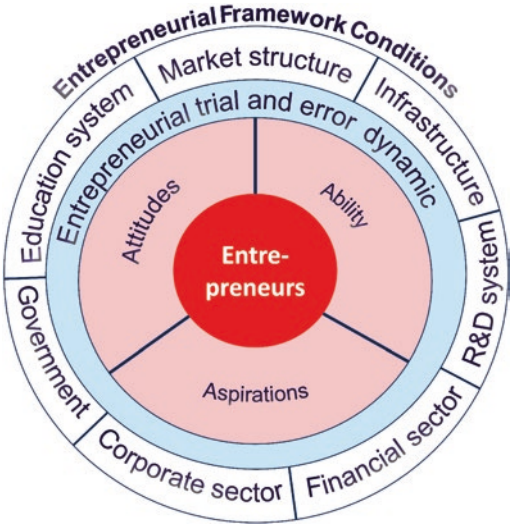

Fig. 5.1 GEI model of entrepreneurial ecosystems

top-down policies, which are usually implemented through formal chains of command (e.g., a government department designing a policy, which is then implemented by a government agency overseen by the department).

Also of relevance is the notion of interaction systems, which means that the stakeholders of entrepreneurial ecosystems "co-produce" their outputs, such as innovative high-growth new ventures. These outputs are co-produced through a myriad of usually uncoordinated interactions between hierarchically independent yet interdependent stakeholders. This combination of independence and interdependence makes ecosystem coordination challenging.

The structure of the entrepreneurial ecosystem is illustrated in Fig. 5.1. 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.

In the GEI model, it is the entrepreneurs who drive the entrepreneurial trial-and-error dynamic. This means that entrepreneurs start new businesses to pursue opportunities that they themselves perceive. An entrepreneurial opportunity is simply a chance to make money through a new venture, such as producing and selling goods and services for profit. However, entrepreneurs can never tell in advance whether a given opportunity is real or not: the only way to validate an opportunity is to pursue it. In other words, entrepreneurs need to take risks: they need to access and mobilize resources (human, financial, physical, technological) before they can verify whether or not a profit can be made. This means, then, that not all entrepreneurial efforts will be successful, as some opportunities turn out to be mere mirages. In such cases, the budding entrepreneur will realize sooner or later that they are never going to make

a profit, or that they could make more money doing something else. In such cases, the entrepreneur will abandon the current pursuit and do something else instead.

If, however, an entrepreneurial opportunity turns out to be real, the entrepreneurs will make more money pursuing that opportunity than doing something else, and they will continue to exploit it. The net outcome of this entrepreneurial trial-and-error dynamic, therefore, is the allocation of resources to productive uses. In other words, a healthy entrepreneurial dynamic within a given economy will drive total factor productivity, or the difference between inputs and outputs. The greater the total factor productivity, the greater the economy's capacity to create new wealth.

Entrepreneurs do not operate in a vacuum, however. Both the entrepreneurial choices individuals make (i.e., those who choose to pursue entrepreneurial opportunities and those who do not) and the wealth-generating potential of the resulting ventures are regulated by what we call the Entrepreneurial Framework Conditions that prevail in the country. There are two issues of importance here. First, there is the question of who chooses to become an entrepreneur and who chooses not to. This matters because individuals with higher human capital (i.e., better education, stronger abilities) are more likely to create innovative, high-growth ventures than individuals with low human capital. If high-potential individuals choose not to pursue such opportunities, the entrepreneurial dynamic will suffer. Second, there is the question of how likely the new venture is to fulfill its potential. A new venture created in a resource-poor environment (say, a poorly developed country) is less likely to fulfill its growth potential than if it were created in an entrepreneurial hotspot (say, London's Silicon Roundabout).

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. If well-educated individuals perceive entrepreneurship to be a valued and glamorous career choice, they are more likely to choose it over alternative career paths. This aspect is captured in the GEI entrepreneurial ecosystem model by Attitudes. The entrepreneurial choice is also regulated by "hard" factors, such as opportunity costs and the size of perceived opportunities. These aspects are regulated by all the framework conditions combined.

The degree to which new ventures are able to fulfill their potential is regulated by a range of entrepreneurial framework conditions, such as the market structure, physical infrastructure, R&D system, financial sector, corporate sector, government, and the education system. These framework conditions are listed in the outer circle of the GEI entrepreneurial ecosystem model. The government provides support, and it also creates flexible regulations and enforces the rule of law. The market structure defines the level of competition and the ease of market entry. The education system facilitates the creation of human capital, and also shapes attitudes toward entrepreneurship and builds entrepreneurial skills. The physical infrastructure impacts ease of trading. The R&D system provides technology inputs and feeds innovation. The financial sector provides financing—both equity and debt funding. The corporate sector provides important demand for new ventures, and an important exit mechanism.

The GEI model illustrates the complexity of entrepreneurial ecosystems and helps explain why traditional modes of policymaking often prove inadequate in addressing them. In a complex system such as the one illustrated in Fig. 5.1, it can be quite difficult to identify clear-cut market or structural failures. Rather, all elements of the ecosystem interact, often in surprising and difficult to predict ways, to influence individual-level entrepreneurial choices and the outcomes of those choices. The ecosystem service is created through the interactions of the different elements of the entrepreneurial ecosystem—that is, innovative, high-growth new ventures.

5.3 Using the GEI to Facilitate Entrepreneurial Ecosystems

The distinctive methodological features of the GEI are designed to capture the distinctive characteristics of entrepreneurial ecosystems, and thus facilitate effective policymaking for these ecosystems. It captures the entrepreneurial ecosystem dynamic by contextualizing individual-level data with data that describe a country's entrepreneurship framework conditions. It uses 14 context-weighted measures of entrepreneurial Attitudes, Abilities, and Aspirations, which are organized into three sub-indices. Importantly, it uses a Penalty of Bottleneck algorithm to both simulate co-production of system outputs through stakeholder interactions and facilitate the identification of bottleneck factors that hold back ecosystem performance. See Chap. 6 for a detailed description of the GEI method.

