



## JRC TECHNICAL REPORTS

# The European Index of Digital Entrepreneurship Systems

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**Title:**

The European Index of Digital Entrepreneurship Systems

**Abstract:**

During the last decade digitisation has transformed the character of entrepreneurial activities as for both the entrepreneurial opportunities and the practices to pursue them. In this context, to ensure that the new productivity potential is fully deployed to the benefits of economic growth and societal welfare, policymakers need adequate metrics to monitor digital entrepreneurship. The measurement challenge of the digital entrepreneurship lays in the pervasive nature of the phenomenon itself that cannot be captured by count-based measures of individual-level entrepreneurial action. Therefore it becomes important to monitor the conditions which set the business context of entrepreneurs in the different EU countries. The European Index of Digital Entrepreneurship Systems (EIDES) addresses the measurement challenge by appraising the framework and systemic conditions for 1. stand-up, 2. start-up, and 3. scale-up activities in the EU28 countries. Furthermore, the EIDES also attempts to disentangle the digital component of the just-mentioned entrepreneurial conditions and stages of development.

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## Foreword

This report is prepared in the context of the three-year research project on Research on Innovation, Start-up Europe and Standardisation (RISES), jointly launched in 2017 by JRC and DG CONNECT of the European Commission. The JRC provides evidence-based support to policies in the domain of digital innovation and start-ups. In particular:

- Innovation with the focus on maximising the innovation output of EC funded research projects, notably building on the [Innovation Radar](#);
- Start-ups and scale-ups – providing support to [Start-up Europe](#); and
- Standardisation and IPR policy aims under the [Digital Single Market](#) priorities.

This research builds on the work and expertise gathered within the [EURIPIDIS project](#). It is part of the long-standing collaboration between the JRC and DG CONNECT in the domain of digital innovation and start-ups.

## Executive summary

Over the recent decade entrepreneurship has undergone a global transformation. The entrepreneurial opportunities were radically redefined and the practices to pursue them have changed accordingly. These transformations are reflected in the global adoption of new organisational innovations to support entrepreneurial activity, and -above all- in the emergence of a regional agglomeration of economic activity: **the entrepreneurial ecosystem**. The digitally-enabled entrepreneurial transformation creates important challenges for policy. Policy-makers need metrics to monitor this transformation and ensure that the productivity potential of digital advances can benefit the economic and societal welfare. This need sets up a **measurement challenge** because **the digitally-enabled entrepreneurial ecosystem is a pervasive systemic phenomenon** impossible to capture by count-based measures of individual-level entrepreneurial action.

The **European Index of Digital Entrepreneurship Systems (EIDES)**, presented in this report, responds to the need for a **tool to better understand and appraise the extent of the digital entrepreneurial ecosystem**. Specifically, the EIDES is an attempt to measure both physical and digital conditions for stand-up, start-up and scale-up ventures in EU 28 countries. To this purpose, the EIDES builds on the existing Entrepreneurship and Scale-up Indices (ESIS) by the Joint Research Centre (Van Roy & Nepelski, 2016) by providing a critical review of the previous index of entrepreneurial conditions. This novel work attempts to turn the existing index **from a tool to measure general framework conditions for entrepreneurship to a tool to framework conditions for digital entrepreneurship**. Following the critical review of the ESIS and a discussion of the current transformation of entrepreneurship, this report presents the method adopted to construct the EIDES with the results that the EIDES highlights for the EU 28 countries.

The structure of the revised EIDES (Figure 2) encompasses **four pillars for the General Framework Conditions** (i.e. *Culture and Informal Institutions, Formal Institutions, Regulation, and Taxation, Market Conditions and Physical Infrastructure*) **and their associated digital counterparts**. Specifically, each framework condition can be digitalised with a suitable measure of a corresponding digital context obtained made by variables that reflect the digitalisation of each specific framework condition. Consequently, two versions of each framework condition appear in the index: a non-digitalised version and a digitalised one.

In addition to the General Framework Conditions, **the EIDES also measures 'systemic' framework conditions** which are the resource-related conditions with a direct effect on the entrepreneurial dynamic in a given country or region. In practical terms, businesses require a range of different resources (i.e. *Human Capital, Knowledge Creation and Dissemination, Finance, and Networking and Support*) in order to scale up successfully. These resources are not substitutable against one another. Therefore, the Systemic Framework Conditions have to come together to help 'co-produce' the system outcomes.

In the EIDES' theoretical structure the General Framework Conditions apply broadly to entrepreneurship, while **the Systemic Framework Conditions act differently across three stages of the entrepreneurial development: stand-up, start-up, and scale-up**. The Stand-up stage relates to the self-selection of individuals into entrepreneurship. The Start-up stage is the subsequent creation of new start-ups. The Scale-up stage concerns the scaling up of the start-ups that discovered a business model with high-growth potential. Accordingly, the EIDES includes three sub-indices for each Systemic Framework Conditions plus their digital versions calculated with measures of the corresponding digital contexts.

Finally, the value of the overall EIDES is the average of both General and Systemic Framework Conditions. This approach possibly provides a helpful portrayal of **national systems of entrepreneurship**. In each national system of entrepreneurship, **general framework conditions regulate how the systemic conditions can** realise their full potential and **co-produce the national entrepreneurial dynamic**. The approach

underlying the EIDES also distinguishes between digital and non-digital conditions to proxy the effect of digitalisation on systems' abilities to facilitate high-quality entrepreneurial dynamic. Furthermore, declining the systemic conditions across three entrepreneurial stages allows for even more fine-grained policy insights.

According to the EIDES ranking for 2018 **Denmark, Sweden, Luxembourg, and Finland lead as for their digitalised General and Systemic Framework Conditions for entrepreneurship.** In particular Denmark is first in all Digital Entrepreneurship Stand-up, Start-up and Scale-up sub-indices. Sweden is the second for Start-up and Scale-up sub-indices, and the fourth for the Stand-up one. Finland is the second for Stand-up conditions and the fourth for the rest. Behind at a notable distance according to the EIDES are **the followers** made of nine countries: **Germany, United Kingdom, Netherlands, Ireland, Belgium, Austria, Malta, Estonia and France.** Germany and the United Kingdom appear quite close to one another. A third cluster is made of **catchers-up: Spain, Czech Republic, Lithuania, Slovenia, Portugal and Cyprus.** Finally, **the laggards** are the remaining nine countries: **Poland, Latvia, Italy, Croatia, Hungary, Slovakia, Greece, Bulgaria and Romania.** It is striking that Italy, in spite being one of the G7 countries, ranks in this group together with former centrally planned economies and Greece.

# 1 Introduction

Over the recent decade or so, entrepreneurship has undergone a global transformation. Not only has the landscape of opportunities for entrepreneurial action been redefined, also the effective practices for pursuing entrepreneurial opportunities have changed radically. These transformations are reflected in, e.g., the global adoption of new organisational innovations to support entrepreneurial activity (notably, new venture accelerators) and in the emergence of a novel, distinctively different type of a regional agglomeration of economic activity, that of the 'entrepreneurial ecosystem' (Autio, Nambisan, Thomas, & Wright, 2018).

The recent transformation in entrepreneurship has been prompted by another global trend: that of digitalisation, or the application of digital technologies and infrastructures to redefining how economies and societies work. This pervasive trend is ultimately underpinned by Moore's Law, which states that the transistor density of microprocessors will double every eighteen months, driving similarly geometric increases in the performance of digital technologies and infrastructures. This law means that the economy and society are being supplied, at a geometrically increasing rate, with possibilities to enhance, extend, and enrich value-creating interactions among their constituent members. These possibilities, also referred to as digital affordances, are not always immediately obvious: many are discovered by entrepreneurs, who exploit them to challenge industry incumbents with radical new business models. This mechanism has prompted the global emergence of regional entrepreneurial ecosystems, while at the same time equipping entrepreneurs with new tools and practices with which to pursue disruption opportunities opened up by digitalisation.

The digitally enabled entrepreneurial transformation of the economy and society creates important challenges for policy. In order to ensure that the productivity potential opened up by digital advances is maximally leveraged for economic and societal welfare, policy-makers need metrics to monitor this transformation. This need sets up a measurement challenge because the digitally enabled entrepreneurial transformation is, in essence, a pervasive systemic phenomenon that cannot be satisfactorily captured in count-based measures of individual-level entrepreneurial action. Digitalisation not only shapes opportunities for entrepreneurial action: it also shapes the context within which entrepreneurial action takes place. It is therefore important to monitor relevant aspects of the systemic context within which prospective and active entrepreneurs operate in different countries. The objective of this report is to address this need, paying attention to the general context for entrepreneurial opportunity pursuit and scale-up in EU countries, digital forces that shape this context, as well as the resource conditions that directly affect entrepreneurs and their ventures in the EU28 countries.