As explained in Chap. 6, each pillar of the GEI is measured as a composite of individual-level data and data that describe relevant framework conditions for entrepreneurship. For example, Startup Skills captures whether adult individuals think they have the necessary skills to start a new venture, weighted by a measure of the degree of tertiary education in the country. This framework variable is used because the higher a country's level of education the higher the quality of its entrepreneurial ventures tends to be. As another example, Networking is a combination of how many individuals in the adult population personally know people who have started new businesses, weighted by the prevalence of Internet use in the country. This measure is used because the Internet tends to amplify opportunities for networking. Thus, the GEI approach captures individual-level attitudes, abilities, and aspirations; each individual variable is then weighted by a relevant framework condition that regulates a given individual-level variable's potential to contribute to a high-quality entrepreneurial dynamic. In other words, this approach captures the notion that entrepreneurial ecosystems are brought to life by individuals, but the ultimate impact of individual-level action is regulated by entrepreneurial framework conditions.

The GEI methodology captures two other important aspects that define entrepreneurial ecosystems. First, it recognizes that the different pillars need to work together to create a high-quality ecosystem dynamic. Traditional indexes fail to capture this aspect. In traditional indexing methods, the different components (pillars) are allowed to substitute for one another. In other words, a traditional index would allow, say, Risk Capital to compensate for the Quality of Human Resources.

This notion of substitutability is similar to replacing eggs with flour when baking a cake. Everyone knows that you need both eggs and flour to bake a good cake, and the GEI methodology similarly requires that a high-quality entrepreneurial dynamic needs both Risk Capital and High-Quality Human Resources, in addition to the system's 12 other pillars. If one or more pillars perform poorly, it is likely to hold back the performance of the entire system. Although one in reality can compensate to some degree for, say, Human Resources with Risk Capital, the entrepreneurial ecosystem is likely to ground to a halt if either element is completely absent.

The notion of bottlenecks derives directly from the notion that ecosystem elements interact to co-produce ecosystem performance. Because one cannot fully substitute individual pillars for others, poorly performing pillars can create bottlenecks that prevent the ecosystem from fully leveraging its strengths. To simulate this effect, the GEI methodology applies the Penalty for Bottleneck algorithm, which is explained in Chap. 6. This algorithm systematically penalizes ecosystem pillars according to its poorly performing pillars. By highlighting potential constraining factors in the entrepreneurial ecosystem, the PFB algorithm guides policy attention to the aspects of the ecosystem that may benefit most from coordinated policy action.

These methodological innovations of the GEI provide important insights into the workings of entrepreneurial ecosystems. Essential to the bottlenecks notion is that some factors may unduly constrain system performance beyond their objective importance. With the PFB methodology, it is possible to identify both where bottlenecks might lurk in any given system and how much the system performance will suffer as a result. These are strengths that no other index approach can offer and that make the GEI approach ideally suited to analyzing entrepreneurial ecosystems.

5.4 GEI Approach for Entrepreneurial Ecosystem Policy Analysis

To illustrate the GEI PFB method, consider a comparison between the US, Japan, and India, as shown in Fig. 5.2. The figure shows the entrepreneurial ecosystem profiles of the three countries, as measured by the GEI approach.

Figure 5.2 shows that the GEI profile of the US entrepreneurial ecosystem is round, with each pillar showing a strong performance. This is the hallmark of a well-balanced entrepreneurial ecosystem. The absence of major gaps in the US GEI profile means that no major bottlenecks are holding back the performance of the US entrepreneurial ecosystem. There is relative softness in the US ecosystem in terms of Networking and Internationalization, which indicates that the US is not as strong in these areas. The relative softness in Internationalization is understandable, as the large size of the US domestic market makes it possible for entrepreneurs to grow a business without having to export their products or services.

Japan's ecosystem profile is considerably more uneven than that of the US, which suggests that the Japanese entrepreneurial ecosystem suffers from real bottlenecks

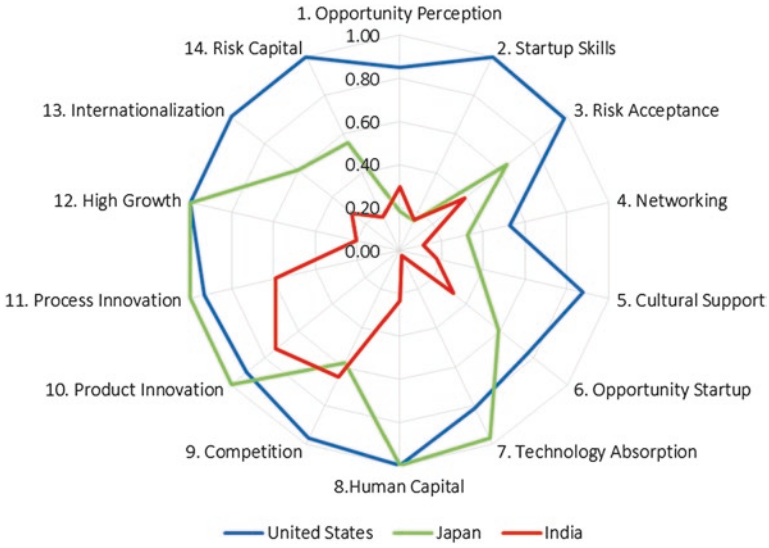

Fig. 5.2 Entrepreneurial ecosystem profiles of the US, Japan, and India

that hold back its performance. The biggest bottlenecks are in Startup Skills, Opportunity Perception, Internationalization, and Competition. If Japan is seeking to improve its entrepreneurial performance, it should prioritize these areas. Addressing Startup Skills is relatively straightforward, as it can be addressed with education policies. These policies would likely also strengthen Opportunity Perception, although this pillar also depends on the country's general economic performance. Like the US, Japan's large domestic market probably moderates its Internationalization aspirations. Addressing the Competition pillar likely requires altogether different policies.

The profile of India's entrepreneurial ecosystem is considerably less developed and more uneven than those of the US and Japan. This pattern is typical of developing economies. The biggest bottlenecks for the India's ecosystem are observed in Startup Skills, Networking, Cultural Support, and Technology Absorption. As a developing economy, India could make considerable progress simply by addressing its basic framework conditions for entrepreneurial and economic activity, such as the rule of law (i.e., equality, objectivity, and predictability in the application of laws, rules, and regulations), equal access to markets, and human capital. It is likely that all developing economies need to address such basic conditions, but the GEI analysis helps highlight specific priority areas for India.

The above examples show how the GEI method could be harnessed for use in the analysis and design of entrepreneurial ecosystem policies in different economic contexts. Merely examining the ecosystem profiles of different countries provides interesting clues about country-specific features and the determinants of the quality of a country's entrepreneurial ecosystem. This is important, because it helps policymakers focus on areas that appear to be constraining a country's entrepreneurial performance. A considerably more detailed analysis can be made by focusing on

Table 5.1 Ecosystem optimization analysis for UK home nations

	Scotland	Wales	N. Ireland	England	UK
Opportunity perception	13%	21%	24%	8%	9%
Startup skills	11%	11%	13%	8%	9%
NonFear of failure	4%	3%	6%	5%	5%
Networking	11%	11%	9%	9%	9%
Cultural support	3%	0%	0%	6%	6%
Opportunity startup	4%	3%	1%	5%	5%
Tech sector	0%	6%	0%	0%	0%
Quality of human resources	4%	3%	5%	4%	4%
Competition	0%	0%	0%	3%	3%
Product innovation	9%	9%	6%	10%	10%
Process innovation	11%	11%	13%	9%	9%
High growth	9%	6%	7%	11%	10%
Internationalization	7%	6%	4%	10%	10%
Risk capital	12%	11%	12%	13%	11%
	100%	100%	100%	100%	100%

individual pillar components (only pillar-level analysis was shown here) and choosing benchmarks that are at a similar level of economic development. For example, it probably does not make sense to compare India to the US because the two economies are so different. Better insights could perhaps be gained by comparing India to, say, China, Pakistan, or even a more aspirational benchmark such as Malaysia.

This analysis can be taken much further. For example, because the GEI methodology allows the ecosystem pillars to interact, it is possible to conduct sensitivity analyses and simulate different policy scenarios. For example, in a recent policy analysis for the Scottish Enterprise, we analyzed where additional policy efforts should be focused in Scotland and other UK Home Nations (i.e., England, Northern Ireland, and Wales) in order to achieve a 10% increase in the overall GEI score. This analysis is presented in Table 5.1, which shows how the additional policy efforts should be allocated across the ecosystem pillars, assuming equal cost to increase pillar performance. The GEI methodology for Scotland, for example, suggests that 13% of the additional policy effort should be allocated to Opportunity Perception, 12% to Risk Capital, 11% each to Startup Skills, Networking, and Process Innovation, and so on.

These figures were calculated by focusing policy efforts on the most pressing bottleneck until it was alleviated, then moving to the next most pressing bottleneck, and so on. While this example obviously includes a number of simplifying assumptions (notably, equal cost to address each pillar; an equally applied bottleneck penalty for all pillars; pillars' equal ability to be changed by policy action), it nevertheless demonstrates the GEI methodology's ability to assess different policy scenarios. Although the scenarios should not be taken as prescriptive, the exercise nevertheless highlights priority areas that could be explored further. Another important benefit is that even this simplifying analysis suggests that there may be important differences among the UK Home Nations in terms of policy priorities in facilitating the UK's entrepreneurial ecosystem.

5.5 Using the GEI Method for Entrepreneurial Ecosystem Policy Implementation

While the GEI provides the most innovative and powerful platform for entrepreneurial ecosystem policy analysis and design, important challenges remain. As noted above, a number of simplifying assumptions are needed to apply a PFB algorithm in constructing the Index. Such assumptions should be kept in mind when using the GEI approach to simulate the kind of policy scenarios illustrated in Table 5.1. As such, the choice of the ecosystem pillars themselves could be debated. For example, different framework measures might be required when developing a regional version of the GEI, as was done when a version was designed for the 125 EU regions. Importantly, the scenarios in Table 5.1 imply that there may not be one optimal ecosystem configuration for each country and each level of economic development. In fact, it is highly likely that there may be several efficient configurations for different countries at the same level of economic development, and for those at different levels of economic development. As noted earlier, entrepreneurial ecosystems are complex and there is still a great deal to learn about how they really work.

One important limitation of the GEI methodology is that it only uses hard data. Entrepreneurial ecosystems are inherently complex, and this complexity extends beyond the quantification of individual ecosystem pillars. The GEI profile indicates which elements of the entrepreneurial ecosystem are in place and in what quantity; however, much like using the same ingredients can produce very different outcomes when baking a cake, depending on how the ingredients are mixed, the GEI tells us little about how the elements should be mixed to produce the best possible outcome for any given country. These soft aspects of entrepreneurial ecosystems are hard to capture using only hard data. Therefore, to facilitate entrepreneurship policy design, it is important to blend hard and soft GEI data to understand how the different ecosystem elements could work together most effectively. For this reason, we have developed a GEI Policy Stakeholder Engagement approach, which is designed to extract the soft, experience-based data to give insights into how the entrepreneurial ecosystem really works and what specific policy actions should be made to address bottlenecks.

To extract these soft insights, it is important to engage entrepreneurial ecosystem policy stakeholders who represent different elements of the ecosystem. Because these ecosystems are large and complex, it is likely that no single stakeholder has a full understanding of how they work. Therefore, it is important to allow each stakeholder to contribute their particular insights into what the ecosystem bottlenecks are and how they really work, perhaps by organizing stakeholder workshops. We have developed a stakeholder facilitation process designed to achieve exactly this purpose with the hard GEI data, which suggests that it is possible to organize a coherent, facilitated debate of the analysis to determine which of the bottlenecks are real and how they actually function.

For example, the GEI analysis suggested that Risk Capital was one bottleneck for the Scottish ecosystem. Discussions among the Scottish stakeholders confirmed

that this was so, but they also noted an additional nuanced detail—that it was not the amount of funding that constrained Risk Capital but the fact that the capital tended to get stuck in portfolio companies because of limited exit opportunities. In other words, while they confirmed that Risk Capital was a bottleneck, they also learned that the real cause of this bottleneck was insufficient circulation of Risk Capital within the Scottish entrepreneurial ecosystem. This added considerable insight not easily achieved through the analysis of hard data alone, and also provided pointers for targeted policy action. By helping to extract such soft insights, the GEI Policy Stakeholder Engagement process facilitates an evidence-based, coherent understanding of how a given country's entrepreneurial ecosystem really works, what the system-level priorities are, and how the policy actions to alleviate the bottlenecks should be designed, prioritized, and coordinated. Thus, when combined with the GEI methodology, the GEI Policy Stakeholder Engagement process provides a useful platform for designing and operationalizing entrepreneurial ecosystem policies.