This report constructs the European Index of Digital Entrepreneurship Systems (EIDES). The EIDES is the first of a series of three annual updates of conditions for entrepreneurial stand-up, start-up, and scale-up activity in EU-28 countries, prepared under the project: JRC/SVQ/ 2017/B.6/0009/NC: "Review and annual updates of the Entrepreneurship and Scale-up Indices". This project builds upon an earlier version of 'Entrepreneurship and Scale-up Indices' (ESIS), created by the Joint Research Centre of the European Commission (Van Roy & Nepelski, 2016). The objectives of this project, as stated in the Call for Tenders, are (JRC/SVQ/ 2017/B.6/0009/NC Technical Specifications, p3):

1. deliver a critical review of the latest edition of ESIS, including suggestions for improvement of the indices both on the theoretical framework on which the indices are relying and on the statistical methodology;
2. provide reflections on how to transform the pilot version of ESIS from measuring general framework conditions towards measuring framework conditions that target digital entrepreneurship;
3. construct an update of ESIS by following the state-of-the-art guidelines for constructing composite indicators;



4. produce a final report summarising the results of the critical review and the methodology used to construct the updated version of ESIS and presenting ESIS outcomes;
5. make the results publicly accessible via an online interactive visualisation tool and dissemination to interested parties

This builds on previous deliverables of the project (notably, the critical review of ESIS, as listed in list items 1 and 2 above) and constructs an update of ESIS, which we name the European Index of Digital Entrepreneurship Systems (EIDES). These tasks relate to items 3 and 4 in the above list. The results of the EIDES will also be made publicly accessible through an online visualisation tool, corresponding to item 5 in the list.

We next elaborate on the nature and consequences of the process of digitalisation and elaborate how this trend shapes entrepreneurship. We then focus on entrepreneurial activity and review received approaches to measuring 'entrepreneurship', as elaborated in received literature. Following this review we provide a brief summary of the review of the ESIS and elaborate the measurement approach of the EIDES. We then construct the EIDES and review the performance of EU28 countries through this lens. We conclude with discussing insights and implications for EU entrepreneurship policy.

## **2 Review of approaches to measuring entrepreneurship**

The purpose of the EIDES is to provide actionable insight into the digitally enhanced conditions for entrepreneurial stand-up, start-up and scale-up activity in EU countries. The index is also designed to provide a meaningful basis for cross-country comparisons. These goals set up an important measurement challenge: not only is entrepreneurship itself a highly heterogeneous phenomenon that is shaped by context (Autio, Kenney, Mustar, Siegel, & Wright, 2014), it also operates at multiple levels of analysis. Many different measures are therefore possible, depending on purpose. As different measures apply for different purposes, we next review alternative approaches to measuring entrepreneurship and highlight their strengths, weaknesses, and domains of application.

There are five distinct approaches to measuring country-level entrepreneurship: (1) output (count) measures; (2) attitude measures; (3) framework measures; (4) mixed (weighted) measures; and (5) entrepreneurial ecosystem measures (Acs, Szerb, & Autio, 2014a; Bogdanowicz, 2015; Stam, 2018; Van Roy & Nepelski, 2016).

### **2.1 Output measures**

Output measures count the incidence of entrepreneurial entries in a given region or country. These can be, for example, counts of new business registrations (World Bank, 2011), survey-based self-reports of self-employment (Reynolds, Bosma, & Autio, 2005), or counts of specific types of start-ups, such as unicorns (Insights, 2017).

The Global Entrepreneurship Monitor GEM provides an example of a survey-based measure. It collects representative samples of at least 2 000 adult-age individuals in the participating countries and uses population weighting (mostly relating to respondent demographics) to create country-level estimates of self-employment prevalence rates.

Registry-based indices such as those employed by the World Bank or OECD (Ahmad & Hoffmann, 2008; OECD, 2017) use government registries to estimate the creation of new companies. Similar to GEM, these are often converted into density measures by standardising them with population size.

Both survey and registry approaches have strengths and weaknesses. A weakness of survey measures is that they derive population-level estimates from samples whose representativeness is seldom perfect. GEM bases its estimates on a minimum sample of 2 000 adult-age individuals. This is quite small, especially for large and diverse countries such as China, and this sample size also does not provide sufficient granularity to provide reliable estimates of the economically more consequential forms of entrepreneurial activity, such as high-impact entrepreneurship. A plus of the survey-based method is that it can separate more finely 'entrepreneurial' new firm creation from, e.g., new establishments created by corporations, which do not necessarily indicate an entrepreneurial event. Survey-based measures are also arguably better at tracking informal entrepreneurship – i.e., new businesses that do not register with government registries (Autio & Fu, 2015).

The strengths and weaknesses of registry-based measures mirror those of survey-based measures. While registrations cover the totality of new firm registrations, they obviously cannot inform on businesses that do not register. In addition, registry-based measures often have difficulty distinguishing 'entrepreneurial' new firm creations from new entities registered for other purposes (e.g., tax vehicles, corporate subsidiaries, corporate reorganisations).

### **2.2 Attitude measures**

In contrast to count measures, which measure action, attitude measures proxy social norms and attitudes that are thought to regulate entrepreneurial action through their influence on perceived trade-offs individuals face when considering entrepreneurial action (Autio, Pathak, & Wennberg, 2013). Thus, attitude measures profile informal institutions

sometimes referred to as the 'entrepreneurial culture'. One well-known example is the Eurobarometer survey, which tracks entrepreneurial career preferences, as self-reported by individuals (Gallup, 2009). Also the GEM survey measures self-reported attitudes towards entrepreneurship, as does the International Social Survey (ISSP, 1997).

Attitude surveys monitor a range of attitudes, such as individuals' preference for self-employment; attitudes toward entrepreneurs and entrepreneurial careers; perceptions of entrepreneurial skills; and individuals' fear of failure. These reflect individual-level perceptions of the feasibility, desirability, and legitimacy of entrepreneurial activities and career choices.

Attitude measures are useful particularly in the early stages of the entrepreneurial dynamic – i.e., the stand-up stage, as this is when individuals decide whether or not to engage in entrepreneurial activities. However, attitudes towards entrepreneurship – to the extent they provide a reflection of informal institutions shaping societal resource allocations and the regulatory environment (Henrekson, 2005) – have also been shown to be consequential in regulating post-entry entrepreneurial behaviours such as entrepreneurial growth orientations (Autio et al., 2013).

The strength of attitude surveys is that they provide a proxy for the cultural and social norms that are thought to regulate entrepreneurial career choice. Some studies have also shown cultural practices to influence the growth orientations of already operating entrepreneurs (Autio et al., 2013). Attitude surveys also provide a reflection of the attitudes that prevail in the population at large, thereby providing some reflection of the entrepreneurial potential that exists in a given population. An obvious weakness, however, is the dissociation of this measure from actual activity. There is also fairly little evidence on the predictive power of entrepreneurial attitudes on entrepreneurial actions, and the extent to which this link might be moderated by contextual factors. Therefore, we know little about which policy interventions could be effective in converting positive attitudes to activity.

### **2.3 Framework measures**

Framework measures profile the context for entrepreneurial activity. Whereas attitude measures provide a proxy of informal institutions (e.g., social norms as expressed in individual-level attitudes), framework measures tend to capture more formal institutions and tangible structural conditions (e.g., education level of the population; quality of regulations and entrepreneurship policy interventions; and the availability of resources for entrepreneurship).

There are several approaches to profiling framework conditions for entrepreneurship. GEM surveys national experts with a mail questionnaire to construct multi-item scales that reflect specific entrepreneurial framework conditions (Reynolds et al., 2005). World Bank's 'Ease of Doing Business' index compared national regulatory frameworks for new business entry (Djankov, La Porta, Lopez-de-Silanes, & Shleifer, 2002). OECD Entrepreneurship Indicators Programme developed a more comprehensive framework measure that distinguished between framework conditions, entrepreneurship performance, and economic impact (Ahmad & Hoffmann, 2008).

The 'Ease of Doing Business' programme of the World Bank focused on practical regulatory hurdles faced by a 'standardised' manufacturing start-up (also standardised by size and location). The measures included, e.g., the number of procedures required to register a new business; the duration of the registration process; capital requirements; ease of hiring and firing; and so on. The OECD Entrepreneurship Indicators Programme (EIP) measured a slightly broader range of policy interventions and framework conditions (Ahmad & Hoffmann, 2008; Hoffmann, Larsen, & Oxholm, 2006; Nordic\_Council, 2010). This programme also included measures of 'entrepreneurship performance' in the form of new business registrations and growth rates.

The strength of framework measures is that they tend to focus on tangible contextual factors that are amenable to being modified through policy intervention. However, an obvious weakness is that there is usually no link to actual entrepreneurial activity. Similar to attitude measures, the influence of framework conditions tends to be assumed rather than based on solid empirical evidence, and we know little about how idiosyncratic contextual factors might regulate the link between framework conditions and entrepreneurial activity. In another context, the World Economic Forum's international competitiveness index has not been shown to have a meaningful predictive association with 'hard' measures of economic performance, such as total factor productivity or GDP per capita.

## 2.4 Weighted measures

Of the types of measures reviewed thus far, output measures provide direct proxies of the extent of entrepreneurial activities in the economy, and attitude and framework measures proxy contextual conditions that are thought to drive entrepreneurial outcomes. Weighted measures combine contextual conditions and entrepreneurial outcomes, thereby providing a reflection of the quality of the entrepreneurial dynamic in the economy. The Global Entrepreneurship Index (GEI) and the Regional Entrepreneurship and Development Index (REDI) provide the two known examples of this approach (Acs, Szerb, Autio, & Ainsley, 2017; Acs, Autio, & Szerb, 2014b; Szerb, Acs, Autio, Ortega-Argiles, & Komlosi, 2013). Both are based on the same method: using measures of individual-level entrepreneurial attitudes, abilities, and activity as weights to adjust the magnitude of contextual factors in regulating the quality of the entrepreneurial dynamic. In this approach, thus, the dependent variable changes, as the index no longer exclusively portrays framework conditions for entrepreneurship, nor does it portray the magnitude of entrepreneurial action. Instead, the GEI and REDI indices are thought to reflect the *quality* of the entrepreneurial resource allocation dynamic in the economy towards high-productivity uses (Acs et al., 2014b). According to Lafuente, Szerb, and Acs (2016), public policies promoting economic growth should consider national systems of entrepreneurship as a critical priority to effectively allocate resources in the economy. In the GEI index theory, entrepreneurs are seen as operating a trial-and-error resource allocation dynamic by mobilising resources to pursue perceived opportunities. Contextual conditions moderate the potential impact of such resource allocations – for example, the availability of high-quality human capital would regulate the growth potential of a new venture: scarcity in high-quality human capital would constrain the ability of new ventures to meet their recruitment needs to support rapid growth.

In the GEI theory, thus, framework conditions are not seen as direct *drivers* of entrepreneurial action, but rather, as *contextual regulators* of the potential economic impact of individual-level entrepreneurial attitudes (stand-up system), ability (start-up system), and aspirations (scale-up system). Whereas framework measures tend to assume a driving effect of entrepreneurial framework conditions on entrepreneurial action (framework conditions are assumed to directly drive entrepreneurship), the GEI theory conceptualises framework conditions as regulating the economic potential associated with that action through the regulating effect of entrepreneurial framework conditions on stand-up, start-up, and scale-up dynamics. Whereas framework measures treat entrepreneurship as a goal in its own right, the focus of the GEI methodology is on economic outcomes.

The strength of the weighted approach is exactly this: focus on economic and not entrepreneurial outcomes. The quality of the entrepreneurial dynamic is considered more important than its quantity. The GEI methodology also provides the only systemic index, in the sense that system components are thought to 'co-produce' system-level outcomes. In practice, this property is operationalised through the penalty for bottleneck algorithm, which 'penalises' strong pillars for gaps – or bottlenecks – in pillar-level performance. This means that the GEI methodology is potentially useful for profiling entrepreneurial ecosystems, where a similar co-production dynamic is thought to be in operation (Autio &

Levie, 2017b; Autio et al., 2018). As the GEI methodology is able to highlight gaps in the entrepreneurial dynamic, it also provides a potentially useful template to guide policy action.





Among the weaknesses of the weighted method is that understanding the index outcomes is less straightforward than in count, attitude, and framework measures. The GEI methodology also makes several simplifying assumptions, for example, in assigning equal weight to each pillar, thereby assuming that all pillars always contribute equally to the outcomes of the entrepreneurial dynamic. So doing, the method also assumes that one best configuration for entrepreneurial system exists – one in which all elements are maximised and in balance. This 'one size fits all' assumption does not recognise the heterogeneity across economic systems. Finally, the GEI focus on system bottlenecks potentially tends to focus attention to fixing gaps, which may come at the cost of maximising system strengths.

## **2.5 Ecosystem measures**

Entrepreneurial ecosystem measures represent the latest evolution in the measurement of entrepreneurship (Stam, 2018; Stangler & Bell-Masterson, 2015). While most approaches are descriptive and practitioner-driven (Auerswald, 2014; Feld, 2012; Stam, 2014), increasing availability of conceptual frameworks is enabling progress towards more structured approaches (Autio et al., 2018; Pitelis, 2012; Spigel, 2017).

In many ways, the GEI index remains the most structured and comprehensive approach to entrepreneurial ecosystem measurement and thus far, the only measurement approach that is underpinned by coherent theory. Two other notable measurement approaches exist: the Kauffman Foundation's entrepreneurial ecosystem initiative (Stangler & Bell-Masterson, 2015) and the model developed by Stam (2018). These approaches differ significantly from one another. The Kauffman Foundation approach focuses on processes that are under way in the entrepreneurial ecosystem, approaching these with four pillars: density, fluidity, connectivity, and diversity. Density is measured in terms of new and young firm density, their employment share, as well as the presence of high-tech sectors. Fluidity is measured in terms of human capital flows, labour market reallocation, and high-growth firms. Connectivity is measured as spinoff rate and venture capital networks. Diversity is measured as economic specialisation diversity, labour mobility, and immigrant flows. These are all measures of the system state, processes, and some structural characteristics, and the set of variables covers both outcome variables (e.g., density of new and young firms) and proxies of resource munificence (e.g., economic specialisation diversity, labour mobility). On the other hand, some resources directly affecting entrepreneurial businesses are not measured (e.g., venture capital was only added subsequently, crowdfunding is left out). Kauffman survey measures are shown in Table 1.

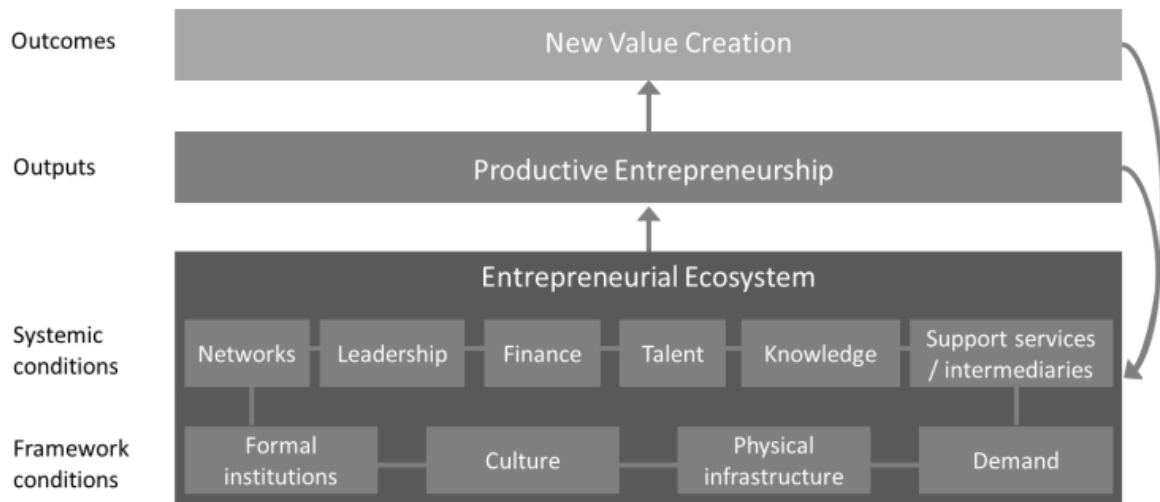
**Table 1. Entrepreneurial ecosystem measures in the Kauffman survey**

Indicator	Measure	Possible Sources
 DENSITY	New and young firms per 1,000 people	Census Bureau, Business Dynamics Statistics (BDS)
	Share of employment in new and young firms	Census Bureau, BDS
	Sector density, especially high tech	National Establishment Time Series (NETS)
 FLUIDITY	Population flux	Internal Revenue Service
	Labor market reallocation	Quarterly Workforce Indicators (QWI)
	High-growth firms	Inc. 5000 and NETS
 CONNECTIVITY	Program connectivity	Under development
	Spinoff rate	Possibly: CrunchBase; LinkedIn
	Dealmaker networks	Private databases, including Capital IQ
 DIVERSITY	Multiple economic specializations	Quarterly Census of Employment and Wages (QCEW)
	Mobility	Equality of Opportunity project
	Immigrants	American Community Survey (ACS)

Source: Stangler & Bell-Masterson, 2015

Stam (2014, 2018) developed an alternative approach to measuring entrepreneurial ecosystems, in the context of the Netherlands. See Figure 1. His approach distinguishes between 'framework conditions' and 'systemic conditions', as well as 'outputs' and 'outcomes'. Framework conditions include formal institutions, culture, physical infrastructure, and demand. Systemic conditions include networks, leadership, finance, talent, knowledge, and support services. 'Productive entrepreneurship' refers to entrepreneurial growth orientation as well as realised growth. The notion of 'new value creation' is not elaborated theoretically or operationalised in the model.

**Figure 1. Entrepreneurial ecosystem measurement framework by Stam, 2015, 2018**



Source: Stam (2015)

In Stam's model, formal institutions are measured as corruption, rule of law, government effectiveness and accountability. 'Entrepreneurship culture' is measured as entrepreneurial activity (new firm creation). This assumes that new firm creation is a relevant expression of such a culture but also risks confusing inputs and outputs. Physical infrastructure is proxied as connectivity or transportation infrastructure but other aspects of infrastructure are not included – e.g., the availability of business premises and the quality of the communications infrastructure. Demand is measured as purchasing power per capita – which could also be a reflection of economic output in the region. 'Leadership' is measured as EU-funded innovation projects, but the rationale for this is not fully clear. Finance is measured as bank loans. New knowledge is measured as R&D share of GDP. Intermediate services are measured as share of firm population specialising in business services.

Stam's model makes the potentially useful distinction between 'framework conditions' and 'systemic conditions'. This conceptual distinction is not clarified in the model, however, and the meaning of it is also challenging to infer from variable operationalisations, as 'entrepreneurial culture' is measured as new firm creation, and 'demand' appears to be a reflection of regional economic wealth (a density measure, similar to 'culture') and population size (count measure).

While both the Kauffman and Stam measurement frameworks provide useful illustrations of potential approaches to profiling entrepreneurial ecosystems, both approaches are yet to provide conceptual and theoretical grounding to support the measurement frameworks. Construct meanings remain implicit, including the notion of an 'entrepreneurial ecosystem' itself. Neither framework captures characteristic structural elements of entrepreneurial ecosystems, such as new venture accelerators or co-working spaces. These shortcomings reflect the generally under-theorised quality of entrepreneurial ecosystem research (Autio et al., 2018).