The GEI Policy Stakeholder Engagement Process comprises several steps:

1. Use the GEI analysis to identify possible bottlenecks in the country's entrepreneurial ecosystem.
2. Examine each bottleneck more closely in order to understand how it really works. To do this, it is important to engage with a group of policy stakeholders who can offer complementary insights into the inner workings of the entrepreneurial ecosystem. It is critical that the discussions be facilitated competently in order to draw out balanced insights and maintain coherence.
3. Conduct a causal analysis of how a bottleneck works by drawing on different sources of qualitative and quantitative data, thereby enabling a coherent discussion on how to alleviate the bottleneck.
4. Design and implement specific, coordinated policy actions to alleviate the country's ecosystem bottlenecks, and use the GEI to help set performance improvement targets.
5. Once consensus has been achieved about what the ecosystem's most pressing bottlenecks are and the associated policy priorities, an action stage should follow. This stage should focus on implementing specific, targeted policy actions collectively designed to bring about a real and tangible change in the ecosystem dynamic. This last stage can (and, in most cases, should) last for several years in order to ensure that it has a lasting impact.

Used this way, the GEI and the policy facilitation process can provide a powerful platform to identify and implement real, long-lasting change in how entrepreneurial ecosystems work. Our experiences in countries such as Scotland and Estonia suggest that the approach can identify both key pressure points on entrepreneurial ecosystems and ways to address them.

At present, most entrepreneurship policy initiatives are still implemented without much coordination or with coordination that is limited to different initiatives within the same domain (e.g., alternative policies to provide funding for small and medium-sized firms). Typically, the aim of such coordination is to avoid overlap in policy

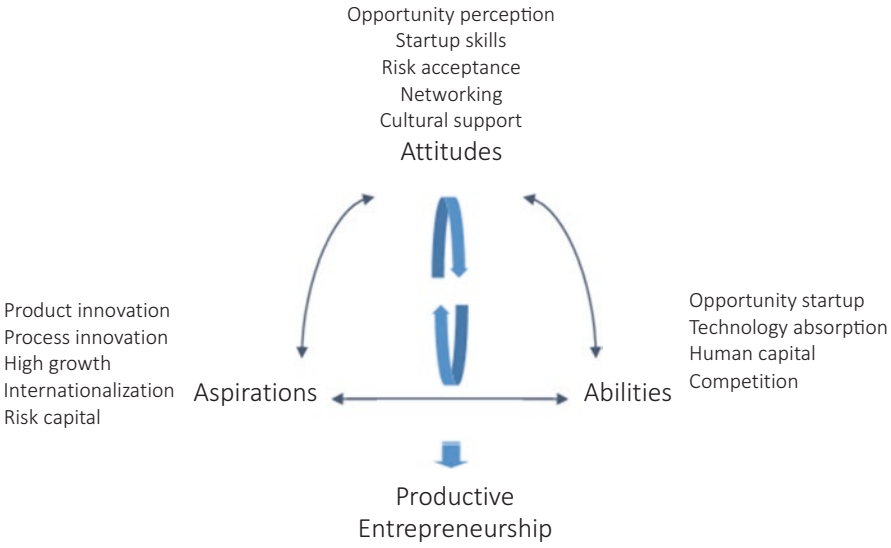

Fig. 5.3 Dynamic of national systems of entrepreneurship

initiatives that address the same need, such as financing. While such coordination helps avoid the waste of resources that stems from a duplication of effort, it also fails to create and exploit synergies that might result from the kind of dynamic, mutually reinforcing interactions that bring entrepreneurial ecosystems to life. Today, coordinated entrepreneurship policy still primarily refers to avoiding overlap, rather than to maximizing the positive feedback and synergies between complementary actions. For entrepreneurship policies to nurture and facilitate entrepreneurial ecosystems effectively, policymakers must become more aware of how the different elements of these ecosystems interact. For example, the proliferation of government-sponsored venture capital programs has given rise to complaints in some countries that the real bottleneck is no longer scarce venture funding but the dearth of fundable management teams and innovative business concepts. If there are too few innovative, high-potential startups, venture capital initiatives will address the wrong bottlenecks. In an ecosystems approach to entrepreneurship policy, attention is paid to such bottlenecks and policy actions are coordinated to maximize positive synergies across complementary initiatives. This level of coordination is still missing in entrepreneurship policy today. The GEI platform, when appropriately implemented, should provide an effective tool for entrepreneurial ecosystem policymaking (Fig. 5.3).

Chapter 6
Methodology and Data Description

6.1 Introduction

In previous GEI publications, we have described the Global Entrepreneurship and Development Index methodology in detail.[1] Here we describe the structure of the dataset, and a short summary of the GEI methodology. As compared to the previous versions the institutional components of the GEI have been reviewed and changed. Here, we provide a description of the changes. As a result, the previous scores and rankings cannot be compared to this version.

6.2 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."[2] According to this definition, we propose four-level index building: (1) variables, (2) pillars, (3) sub-indices, and, finally, (4) the super-index. All three sub-indices contain several pillars, which can be interpreted as the quasi-independent building blocks of this entrepreneurship index.

In this section, we describe the sub-indices and pillars. In the following section, we describe the variables. The three sub-indices of Attitudes, Abilities, and Aspirations constitute the entrepreneurship super-index, which we call the Global Entrepreneurship and Development Index. While in Chap. 3 we have provided a

[1] See Acs & Szerb 2009, 2012; Acs, Szerb, & Autio 2013, 2014, 2016.

[2] See Acs, Szerb, & Autio, 2014 p. 480.

Z.J. Acs et al., *Global Entrepreneurship and Development Index 2017*,
SpringerBriefs in Economics, DOI 10.1007/978-3-319-65903-9_6

detailed portrayal of the GEI index components here we focus on the measurement of the particular variables and pillars. The new structure of the index is in Table 6.1.

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).