## 2.6 Conclusions

Our review suggests several conceptual and methodological conclusions. These are summarised in Table 2. Considerable terminological and conceptual heterogeneity in approaches to measure entrepreneurship exist. The different approaches are often unclear regarding their ontological and epistemological assumptions, although some make strong implicit ones.

These problems reflect the lack of a coherent and widely accepted theory of entrepreneurship and its role in economic growth. The operationalisation of entrepreneurship at the firm level has also proved problematic, with operationalisations based on firm size, age, and ownership each having their own problems. Entrepreneurship can also operate at multiple levels, such as the individual, the new venture, an established corporation (referring to corporate entrepreneurship or intrapreneurship), and, most recently, at the level of the cluster or the 'ecosystem'. Thus, the way how entrepreneurship is actually operationalised can vary widely across different measurement approaches.

These problems partly trace back to the heterogeneity of the phenomenon of 'entrepreneurship'. Low-tech manufacturing SMEs can be very different from service SMEs and medium- to high-tech SMEs. Self-employment is different from an SME operation. New ventures tend to be different from older firms. Family businesses tend to be different from managerially run businesses. And new ventures applying the 'lean' entrepreneurship heuristic tend to be different from those that adopt more linear planning approaches.

These considerations suggest several insights for the construction of measures of 'entrepreneurship':

- The definition of 'entrepreneurship' should be consistent with the purpose of the measurement exercise, and it should always be made explicit.
- It is important to be clear about the ultimate dependent variable, regardless of whether or not it is being measured during the measurement exercise.
- It is important to lay out the conceptual foundations and ontological positions underpinning the approach – and articulate how these are captured in the measurement approach.
- It is important to be explicit regarding the assumptions concerning causal relationships between input and outcome variables, as well as the causal mechanisms that drive this relationship.
- It is important to lay out the empirical evidence supporting the assumptions made – or the lack of it.

We build on these insights when constructing the measurement approach of EIDES.



**Table 2. Entrepreneurship measurement approaches: Summary**

<b>Approach</b>	<b>Strengths</b>	<b>Weaknesses</b>	<b>Notes</b>
<b>Output measurement</b>	Focus on entrepreneurial activity Usually 'clean' measures	Difficulty identifying true entrepreneurial start-ups (registries); identification of consequential start-ups (surveys); tracking informal activity (registries)	Output measures can be combined with other measures to derive actionable policy insight
<b>Attitude measurement</b>	Wide coverage (population at large); informs particularly the stand-up stage	Self-reported attitudes may not reflect 'real' attitudes; attitude measures often indirect; self-report measures do not necessarily capture prevailing social norms; assumes straightforward, causal effect of attitudes on action	In spite of problems, attitude measures can illuminate stand-up dynamic
<b>Framework measurement</b>	Provide a nuanced reflection of the context of entrepreneurial action; covers conditions that are directly addressable through policy action; usually wide coverage and relevant indicators at the national level; can cover both policy interventions and structural conditions	Do not directly measure entrepreneurial action; the coverage of start-ups-specific structural elements tends to be patchy (e.g., accelerators) ; underlying logic of selecting framework conditions often unclear; typically assumes direct causal effect on entrepreneurial action although evidence base supporting such an assumption is limited	In spite of its deficiencies, framework indices provide one of the most policy-relevant approaches to assessing contexts for entrepreneurship
<b>Weighted measures</b>	Capture the quality of the entrepreneurial dynamic; able to consider the context both as a driver and as a moderator of the entrepreneurial potential; explicitly focuses on economic outcomes realised through entrepreneurial actions; able to guide policy action; the only measures to capture the systemic character of entrepreneurial ecosystems and the co-production of outputs	Makes simplifying assumptions regarding the configuration of systems of entrepreneurship; high data demands; assumptions regarding links to economic performance rely on limited evidence; no coverage of the characteristic structural elements of entrepreneurial ecosystems (e.g., accelerators)	While comprehensive and able to cover all three stages of the entrepreneurial dynamic, the data demands of this approach may render it impractical

<b>Ecosystem measures</b>	Explicitly focused on entrepreneurial ecosystems; focus on contexts of entrepreneurial action; seeks to directly address a digital economy phenomenon; responds to current trends in entrepreneurship	Apart from the GEI (REDI) index, current approaches atheoretical and conceptually inadequate and methodological (measurement content) choices inadequately explained; none of the current operationalisations capture characteristic structural elements of entrepreneurial ecosystems	
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Source: Own creation

### **3 The digital context of entrepreneurial activity**

Digitalisation is the process by which digital technologies and infrastructures get woven into the fabric of the economy and society (Autio & Rannikko, 2017; Yoo, Henfridsson, & Lyytinen, 2010). With wireless technologies, the resources embedded in the Internet (e.g., cloud storage and computing power, learning algorithms, Internet intermediaries and marketplaces) can be accessed asynchronously and virtually from anywhere (Yoo, Boland Jr, Lyytinen, & Majchrzak, 2012; Yoo et al., 2010). With successive phase changes, as reflected in monikers such as 'Web 1.0', 'Web 2.0' and 'Web 3.0', the Internet has reached a state where it can support highly sophisticated, complex, and consequential interactions among many stakeholders over time and distance (Constantinides & Fountain, 2008; John, 2012; Yoo et al., 2010). The disintermediation affordance of digital infrastructures is breaking down traditional, vertically organised value chains and re-organising economic activity around digital platforms (Thomas, Autio, & Gann, 2014; World Economic Forum, 2016). The openness and interactivity of the Internet enable businesses to harness the co-creative potential of large, uncoordinated audiences for novel forms of value creation, which, combined with novel revenue models, enable businesses to fundamentally re-think how they deliver products and services (Yoo et al., 2012; Zittrain, 2006).

The advances in digitalisation enable often even quite radical re-think of how value is co-created and delivered in society and economy, and how private and public organisations and the government capture and re-distribute that value (Amit & Zott, 2012; Frach, Fehrmann, & Pfannes, 2017; Katz & Koutroumpis, 2012; Wareham, Fox, & Cano Giner, 2014; Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007). Because digital technologies are infrastructural, the effects of digitalisation are not limited to a specific segment of 'digital economy' businesses or organisations only, but rather, they impact all constituents on society and the economy, including current and prospective entrepreneurs and their ventures.

Digitalisation impacts entrepreneurship through digital affordances, defined as potentialities to perform entirely new functions or perform existing functions in radically different ways (Autio et al., 2018; Majchrzak & Markus, 2013). The impact of digital affordances upon entrepreneurship operates through two major mechanisms: structural and processual. Structural mechanisms involve the reorganisation of value-creating activities in the economy, and they shape the locus and nature of entrepreneurial opportunities. Processual mechanisms are associated with the way digital affordances influence the feasibility and trade-offs associated with business model design choices, thereby shaping effective practices for entrepreneurial opportunity pursuit. We next elaborate on the notion of digital affordances and highlight the structural and processual mechanisms through which these affordances shape entrepreneurship.

The disruptive effect of digital technologies derives from their ability to shape interactions among societal and economic constituents (Autio, 2017). This impact is created through digital affordances, as defined above. One example of the interaction-enhancing effects of digital affordances is the execution of micro transactions (as enabled by online payment platforms and online marketplaces) with individuals on the other side of the globe reliably and cost effectively. Or, digital affordances could be called upon to enable distributed teamwork in projects where such teamwork was not previously possible due to technical constraints – e.g., by leveraging new online collaboration platforms such as Trello and Slack. In both of these examples, digital affordances enabled by the Internet have made it possible to enhance, extend, and enrich interactions among economic actors in ways that were not possible prior to the current digital era, thereby opening new opportunities for value co-creation, delivery, and capture.

Five generic digital affordances are particularly consequential for our discussion: disintermediation, dissociation, generativity, ubiquity, and reintermediation (Autio, 2017). Disintermediation refers to the possibility created by open digital infrastructures (broadly, the Internet) for businesses to directly interact with their customers regardless

of time and place, thereby bypassing traditional distribution channels (Katz, 1988). Harnessing the disintermediation affordance of open digital infrastructures, new ventures can greatly enhance, extend, and enrich their interactions with their customers and reduce their dependence on physical value chains. Dissociation refers to the separation of the flows of goods and materials from flows of associated information. This separation increases flexibility in outsourcing and offshoring, increasing options available for new ventures when these build the activity systems for the delivery of their products and services. Generativity is the ability of open digital architectures such as the Internet to facilitate innovative inputs from large, uncoordinated audiences. Generativity enables new ventures to engage their users for co-creative interactions and harness the innovative inputs of these to build momentum around their services. Ubiquity refers to the universal accessibility of digital infrastructures and resources embedded therein. Finally, reintermediation refers to Internet platforms and marketplaces for, e.g., payment processing (e.g., PayPal) and the sales of goods and services (e.g., Apple store, eBay) that enable new ventures to transact cost efficiently and reliably over large distances and also operate as trust platforms that guarantee such transactions.

Digital affordances shape the locus of entrepreneurial opportunities in the economy. The most notable structural effect is the reduced dependence of new ventures on regional clusters as hubs of entrepreneurial opportunities (Autio et al., 2018). By reducing the power of supply chain intermediaries (disintermediation) and reducing the location dependency of user-facing interactions, digital affordances enable new ventures to more freely access opportunities outside regional clusters, and also, internationally. Disintermediation also has the effect of breaking down linear value chains and re-organising value creating activities around digital platforms, where the traditional pattern of linear networking (among complements in successive stages of the value chain) and horizontal competition (among substitute businesses in the same stage of the value chain) is replaced by a pattern of horizontal networking (among new ventures in accelerators and co-working spaces) and vertical competition (by challenging industry incumbents in traditional sectors with radical new business models) (Autio et al., 2018; Pagani, 2013). With this effect on the organisation of value-creating activities within clusters and on the cluster-specificity of entrepreneurial opportunities, digital affordances also change the nature of benefits that clusters offer for cluster participants. Notably, new ventures gravitate towards regional entrepreneurial ecosystems not so much because of the localised opportunities, nor because of the access to technical knowledge spill-overs. Digital affordances make it possible for new ventures to challenge industry incumbents with radical new business models, and it also makes entrepreneurial ecosystems the primary forum for facilitating experimentation with different business models, as well as for associated knowledge exchange. Digital affordances therefore convert entrepreneurial ecosystems into hubs of business model innovation and associated knowledge spill-overs. This, combined with access to specialised resources, is the primary reason why new ventures migrate towards entrepreneurial ecosystems.

In addition to structural effects, digitalisation also shapes the optimal processes for entrepreneurial opportunity pursuit (Ries, 2011). Because of disintermediation, fledgling new ventures can directly interact with their customers even at the idea development stage, engaging these in a co-creation process. Digital technologies also make it easy and cheap to experiment with different concepts (e.g., by setting up mock-up web pages) (Boudreau, 2017). Combined, disintermediation and the low cost of experimentation have given rise to an experimentation-driven approach to entrepreneurial opportunity pursuit, also termed in practitioner language as 'Lean Entrepreneurship' (Blank, 2013; Ries, 2011). In this approach, entrepreneurial ventures engage their users in a co-development and experimentation process, which, if successful, results in the discovery of robust and scalable business models. This experimentation-driven approach to business model discovery stands in contrast with the traditional, planning-driven approach, which emphasised the careful preparation of detailed business plans to identify and evaluate an opportunity before acting upon it. In the planning-driven approach, it was assumed that the firm needs to first invest in

technology development and manufacturing equipment before it can truly test the market with products thus created. The planning-driven approach was designed to mitigate risks created by such upfront investment, through the carefully study of markets, competitors, and financials. Only after careful planning was it considered possible to decide whether to pursue the venture. This approach has been reversed in the digital era because of the dramatically falling cost of experimentation. The 'plan first, act later' approach to entrepreneurial opportunity pursuit has been transformed into an 'act first, plan later (for the scale-up phase)' approach.

The difference between planning-driven and experimentation-driven approaches to entrepreneurship echoes a related distinction: the difference between 'product-dominant' and 'service-dominant' logics of value creation (Lusch & Nambisan, 2015). The 'product-dominant' logic considers value to be created during a linear and sequential manufacturing process, during which manufacturing activities incrementally 'add' value into the end product. This value is realised in a market transaction, when the final product is sold to the customer. In the 'product-dominant' paradigm, thus, value creation is thought to precede value realisation, and 'value' is embedded in and carried with a physical product to the customer. This logic is reflected in the planning-driven approach to entrepreneurship, notably, in its assumption that the venture first has to invest in R&D and equipment before it can create and appropriate value through its products.

In contrast, in the 'service-dominant' logic, 'value' is thought to be simultaneously co-created and consumed in interactions between the service provider and the service beneficiary. In this logic, 'value' itself takes the form of benefits received by service beneficiaries, and because both parties receive benefits in addition to making resources available to the other party, both are simultaneously service providers and service beneficiaries. The process of value co-creation and co-consumption is activated when the service beneficiary engages the resources made available by the service provider. For example, a haircut service is activated then the person in need of a haircut engages the haircutting capacity of the hairdresser. The benefit for the customer is created simultaneously with its consumption. The service provider – i.e., the hairdresser – also derives benefits from this interaction, in the form of payment and perhaps also valuable insight into user preferences.

Because the service-dominant logic assumes that all parties to interactions simultaneously operate as service providers and service beneficiaries, the service-dominant perspective to value co-creation can be extended to characterise all Internet-facilitated interactions between different parties, and also, to extend the consideration of benefits created by and for different parties. For example, when users engage the search capacity of Google's search engine, the user receives a benefit – the search result and the convenience with which the search was executed. In return, Google receives valuable data on the user's preferences and tastes – data that Google can subsequently monetise in its interactions with advertisers, for example. Both of these interactions are enabled by the Internet. Two-sided market platforms such as AirBnb create benefits for those seeking convenient accommodation by connecting these with those with surplus living space and vice versa, and in return, it receives valuable data plus a commission of any transactions executed in its platform. A Mobility-as-a-Service (MaaS) business model connects those with mobility needs with resources that can be harnessed to meet those needs, thereby adding a service layer on the traditionally product-dominant operating logic of car industry value chains. These examples illustrate the general 'servitising' outcomes digital technologies and infrastructures can be called upon to facilitate. With digitalisation, value-creating interactions in the economy increasingly operate consistent with the service-dominant logic, and the experimentation-driven approach to entrepreneurship reflects this general trend.

In the experimentation-driven approach to entrepreneurship, the key focus of experimentation revolves around the venture's business model. A business model is composed of the firm's value proposition for its customers and users, its interaction channels with these, its internal activity design, its partnerships and outsourcing

arrangements, and its revenue and cost models (Amit & Zott, 2015; Zott & Amin, 2016). The firm's business model defines the configuration of its interactions with its various stakeholders, and also, the pattern of interactions with each group of stakeholders. Each of these interactions can be enhanced, extended, and enriched through the application of digital technologies. Seen against this background, experimentation-driven entrepreneurship represents the application of digital technologies and infrastructures for business model innovation – i.e., the innovative re-design of value co-creation, delivery, and capture in the venture's interactions with its stakeholders (Autio et al., 2018). Quite often, such business models directly challenge established industry incumbents in different sectors, especially where the legacy investment by incumbents in old business models prevents these from responding effectively to the new competitive threat.

A novel cluster type, the entrepreneurial ecosystem, has emerged during the past decade or so to support the above dynamic (Autio et al., 2018; Feld, 2012; Spigel, 2017). These structures are composed of characteristic structural elements which have two main purposes: first, to facilitate business model experimentation and related knowledge spill-over among new ventures; and second, facilitate new ventures' access to specialised resources to support entrepreneurial start-up and scale-up. Characteristic structural elements of entrepreneurial ecosystems include, for example, new venture accelerators, co-working spaces, specialist financiers, entrepreneurial networks and networking events. The importance of digitalisation for these developments is highlighted in the fact that the first modern new venture accelerator, the Y-Combinator, was launched in Silicon Valley in 2005, only a year after the term: 'Web 2.0' was coined – in a web developer conference also held in Silicon Valley.

The above review suggests one distinctive aspect about entrepreneurial ecosystem as a novel type of clusters in the digital economy. As reviewed above, in traditional clusters of the vertical manufacturing economy, the locus of entrepreneurial opportunities was localised, driven by value chain specialisation, and tended to drive process innovation – i.e., greater output efficiency at the level of the value chain through enhanced user-producer role specialisation and coordination (Autio & Levie, 2017a). Most knowledge spill-overs operated vertically, in user-producer relationships. Horizontally organised digital platforms dominating as sources of opportunity in entrepreneurial ecosystems, the key source of knowledge spill-overs migrates towards horizontal relationships among non-competing firms. As new ventures in venture accelerators typically do not compete directly with one another, yet compete with the same means (i.e., radical business model innovation), they have an incentive to share experiences, as such experience sharing helps all new ventures become more effective in competing against industry incumbents. This also means that entrepreneurial ecosystems facilitate not so much linear, technology-push innovation, but rather, business model innovation, which harnesses digital affordances for the transformation of value processes in the economy (Autio & Levie, 2017a).

These trends create new challenges for policy. In the digital age, the key policy challenge becomes facilitating entrepreneurial ecosystems, instead of focusing on individual SMEs, as is the case in traditional SME policy (Autio, 2016; Autio & Rannikko, 2016). In the traditional mode of SME policy, support is directed to existing SMEs on the basis of their employment size: if you employ 249 employees or less, you qualify for SME support. In an ecosystems approach to entrepreneurship policy, the focus has to be on facilitating entrepreneurial experimentation and business model discovery – for example, by facilitating horizontal spill-over of effective business model practices among new ventures located in co-working spaces and accelerators. Instead of a siloed, top-down approach aimed at fixing static, easily observable 'market' and 'system' failures, entrepreneurship policies need to address the entire entrepreneurial discovery and resource allocation dynamic that is facilitated by entrepreneurial ecosystems (Autio & Levie, 2017b; Autio & Rannikko, 2017).

In summary:

1. Digitalisation is transforming how value is created, delivered, and captured in the economy;
2. Digitalisation impacts all stakeholders in society, not only new ventures operating in ICT sectors;
3. Digital technologies are infrastructural and affect all businesses and industries, albeit in different ways and at different times;
4. Digitalisation is transforming both the location and emergence of entrepreneurial opportunities, the process of entrepreneurial opportunity discovery and pursuit itself, and the processes of new venture scale-up;
5. Digitalisation is therefore increasing the importance of contextual factors for entrepreneurship (such as 'entrepreneurial framework conditions' and 'entrepreneurial ecosystems') and the entrepreneurial business model discovery and associated resource allocation dynamics underpinned by these;
6. These changes challenge traditional, static, top-down, and 'market' and 'system' failure focused approaches to SME and entrepreneurship policy, calling for more dynamic, bottom-up, and ecosystem-level policies that seek to identify and correct ecosystem failures

Next, we build upon this conceptual review of digitalisation and entrepreneurship when constructing the structure of the EIDES.