Table 6.1 The structure of the new Global Entrepreneurship and Development Index (GEI)[a]

	Sub-indexes	Pillars	Variables (ind./inst.)
GLOBAL ENTREPRENEURSHIP AND DEVELOPMENT INDEX	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*INFRASTUCTURE)
		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)
		COMPETITION	*COMPETITORS*
			COMPETETIVNESS (MARKET DOMINANCE*REGULATION)
	ASPIRATION SUB-INDEX	PRODUCT INNOVATION	*NEW PRODUCT*
			TECH TRANSFER
		PROCESS INNOVATION	*NEW TECHLOLOGY*
			SCIENCE (GERD*((AVERAGEQUALITY OF SCIENTIFICAL INSTITUTIONS +AVAILABILITY OF SCIENTISTS AND ENGENEERS))
		HIGH GROWTH	*GAZELLE*
			FINANCE AND STRATEGY (VENTURE CAPITAL*BUSINESS SOPHISTICATION)
		INTERNATIONALIZATION	*EXPORT*
			ECONOMIC COMPLEXITY
		RISK CAPITAL	*INFORMAL INVESTMENT*
			DEPTH OF CAPITAL MARKET

Red letters show the changes in the index structure as compared to the previous GEI version

[a]Individual variables are colored with white background while institutional ones with light blue background

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

Table 6.2 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.

(continued)

Table 6.2 (continued)

Pillar name	Description
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% in 5 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.

6.3 The Individual Variables 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 6.3.

For the 2017 GEI publication we used 2014–2015 or previous years' Global Entrepreneurship Monitor individual data. For the individual variable calculation, we include 508,009 individuals from 100 countries of the GEM Adult Population Survey; 61 countries' individual data are from the years 2014–2015, and 39 coun-

Table 6.3 The description of the individual variables used in the GEI

Individual variable	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 ten more employees and 50% in 5 years)
Export	Percentage of the TEA businesses where at least some customers are outside country (over 1%)
Informal investment mean	The mean amount of 3-year informal investment
Business angel	The percentage of the 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 INFINVMEAN* BUSANG

tries have individual data from the pre-2013 years. We estimated the individual variables for 37 countries by using nearby and similar countries' GEM Adult Population Survey data. 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 viewed with discretion.

Since the availability of the institutional data also limited the selection of the countries, we could involve only those nations that participated in the World

Economic Forum 2014–2015 or 2015–2016 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 different years, the participating countries and the calculation of the individual variables, including the 37 non-GEM countries, are also reported in Table 6.4. All analyses of countries having data older than 2013 and based on estimation should be handled with caution and cannot be used for any policy suggestions. This is particularly true for countries with estimated individual data.[3] In fact, even GEM survey backed calculated variables and pillars are only the starting point of a detailed GEI based policy analysis.[4]

6.4 The Institutional Variables and Dataset

Since the GEM lacks the necessary institutional variables, we complement individual 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 and Private Equity Country Attractiveness Index (depth of capital market[5]).

In this version, we apply the most recent institutional variables available on January 31, 2016. The full description of the institutional variables, their sources, and the year of the survey can be found in Table 6.5.

[3] 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 11 countries that joined GEM over the 2012–2015 time period for which we previously estimated their data points. Out of the 11 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/.

[4] For detailed policy analysis see Autio & Levie 2015, Estonia report 2015.

[5] Groh et al. 2012.

Table 6.4 The distribution of the sample by countries and the calculation of the individual variables

Country	Year							Individual variable method of calculation
	2009	2010	2011	2012	2013	2014	2015	
Albania								Average of Bosnia and Macedonia 2014
Algeria				4984	2497			Average of 2012–2013
Angola					2049	2028		Average of 2013–2014
Argentina						2095	2519	Average of 2014–2015
Armenia								Average of Georgia and Russia
Australia						1823	1770	Average of 2014–2015
Austria				4548		4554		Average of 2012–2014 data
Azerbaijan								Average of Georgia and Turkey
Bahrain								Same as Qatar 2014
Bangladesh			1932					2011 data
Barbados						2000	2000	Average of 2014–2015
Belgium						2004	2022	Average of 2014–2015
Belize								Average of Burkina Faso, Cameroon and Senegal
Benin						2000		2014 data
Bolivia						2590		2014 data
Bosnia and Herzegovina					2004	2015		Average of 2013–2014
Botswana						2146	2200	Average of 2014–2015
Brazil						10,000	2000	Average of 2014–2015
Brunei Darussalam								Average of Malaysia and Singapore 2014
Bulgaria							2001	2015 data
Burkina Faso						2850	2325	Average of 2014–2015
Burundi								Average of Burkina Faso, Cameroon and Senegal
Cambodia								Average of Vietnam and Thailand
Cameroon						2087	2397	Average of 2014–2015
Canada						2037	2933	Average of 2014–2015
Chad								Average of Burkina Faso, Cameroon and Senegal
Chile						5375	5407	Average of 2014–2015
China						3647	3365	Average of 2014–2015
Colombia						3691	3686	Average of 2014–2015

(continued)

Table 6.4 (continued)

Country	Year							Individual variable method of calculation
	2009	2010	2011	2012	2013	2014	2015	
Costa Rica				2041		2057		Average of 2012–2014 data
Côte d'Ivoire								Average of Burkina Faso and Cameroon
Croatia						2000	2000	Average of 2014–2015
Cyprus								Same as Greece
Czech Republic					5009			2013
Denmark				2217		2008		Average of 2012–2014 data
Dominican Republic	2007							2009
Ecuador						1834	1931	Average of 2014–2015
Egypt				2501			2512	Average of 2012–2015 data
El Salvador				1905		2014		Average of 2012–2014 data
Estonia						2036	2002	Average of 2014–2015
Ethiopia				3003				2012
Finland						2005	2007	Average of 2014–2015
France					1567	1567		Average of 2013–2014
Gabon								Average of Namibia and Botswana previous year
Gambia, The								Average of Burkina Faso, Cameroon and Senegal
Georgia						1648		2014 data
Germany						4311	3842	Average of 2014–2015
Ghana				2213	2100			Average of 2012–2013
Greece						2000	2000	Average of 2014–2015
Guatemala						2158	2181	Average of 2014–2015
Guinea								Average of Burkina Faso, Cameroon and Senegal
Guyana								Same as Suriname 2014
Honduras								Average of Guatemala and Panama
Hong Kong	2000							2009
Hungary						2003	2000	Average of 2014–2015
Iceland		1684						2010 data
India						3360	3413	Average of 2014–2015
Indonesia						5520	5620	Average of 2014–2015

(continued)

Table 6.4 (continued)