## **4 Construction of the EIDES**

### **4.1 Conceptual grounding**

The concept of the European Index of Digital Entrepreneurship Systems draws on the entrepreneurial ecosystem (EE) literature. Although this is a fresh approach, it also introduces some conceptual ambiguity, given the relatively weak theoretical grounding of the entrepreneurial ecosystems literature. The strength of the entrepreneurial ecosystems approach is the ability to weave many different layers of the entrepreneur's context together, highlighting the close relationships, interdependencies, and reinforcing mechanisms across the different constituent elements of the entrepreneurial ecosystem, often centred around a focal community of ecosystem constituents (Autio et al., 2018; Spigel, 2017). A weakness of the approach is that most conceptualisations are descriptive, rather than theory-grounded, and tend to emphasize different layers, structural elements, and processes of entrepreneurial ecosystems.

One theoretical weakness of the entrepreneurial ecosystems literature concerns the level of analysis. While there are some country-level conceptualisations, most conceptualisations tend to treat entrepreneurial ecosystems as a regional phenomenon. This is also the way the literature seems to be evolving: a recent comprehensive theoretical review suggested that entrepreneurial ecosystems should be viewed as a novel, distinct type of regional cluster, one that harnesses both digital and spatial affordances (Autio et al., 2018). This conceptualisation suggests that the essence of the entrepreneurial ecosystem phenomenon is the exploitation of digital affordances created by rapid advances in digital technologies and ubiquitous digital infrastructures for radical business model innovation – i.e., for a re-think on how to best create, deliver, and capture value. Many modern-day structural elements of entrepreneurial ecosystems, such as new venture accelerators and co-working spaces have emerged to facilitate business model experimentation and the discovery of robust and scalable business models. Such structural elements become focal points, around which regional clusters of specialised actors and resources tend to cluster, thereby giving birth to regional hubs of entrepreneurial activity. Given the spatial clustering pattern associated with such developments, we suggest that, for conceptual clarity, it is best to restrict the use of the term: 'entrepreneurial ecosystems' to regional phenomena.

Although we suggest that the emerging theoretical grounding of the entrepreneurial ecosystems literature makes it best suited for understanding regional phenomena, we are not implying that a country-level analysis would not be relevant. For example, many framework conditions only operate at the national level and are shared across regions (e.g., legal and regulatory frameworks). And, although many resources tend to exhibit regional clustering, so does entrepreneurial activity. Therefore, national aggregates provide a reasonable proxy of what is going on in that country's regional concentrations of entrepreneurial activity. Finally, although entrepreneurial ecosystems may be spatially concentrated, the contributions of their dynamic still add to countries' GDP. In order to distinguish a country-level unit of analysis, we therefore adopt the concept of 'systems of entrepreneurship' to communicate the country-level focus of the EIDES (Acs et al., 2014b).

### **4.2 Basic index structure**

The structure of the EIDES is provided in Table 3. The top of the table lists General Framework Conditions and associated digital context. The four General Framework Conditions are: (1) Culture and Informal Institutions, (2) Formal Institutions, Regulation, and Taxation, (3) Market Conditions, and (4) Physical Infrastructure. These pillar values are calculated as arithmetic averages of the pillar variable values after normalisation, and each framework condition is represented by one value. We thus depart from the previous ESIS structure, where all pillar values are calculated separately for the ESIS Entrepreneurship Index and ESIS Scale-up Index. This is because we think that General



Framework Conditions apply generally to all business and entrepreneurial activities in the economy.

In the EIDES structure, each framework condition can be digitalised with an associated measure of the digital context, as listed in the rightmost column of Table 3. Each general framework condition is matched with a set of digitalisation variables that resonate with those included in a given general framework condition. The measures of the digital context are calculated as the arithmetic average of their constituent variables after normalisation. The resulting measure is then used as a weight to calculate a digitalised version of each of the General Framework Conditions. This procedure means that we have two versions of each general framework condition: a digitalised version and a non-digitalised version. The mean of all four General Framework Conditions (either digitalised or non-digitalised) thus reflects the state of the General Framework Conditions in a given country.

In addition to General Framework Conditions, the EIDES also includes 'systemic' framework conditions. These are mostly resource-related conditions that have a direct effect on the entrepreneurial dynamic in a given country or region. We call these framework conditions systemic because, being related to resources of different kinds, each of these conditions may act as a bottleneck that holds back the entrepreneurial dynamic. Most businesses require access to a range of different resources such as human capital, finance, knowledge, and the physical infrastructure in order to scale up successfully. These resources are not easily substitutable against one another: a resource of a given type (say, finance) cannot easily be replaced by a resource of another type (say, human capital). This means that each of the Systemic Framework Conditions may act as a bottleneck that holds back the performance of the entire system, and the Systemic Framework Conditions have to come together to help 'co-produce' the system outcomes.

Whereas the General Framework Conditions apply generally to entrepreneurship, the EIDES distinguishes between three stages of the entrepreneurial dynamic when it comes to Systemic Framework Conditions. These we call Stand-up, Start-up, and Scale-up stages. The Stand-up stage represents the earliest stage of the entrepreneurial dynamic and is concerned with the self-selection of individuals into entrepreneurship. The Start-up stage covers the actual creation of new start-ups. The Scale-up stage covers the scaling up of those start-ups that have discovered a business model with a high growth potential. Accordingly, Systemic Framework Conditions are divided into three sub-indices, each representing one of the three stages. For each systemic framework condition, each of the three stages is calculated as the post-normalisation arithmetic average of the pillar variables. A digital version is then calculated by using the relevant measure of the digital context as a weight. The overall value of the EIDES for the Systemic Framework Conditions is then calculated as the arithmetic mean of the sub-index values. Both digitalised and non-digitalised versions can be calculated.

Finally, the value of the overall EIDES is the mean of the measures for General and Systemic Framework Conditions. This approach, we believe, provides a good and true-to-phenomenon portrayal of national systems of entrepreneurship, where general framework conditions regulate the degree to which the systemic conditions can realise their full potential, and where the systemic conditions are directly involved in the co-production of the national-level entrepreneurial dynamic. The EIDES approach also distinguishes between digital and non-digital versions of the dynamic, making it possible to estimate the effect of digitalisation on the system's ability to facilitate high-quality entrepreneurial dynamic. The distinction between systemic conditions and the three sub-dynamics of the overall entrepreneurial dynamic also makes it possible to support more nuanced policy insights: first, for General Framework Conditions for entrepreneurship; second, for digitalisation; and third, for the three sub-dynamics of the overall entrepreneurial dynamic. These three layers of entrepreneurial ecosystems likely require different policy approaches.

**Table 3. Structure of the European Index of Digital Entrepreneurship Systems**

<b>Pillars</b>	<b>General Framework Conditions (GFC, market and institutional context)</b>			<b>Digital context</b> <i>(Digital Framework Conditions, DFC)</i>
	<b>Culture and Informal Institutions (P1)</b>	Social desirability and acceptance of entrepreneurship	Population attitude toward start-up risk	Reliance on professional management, willingness to delegate authority
<b>Formal Institutions, Regulation, and Taxation (P2)</b>	Rule of law, private property protection	Ease of start-up (regulation)	Government effectiveness in terms of services and taxation	Freedom of the net vs security, e-government
<b>Market Conditions (P3)</b>	Local, domestic market conditions	Ease of entry to local market	Internationalisation	Use of the net for sales
<b>Physical Infrastructure (P4)</b>	Electricity and telephony infrastructure, business premises, electricity, industrial parks	Transport infrastructure, accelerators, telephony	Quality of overall infrastructure, international aspects of infrastructure, connectivity to entrepreneurial ecosystems abroad	Digital infrastructure, access, cost, speed and reliability
<b>Pillars</b>	<b>Systemic Framework Conditions (SFC, resource context)</b>			<b>Digital context</b> <i>(Systemic Digital Conditions, SDC)</i>
	<b>Stand-up stage (S1)</b>	<b>Start-up stage (S2)</b>	<b>Scale-up stage (S3)</b>	
<b>Human Capital (P1)</b>	Basic education (primary and secondary), education level of population, entrepreneurial education	Advanced education, STEM education, entrepreneurial skills, entrepreneurship education	Life-long learning, labour market conditions, mentoring, serial entrepreneurs	Internet access in schools, e-learning, availability of IT personnel
<b>Knowledge Creation and Dissemination (P2)</b>	Efficient use of talent, general R&D measures (knowledge production)	Quality of scientific research institutions, technology transfer, knowledge transfer	Research and innovation capacity, knowledge absorption	Population, ICT personnel, capability of businesses to use the Internet
<b>Finance (P3)</b>	Availability of credit – general finance	Early stage entrepreneurial finance	Later stage finance	Digital finance
<b>Networking and Support (P4)</b>	Attitudes toward entrepreneurs	External support for start-ups	Clusters and value chain development	Use of social media and virtual networks

Source: Own creation

The three sub-indices – Digital Entrepreneurship Stand-up, Digital Entrepreneurship Start-up, and Digital Entrepreneurship Scale-up – capture three broad ‘stages’ of the entrepreneurial dynamic. Note that the EIDES does not differentiate between these three stages at the level of General Framework Conditions: these are assumed to apply similarly to all three stages. The EIDES only differentiates between the three stages at the level of Systemic Framework Conditions. Thus, we have three different versions of the Systemic Framework Condition pillars – i.e., those for (1) Human Capital, (2) Knowledge Creation and Dissemination, (3) Finance, and (4) Networking and Support. For these, the EIDES calculates a different version to reflect the Stand-up, Start-up, and Scale-up stages of the entrepreneurial dynamic.

Digitalisation is included in the EIDES as an external, contextual condition that applies throughout the country. This reflects the notion that digitalisation is a process by which digital technologies permeate the economy and society, making them infrastructural (Tilson, Lyytinen, & Sørensen, 2010). Accordingly, the EIDES incorporates digitalisation as an external weight: each of the eight pillars of the EIDES (four representing General Framework Conditions and four representing Systemic Framework Conditions differentiated along the three ‘stages’ of the entrepreneurial process – i.e., Stand-up, Start-up, and Scale-up) is ‘digitalised’ by using an appropriate composite variable of digitalisation as weight. The aggregation of the pillar values involves the application of two unique steps, the equalization of the pillar averages and the penalty for bottleneck methodologies (Acs, Autio, & Szerb, 2014). In this report we focus on the creation and the analysis of the EIDES and only marginally deal with the connection between EIDES and outputs. We also leave out the outcome effects. In the later parts of the report we detail out the structure of the index up to the indicator level and the way of calculation; here we focus on the basic analysis of the EIDES and its three sub-indices.

### 4.3 Pillars and variables of the EIDES

A potential criticism of the EIDES methodology – as with any other index – might be the apparently arbitrary selection of indicators and the neglect of other important ones. All indices are inevitably constrained by availability of relevant data. In constructing the EIDES, we tested alternative proxies for each pillar and selected variables on the basis of their coverage of the relevant aspect as well as their pertinence to the phenomenon we sought to portray. Specific selection criteria for individual variables were:

1. Relevance of the variable for the construct we sought to measure
2. Clear interpretation of the variable
3. Explanatory power
4. Distinctiveness relative to other variables in the pillar
5. Comprehensiveness of the combined set of variables in the pillar relative to the construct we sought to measure
6. Positive correlation between each pillar, when fully composed, and the overall EIDES
7. Specificity of the variable to the phenomenon it represents<sup>1</sup>

We next discuss each framework pillar and its associated variables.

#### 4.3.1 Detailed index structure

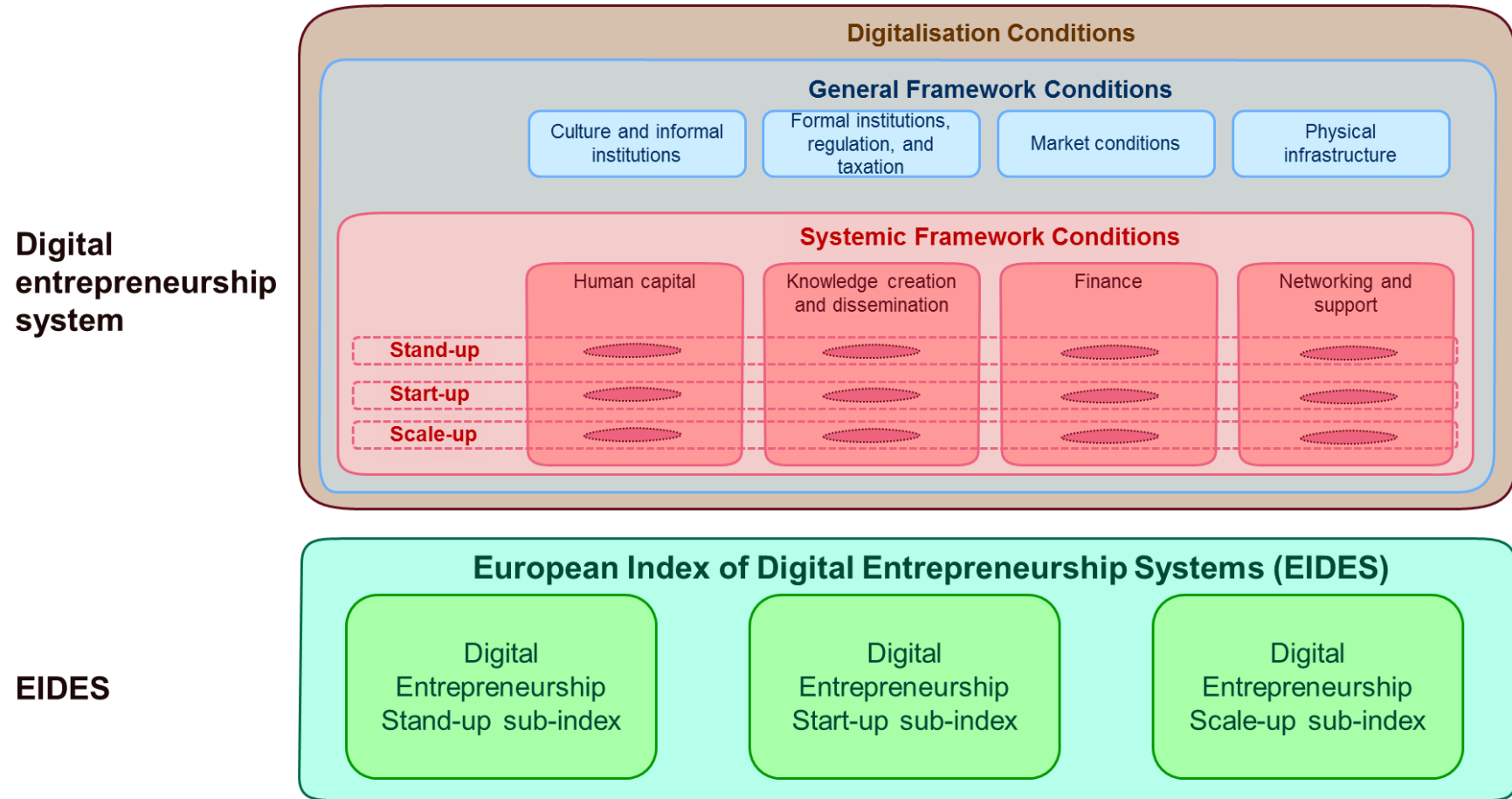
We present the basic structure of EIDES in Figure 2 and provide detail about its components (variables and pillars) in Chapter 4. This structure differentiates between General Framework Conditions and Systemic Framework Conditions. Similar to the previous ESIS model we also differentiate between framework conditions and high-quality (i.e., productive) entrepreneurial activity, the latter representing the output facilitated by the General and Systemic Framework Conditions. Productive entrepreneurship typically only representing only a fairly minor share of overall self-employment and small business activity, we therefore expect EIDES to regulate the quality, rather than the quantity, of the entrepreneurial dynamic in the economy.

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(1) In some cases, data constraints forced us to include composite indices in the EIDES index. This resulted in some occurrences of overlap between the composite index and the individual variables included in EIDES:

- WEF Transportation infrastructure (GFC\_P4\_I2) composite index includes "Quality of overall infrastructure" (GFC\_P4\_I3) indicator.
- WEF Affordability (DFC\_P4\_I3) composite index encompasses indicators as "Prepaid mobile cellular tariffs" (DFC\_P4\_I1) and Fix broadband internet tariffs (DFC\_P4\_I2).
- WEF Business sophistication (SE\_SFC\_P4\_I2) index contains the "State of cluster development" (SE\_SFC\_P4\_I1), the "Willingness to delegate authority" (GFC\_P1\_I5) and "Reliance on professional management" (GFC\_P2\_I6) indicators.

**Figure 2. Structure of the European Index of Digital Entrepreneurship Systems**



Source: Own creation

The three sub-indices, Digital Entrepreneurship Stand-up, Digital Entrepreneurship Start-up, and Digital Entrepreneurship Scale-up reflect to the three phases of entrepreneurship development such as idea formulation (Stand-up), business formation (Start-up) and growth (Scale-up). While the four General Framework Conditions – Culture and Informal Institutions, Formal Institutions, Regulation, and Taxation, Market Conditions, Psychical Infrastructure - are the same for all three sub-indices, they are different in the cases of the Systemic Framework Conditions – Human Capital, Knowledge Creation and Dissemination, Finance, Networking and Support. All entrepreneurship variables are weighted by the proper digitalization variable constituting a pillar. These digital components are the same for each of the four general and each the four systemic conditions. The reason of this “equal” weighting is practical: We lack the proper data for many digital systemic conditions that question the use of a more sophisticated weighting method. The aggregation of the pillar values involves the application of two unique steps, the equalization of the pillar averages and the penalty for bottleneck methodologies (Acs, Autio, & Szerb, 2014).

In this report we focus on the creation and the analysis of the EIDES and only marginally deal with the connection between EIDES and outputs. We also leave out the outcome effects. In the later parts of the report we detail out the structure of the index up to the indicator level and the way of calculation; here we focus on the basic analysis of the EIDES and its three sub-indices.

### **4.3.2 General Framework Conditions**

General Framework Conditions (GFC) regulate the degree to which the grassroots-level entrepreneurial dynamic is translated into national (or regional) economic development, and also the quality of that dynamic in itself. These framework conditions tend to be fairly path-dependent, and we would not expect them to change suddenly. The EIDES assumes that each general framework condition exercises a more or less equal influence on the entrepreneurial dynamic.

#### ***Culture and Informal Institutions (GFC\_P1 and DFC\_P1)***

The pillar of *Culture and Informal Institutions* reflects the degree to which social and cultural norms and resulting societal practices support the expression and realisation of high-quality entrepreneurial endeavours. Where positive cultural and social norms and practices should enhance the quality of the entrepreneurial dynamic by increasing the attractiveness of the entrepreneurial career choice for high-potential individuals, by encouraging the formation of high-potential ventures, and by encouraging entrepreneurial orientation and risk taking for growth, negative norms and practices would impede these outcomes. The *Culture and Informal Institutions (GFC\_P1)* pillar therefore measures both cultural and social norms and practices and combines a number of proxies of such norms and relevant to entrepreneurial action.