Country	Year							Individual variable method of calculation
	2009	2010	2011	2012	2013	2014	2015	
Iran						3352	3234	Average of 2014–2015
Ireland						2000	2001	Average of 2014–2015
Israel					2039		2055	Average of 2013–2015
Italy						2000	2000	Average of 2014–2015
Jamaica					2246	2637		Average of 2013–2014
Japan					2000	2006		Average of 2013–2014
Jordan	2006							2009
Kazakhstan						2099	2101	Average of 2014–2015
Kenya								Average of Burkina Faso, Cameroon and Senegal
Korea					2000		2000	Average of 2013–2015
Kuwait								Same as Qatar 2014
Kyrgyz Republic								Average of Kazakhstan and Russia
Lao PDR								Average of Vietnam and Thailand
Latvia					2000		2004	Average of 2013–2015
Lebanon	2000						2600	2015 data
Liberia								Average of Burkina Faso, Cameroon and Senegal
Libya					2246			2013
Lithuania					2000	2000		Average of 2013–2014
Luxembourg						2074	2016	Average of 2014–2015
Macedonia					2000		1998	Average of 2013–2015
Madagascar								Average of Burkina Faso, Cameroon and Senegal
Malawi				1847	2094			Average of 2012–2013
Malaysia						1999	2000	Average of 2014–2015
Mali								Average of Burkina Faso, Cameroon and Senegal
Mauritania								Average of Burkina Faso, Cameroon and Senegal
Mexico						2587	4643	Average of 2014–2015
Moldova								Average of Romania and Russia
Montenegro		2000						2010
Morocco							2061	2015 data

(continued)

Table 6.4 (continued)

Country	Year							Individual variable method of calculation
	2009	2010	2011	2012	2013	2014	2015	
Mozambique								Average of Burkina Faso, Cameroon and Senegal
Myanmar								Average of Vietnam and Thailand
Namibia				1959	1938			Average of 2012–2013
Netherlands						1836	1754	Average of 2014–2015
Nicaragua								Average of Guatemala and Panama
Nigeria				2651	2604			Average of 2012–2013
Norway						2000	2000	Average of 2014–2015
Oman								Same as Qatar 2014
Pakistan			2002	2000				Average of 2011–2012
Panama						2005	2000	Average of 2014–2015
Paraguay								Average of Ecuador and Peru
Peru						2078	2078	Average of 2014–2015
Philippines						2000	2000	Average of 2014–2015
Poland						2001	2000	Average of 2014–2015
Portugal						2005	2005	Average of 2014–2015
Puerto Rico						1995	1999	Average of 2014–2015
Qatar						4269		2014 data
Romania						1998	2002	Average of 2014–2015
Russia						2001		Average of 2013–2014
Rwanda								Average of Burkina Faso, Cameroon and Senegal
Saudi Arabia		1957						2010 data
Senegal							2363	2015 data
Serbia	1766							2009 data
Sierra Leone								Average of Burkina Faso, Cameroon and Senegal
Singapore					1998	2004		Average of 2013–2014
Slovakia						2000	2003	Average of 2014–2015
Slovenia						2004	2009	Average of 2014–2015
South Africa						3350	2765	Average of 2014–2015
Spain						25,000	24,300	Average of 2014–2015
Sri Lanka								Average of India and Pakistan 2014
Suriname					2074	2006		Average of 2013–2014

(continued)

Table 6.4 (continued)

Country	Year							Individual variable method of calculation
	2009	2010	2011	2012	2013	2014	2015	
Swaziland								Average of Namibia and Angola previous year
Sweden						1889	3716	Average of 2014–2015
Switzerland						1895	1886	Average of 2014–2015
Taiwan						2000	2000	Average of 2014–2015
Tajikistan								Average of Kazakhstan and Russia
Tanzania								Average of Burkina Faso, Cameroon and Senegal
Thailand						2059	3000	Average of 2014–2015
Trinidad and Tobago					1787	1769		Average of 2013–2014
Tunisia							1946	2015 data
Turkey				2401	32,945			Average of 2012–2013
Uganda					2513	2112		Average of 2013–2014
Ukraine								Average of Russia and Romania
United Arab Emirates			3029					2011 data
United Kingdom						1572	7886	Average of 2014–2015
United States						2840	2683	Average of 2014–2015
Uruguay						1616	1742	Average of 2014–2015
Venezuela			1888					2011 data
Vietnam						2000	2000	Average of 2014–2015
Zambia				2155	2099			Average of 2012–2013

6.5 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 7 out of our 14 institutional variables are from the GCI, it is particularly important to have these variables. While there were five additional countries in the GEM 2014 surveys, we had to cancel out Tonga, Vanuatu, the West Bank and Gaza Strip, Yemen, and Syria because of the lack of proper institutional variables.[6]

[6] 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.

Table 6.5 The description and source of the institutional variables used in the GEI

Institutional variable	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 2015.	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 * Property Rights	Own calculation	
Tertiary education	Gross enrolment ratio in tertiary education, 2015 or latest available data.	World Bank	http://data.worldbank.org/indicator/SE.TER.ENRR
Quality of education	Answers to the question: "In your country, how do you assess the quality of math and science education? [1 = extremely poor–among the worst in the world; 7 = excellent–among the best in the world]"		The Global Competitiveness Report 2015–2016, p. 377
Education	Tertiary Education * Quality of Education	Own calculation	
Country risk	The country risk classifications are meant to reflect country risk. Under the Participants' system, country risk is composed of transfer and convertibility risk (i.e. the risk a government imposes capital or exchange controls that prevent an entity from converting local currency into foreign currency and/or transferring funds to creditors located outside the country) and cases of force majeure (e.g. war, expropriation, revolution, civil disturbance, floods, earthquakes).	OECD	http://www.oecd.org/tad/xcred/crc.htmx

Institutional variable	Description	Source of data	Data availability
Urbanization	Urbanization that is the percentage of the population living in urban areas, data are from the Population Division of the United Nations, 2010 estimate	United Nations	http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS
Infrastructure	Pillar 2, Infrastructure and connectivity in the World Competitiveness Report: "(…) in addition to assessing the quality of the transport infrastructure, the pillar also measures the quality of domestic and international transport networks."	World Economic Forum	The Global Competitiveness Report 2015–2016, p. 47
Connectivity	Urbanization * Infrastructure	Own calculation	
Corruption	The Corruption Perceptions Index (CPI) measures the perceived level of public-sector corruption in a country. "The CPI is a "survey of surveys", based on 13 different expert and business surveys." (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	http://files.transparency.org/content/download/702/3015/file/CPI2013_DataBundle.zip
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 * Good Governance	Own calculation	
Tech absorption	Firm level technology absorption capability: "Companies in your country are (1 = not able to absorb new technology, 7 = aggressive in absorbing new technology)".	World Economic Forum	The Global Competitiveness Report 2015–2016. p. 379
Labor freedom	Measures the freedom of the labor as "(…) that considers various aspects of the legal and regulatory framework of a country's labor market, including regulations concerning minimum wages, laws inhibiting layoffs, severance requirements, and measurable regulatory restraints on hiring and hours worked." (http://www.heritage.org/index/labor-freedom)	Heritage Foundation	http://www.heritage.org/index/download

(continued)

Table 6.5 (continued)

Institutional variable	Description	Source of data	Data availability
Staff Training	The extent of staff training: "To what extent do companies in your country invest in training and employee development? (1 = hardly at all; 7 = to a great extent)".	World Economic Forum	The Global Competitiveness Report 2015–2016, p. 377
Labor market	Labor Freedom * Staff Training		
Regulation	Effectiveness of anti-monopoly policy, answering to the question: "In your country, how effective are anti-monopoly policies at ensuring fair competition? [1 = not effective at all; 7 = extremely effective] "	World Economic Forum	The Global Competitiveness Report 2015–2016, p. 395
Market Dominance	Extent of market dominance: "Corporate activity in your country is (1 = dominated by a few business groups, 7 = spread among many firms)".	World Economic Forum	The Global Competitiveness Report 2015–2016, p. 471
Compregulation	Regulation * Market Dominance		
Technology transfer	These are the innovation index points from GCI: a complex measure of innovation including investment in research and development (R&D) by the private sector, the presence of high-quality scientific research institutions and the collaboration in research between universities and industry, and the protection of intellectual property.	World Economic Forum	The Global Competitiveness Report 2015–2016, p. 22
GERD	Gross domestic expenditure on Research & Development (GERD) as a percentage of GDP, year 2014 or latest available data Puerto Rico, Dominican Republic, and United Arab Emirates are estimated	UNESCO	http://stats.uis.unesco.org/unesco/TableViewer/tableView.aspx?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 = extremely good–among the best in the world] "	World Economic Forum	The Global Competitiveness Report 2015–2016, p. 381

Institutional variable	Description	Source of data	Data availability
Availability of Scientist	Availability of scientists and engineers. Answering to the question: "In your country, to what extent are scientists and engineers available? [1 = not at all; 7 = widely available]"	World Economic Forum	The Global Competitiveness Report 2015–2016, p. 381
Science	GERD* Average of Scientific Institutions and Availability of Scientist	Own calculation	
Venture capital	Venture capital availability. Answering to the question: "In your country, how easy is it for start-up entrepreneurs with innovative but risky projects to obtain equity funding? [1 = extremely difficult; 7 = extremely easy]"	World Economic Forum	The Global Competitiveness Report 2015–2016, p. 379
Business strategy	Refers to the ability of companies to pursue distinctive strategies, which involves differentiated positioning and innovative means of production and service delivery.	World Economic Forum	The Global Competitiveness Report 2015–2016, p. 22
Finance and strategy	Venture Capital Business Strategy	Own calculation	
Economic complexity	"The complexity of an economy is related to the multiplicity of useful knowledge embedded in it. Because individuals are limited in what they know, the only way societies can expand their knowledge base is by facilitating the interaction of individuals in increasingly complex networks in order to make products. We can measure economic complexity by the mix of these products that countries are able to make." (http://atlas.media.mit.edu/en/resources/economic_complexity/)	Observatory of Economic Complexity	http://atlas.media.mit.edu/en/resources/data/
Depth of capital market[a]	The Depth of Capital Market is one of the six sub-indices of the Venture Capital and Private Equity index. This variable is a complex measure of the size and liquidity of the stock market, level of IPO, M&A and debt and credit market activity. Note that there were some methodological changes over the 2006–2015 time period so previous years comparison is not perfect.	EMLYON Business School France and IESE Business School, Barcelona, Spain	http://blog.iese.edu/vcpeindex/

[a]Special thanks to Alexander Groh and his team for providing the Depth of Capital Market data

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.[7]

6.6 Calculating the Scores

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

1. ***The selection of variables:*** We start with the variables that come directly from the original sources for each country involved in the analysis. The variables 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 15 institutional variables.
2. ***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.

$$z_{i,j} = IND_{i,j} \times INS_{i,j} \tag{6.1}$$

for all j = 1 … k, 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

3. ***Normalization:*** Pillar values were first normalized to a range from 0 to 1, according to Eq. 6.1:

$$x_{i,j} = \frac{z_{i,j}}{\max z_{i,j}} \tag{6.2}$$

[7] 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.

for all j = 1…k, 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

4. ***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 132 countries in our dataset, we use the benchmarks values from the full dataset, which contains all the 629 observations made over the 2002–2014 time period.
5. ***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 equate the average values of the components. Equation 6.2 shows the calculation of the average value of pillar j:

$$\bar{x}_j = \frac{\sum_{i=1}^{n} x_{i,j}}{n}. \tag{6.3}$$

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

$$y_{i,j} = x_{i,j}^{k} \tag{6.4}$$

where k is the "strength of adjustment", the k-th moment of X_j is exactly the needed average, $\bar{y}_j$. We have to find the root of the following equation for k

$$\sum_{i=1}^{n} x_{i,j}^{k} - n\bar{y}_j = 0 \tag{6.5}$$

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

$$\begin{aligned} \bar{x}_j < \bar{y}_j \quad & k < 1 \\ \bar{x}_j = \bar{y}_j \quad & k = 1 \\ \bar{x}_j > \bar{y}_j \quad & k > 1 \end{aligned}$$

then k is thought of as the strength (and direction) of adjustment.
The adjusted pillar values are calculated for the entire 2006–2015 time period, resulting 554 observations. These values and this distribution are applied for the

137 countries in the GEDI 2017 edition. It means that the average adjusted pillar values of the countries that participated in the 2015 GEM cycle are exactly same in the 2006–2015 dataset and in the 2017 GEDI edition. Note that, of the individual variables of the 137 countries in the GEDI 2017 edition, 61 are from the 2015 survey, 39 are from earlier GEM surveys, and 37 are estimates.

The distribution of the average adjusted pillars can be found in the Appendix.

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

$$h_{(i),j} = \min y_{(i),j} + \left(1 - e^{-\left(y_{(i)j} - \min y_{(i),j}\right)}\right) \tag{6.6}$$

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,… n = the number of countries
j = 1, 2,….m = 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.

$$ATT_i = 100\sum_{j=1}^{5} h_j \tag{6.7a}$$

$$ABT_i = 100\sum_{j=6}^{9} h_j \tag{6.7b}$$

$$ASP_i = 100\sum_{j=10}^{14} h_j \tag{6.7c}$$

where $h_{i,j}$ is the modified, post-penalty value of pillar j in country i
i = 1, 2,…n = the number of countries
j = 1, 2,….14 = the number of pillars

8. The super-index, the Global Entrepreneurship and Development 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

$$GEI_i = \frac{1}{3}\left(ATT_i + ABT_i + ASP_i\right) \tag{6.8}$$

where i = 1, 2,…n = the number of countries

Starting last year, 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 Chap. 3). 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 2017 GEI scores, the GEI scores of the first six countries—the United States, Switzerland, Canada, Sweden, Denmark, Iceland and Australia—do not differ significantly. However, the GEI score difference is significant between the US in first place and the United Kingdom in seventh. 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.

6.6.1 The Underlying Structure of the Data (Reflecting the Full 2006–2015 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.[8] 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 37 countries, it is better to

[8] OECD (2008).

examine not the 137 countries involved in our analysis but the full 2006–2015 dataset, with 554 data points excluding the estimated country data.

We report correlations between the normalized and average equalized pillars, shown in Table 6.6, and the correlations between the normalized indicators after applying the PFB methodology, shown in Table 6.7. In general, significant and medium to high correlations exist between the pillars in both cases. The lowest correlation is between Startup Skills and High Growth (0.314) 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.[9] 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.[10] In sum, all of these tests support the internal consistency of the structure as described with the 14 selected pillars.

6.7 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, 14 pillars, and 31 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

[9] 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.

[10] 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).

Table 6.6 The correlation matrix between the normalized and average equated pillars (2006–2015 dataset)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Opportunity perception	1	0.531**	0.609**	0.584**	0.831**	0.730**	0.496**	0.443**	0.673**	0.454**	0.406**	0.456**	0.362**	0.455**
2	Startup skills		1	0.484**	0.441**	0.584**	0.553**	0.516**	0.392**	0.447**	0.327**	0.417**	0.314**	0.422**	0.484**
3	Risk acceptance			1	0.528**	0.709**	0.778**	0.634**	0.585**	0.682**	0.551**	0.691**	0.521**	0.556**	0.630**
4	Networking				1	0.626**	0.611**	0.430**	0.353**	0.518**	0.537**	0.498**	0.408**	0.282**	0.481**
5	Cultural support					1	0.824**	0.620**	0.516**	0.739**	0.557**	0.573**	0.565**	0.500**	0.647**
6	Opportunity startup						1	0.696**	0.652**	0.772**	0.569**	0.701**	0.558**	0.605**	0.711**
7	Technology absorption							1	0.540**	0.609**	0.546**	0.713**	0.574**	0.609**	0.655**
8	Human capital								1	0.557**	0.496**	0.547**	0.634**	0.511**	0.602**
9	Competition									1	0.539**	0.618**	0.484**	0.539**	0.592**
10	Product innovation										1	0.665**	0.655**	0.478**	0.624**
11	Process innovation											1	0.583**	0.653**	0.696**
12	High growth												1	0.574**	0.632**
13	Internationalization													1	0.656**
14	Risk capital														1

The number of observations = 556

**Correlation is significant at the 0.01 level (2-tailed)

Table 6.7 The correlation matrix between the indicators, sub-indices, and the GEI super-index after normalizing and applying the PFB method (2006–2015 dataset)

		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Opportunity perception	1	0.638**	0.707**	0.680**	0.869**	0.894**	0.793**	0.619**	0.585**	0.764**	0.775**	0.590**	0.557**	0.597**	0.517**	0.584**	0.647**
2	Startup skills		1	0.617**	0.580**	0.689**	0.813**	0.681**	0.652**	0.559**	0.598**	0.701**	0.503**	0.579**	0.508**	0.577**	0.631**	0.640**
3	Risk acceptance			1	0.654**	0.784**	0.878**	0.834**	0.721**	0.678**	0.766**	0.843**	0.666**	0.766**	0.636**	0.660**	0.716**	0.787**
4	Networking				1	0.718**	0.823**	0.710**	0.575**	0.505**	0.640**	0.683**	0.646**	0.624**	0.546**	0.448**	0.609**	0.655**
5	Cultural support					1	0.935**	0.864**	0.721**	0.638**	0.814**	0.854**	0.676**	0.694**	0.680**	0.630**	0.734**	0.778**
6	ATTINDEX						1	0.897**	0.762**	0.688**	0.828**	0.892**	0.709**	0.746**	0.685**	0.659**	0.757**	0.811**
7	Opportunity startup							1	0.765**	0.734**	0.831**	0.936**	0.679**	0.782**	0.661**	0.700**	0.778**	0.823**
8	Technology absorption								1	0.649**	0.703**	0.882**	0.649**	0.784**	0.684**	0.699**	0.747**	0.813**
9	Human capital									1	0.668**	0.848**	0.616**	0.645**	0.713**	0.629**	0.707**	0.753**
10	Competition										1	0.897**	0.659**	0.722**	0.613**	0.646**	0.691**	0.761**
11	ABTINDEX											1	0.730**	0.826**	0.748**	0.752**	0.821**	0.885**
12	Product innovation												1	0.740**	0.722**	0.610**	0.718**	0.861**
13	Process innovation													1	0.678**	0.735**	0.777**	0.900**
14	High growth														1	0.675**	0.725**	0.858**
15	Internationalization															1	0.741**	0.861**
16	Risk capital																1	0.906**
17	ASPINDEX																	1
18	GEI																	

The number of observations = 556

**Correlation is significant at the 0.01 level (2-tailed)

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, which are calculated mainly from the 2014–2015 individual dataset, except for the 20 countries that only have data from previous years. Altogether, the sample includes 508,009 individuals from 100 countries. Individual data from 37 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 2013 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 new version of GEI we increased the number of institutional indicators 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 January, 31, 2016.

We summarized the index-building steps in eight points. Since these steps were described in full detail in the previous publications, we provided only a short description.[11]

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.

[11] Acs, Rappai & Szerb 2011, Acs, Autio & Szerb 2014.

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