Corruption has a negative effect on economic activity because it undermines the rule of law and erodes the predictability of economic relationships. When the level of corruption is low and the quality of governance is high, citizens are more likely to accept entrepreneurial risk. To incorporate the effect of corruption we used two survey-based composite indices. The [World Economic Forum \(WEF\) Ethics and corruption](#) composite index examines the perception of citizens regarding the following three issues: misappropriation of public funds, lack of trust in politicians, and the prevalence of irregular payments and bribes. The [Transparency International Corruption Perceptions Index](#) aggregates data from a number of different sources and gives an estimate of the perceived level of corruption in the public sector. In addition, the [WEF Ethical behaviour of firms](#) is a survey-based indicator that reflects prevailing social norms and attitudes that may shape entrepreneurial behaviours, such as the perceptions of citizens regarding ethical behaviour by business firms in their interactions with public officials, politicians, and other business firms.

In addition to corruption, fear of failure can have a negative effect at all stages of the entrepreneurial dynamic by discouraging entrepreneurial action. The way how a nation's citizens perceive and handle failure is influenced by their sociocultural norms. We use the *Flash Eurobarometer Survey Risk Aversion* indicator as a proxy of this construct.

Another important aspect of entrepreneurial culture is the reliance upon professional management. If professional management is not valued, this may hold back the country's entrepreneurial dynamic. We therefore included the *WEF Reliance on professional management* survey indicator into our composite pillar.

Another reflection of managerial professionalism is the willingness to delegate. If entrepreneurs are unwilling or unable to delegate, this will hold back their ability to grow their businesses. The *WEF Willingness to delegate authority* indicator captures the willingness to devolve decision-making and involve other managers and subordinates in business planning and operations.

Digitalisation is rapidly shaping and changing social norms, cultural values and practices, and other informal institutions. This impact of digitalisation will depend on the availability and accessibility of digital technologies and infrastructures. The digital pillar complementing the general *Culture and Informal Institutions (DFC\_P1)* pillar therefore includes proxies capturing how easily citizens and businesses can harness the digital infrastructure of their country. We therefore use four indicators to proxy the accessibility and use of digital technologies and infrastructures by households and firms in a given country. Of these, three are derived from the WEF database and one from Eurostat: (1) *Percentage of households equipped with a personal computer (WEF)*, (2) *Percentage of households with Internet access at home (WEF)*, (3) *Percentage of individuals using the Internet (WEF)* and (4) *Percentage of enterprises having a website (Eurostat)*.

### ***Formal Institutions, Regulation, and Taxation (GFC\_P2 and DFC\_P2)***

The connection between a country's formal institutions (including the regulatory framework) and entrepreneurship has been widely investigated, and it has been shown to impact both the quality and quantity of entrepreneurship in a given country (e.g., Autio & Fu, 2015; Evsey & Musgrave, 1944). The indicators included in the EIDES inform on obstacles of the regulatory environment and on the need to improve the quality and efficiency of formal institutions and regulations: (1) *Rule of Law*, (2) *Effectiveness of anti-monopoly policy*, (3) *Government effectiveness and accountability*, (4) *Effect of taxation on incentives to invest*, (5) *Total tax rate* and (6) *Burden of government regulation*.

The *Heritage Foundation Rule of Law* index captures mechanisms by which societies enforce laws and regulations and protect property. The rule of law is a crucial mechanism that curtails corruption and therefore encourages entrepreneurial risk taking. Under a strong rule of law people feel that their personal liberty and the fruits of their labour will be protected. In contrast, under a weak rule of law, there are no guarantees that any effort by citizens will be respected, nor are there effective limits to government abuse, bribery, special interests, and corrupt rent seeking. This composite index incorporates different aspects of the rule of law, including physical and intellectual property rights, the strength of investor protection, the risk of expropriation, the judicial effectiveness and independence, and the transparency of governmental policymaking and civil services.

Entrepreneurial entry may be inhibited by monopolistic practices. For characterising this aspect of the business regulatory environment we use the *WEF Effectiveness of anti-monopoly policies* indicator, which measures the effectiveness of anti-monopoly policies in ensuring fair competition.

In a favourable business environment, entrepreneurial activities are supported by predictable fiscal regulation and a reliable governance system. In the EIDES, the *WEF Total tax rate* and the *WEF Effect of taxation on incentives to invest* compare national

tax systems and capture their effect on business investment. We also included WEF indicators such as the *Government effectiveness and accountability* and the *Burden of government regulation* to capture the quality of government.

Economies and societies are being digitalised at an increasing pace. This phenomenon is driven by different technological trends. Digitalisation can be seen as a dynamic process with enormous number of potential opportunities and advantages related to several fields. However, this quick and ardent deployment of digitalisation infrastructures incorporates –besides the never before seen freedom – several risks as well. Therefore, digital security and privacy have important roles to ensure that citizens and organisations fully engage in the available digital infrastructures.

Digitalisation intertwines with formal institutions to shape entrepreneurship in a given country. In the EIDES, the digitalisation related *Formal Institutions, Regulation, and Taxation (DFC\_P2)* pillar encompasses several indicators describing digital security and privacy. This pillar also includes proxies that measure how formal institutions and the regulatory environment shape digitalisation processes and competition. The pillar also captures the digitisation of public services, focusing on e-Government. Modernisation and digitalisation of public services can lead to efficiency gains for the public administration, citizens and businesses through the delivery of high-quality services. The pillar includes indicators such as: (1) *Laws relating to ICTs (WEF)*, (2) *Prevalence of network attacks by Kaspersky (Securelist)*, (3) *Prevalence of digital threats such as viruses and malware (Securelist)*, (4) *Software piracy rate (WEF)*, (5) *Internet & telephony competition (WEF)* and (6) *E-government (UN Department of Economic and Social Affairs)*.

### **Market Conditions (GFC\_P3 and DFC\_P3)**

Market conditions constitute one of the most important regulators of a country's entrepreneurial dynamic. This pillar includes indicators reflecting different features of market conditions, such as the effect of agglomeration externalities, the market power of existing businesses and business groups, domestic and foreign market size, and also, perceptions of entrepreneurial opportunities.

Agglomeration externalities are positively associated with entrepreneurship because they facilitate opportunity recognition and exploitation, and also, make it easier for demand and supply to meet. These processes are enhanced by urbanisation. This pillar therefore includes the *WEF Size of the domestic markets*, the *Size of foreign markets* and the *Level of urbanisation* calculated by *World Population Prospects*. Domestic market size indicator refers to the sum of gross domestic product plus the value of imports of goods and services minus exports of goods and services. Foreign market size measures the value of national exports of goods and services.

Market conditions also can influence opportunity perception. The *Flash Eurobarometer Survey Opportunity motivation* indicator refers to the entrepreneurial opportunity perception by the population. Specifically, it measures the degree to which a country's citizens prefer self-employment over regular employment.

The intensity of competition among business firms is an important indicator of the entrepreneurial dynamic. The relevant indicators in the EIDES reflect managerial perceptions regarding the freedom of market competition (*WEF Extent of Market dominance*) and the freedom of trade (*WEF Prevalence of trade barriers*).

The digital counterpart of the *Market Conditions (DFC\_P3)* pillar characterises the exploitation of online market channels (e.g., e-commerce, e-sales, e-advertisement) by households and firms. By adopting digital technology households and businesses can enhance efficiency, reduce costs and better engage customers, collaborators, and business partners. Furthermore, the Internet also offers wider access to markets. The digital pillar includes the following six indicators derived from Eurostat and one from Translate.net database: (1) *Individuals using the Internet for ordering goods or services*,



(2) *Enterprises having received orders via computer mediated networks, % of enterprises*, (3) *Enterprises' total turnover from e-commerce*, (4) *Enterprises having done electronic sales to other countries*, (5) *Enterprises having done electronic sales or purchases in the rest of the world*, (6) *T-index*, and (7) *Pay to advertise on the Internet*.

### **Physical Infrastructure (GFC\_P4 and DFC\_P4)**

A country's physical infrastructure plays an important role in supporting business operations, and therefore, also entrepreneurship. Physical infrastructure regulates, e.g., firms' accessibility and connectivity with markets, resources, and other firms. Good accessibility and connectivity enabled by physical infrastructures help business firms and entrepreneurs effectively discover and pursue market opportunities and run their operations. Countries with an effective physical infrastructure are also better positioned to promote the internationalisation of firms, therefore facilitating the realisation of their growth potential.

The EIDES distinguishes between two types of physical infrastructures: first, the electricity and telephony infrastructures, and second, the transportation infrastructure. The *WEF Electricity and telephony infrastructure* aggregate index consists of indicators measuring the reliability of electricity supply, the number of mobile phone subscriptions, and the number of fixed-telephone lines. Another WEF aggregate indicator, namely, the *Overall Transportation infrastructure* comprises indicators of the perceived quality of general infrastructures (e.g. transport, communication, and energy).

Digitalisation affected *Physical Infrastructure (DFC\_P4)* pillar encompasses indicators reflecting quality-related features – such as affordability, speed, security, and coverage – of the digital infrastructure. Limited affordability of network services, devices, and applications impedes consumers' engagement with the digital economy and widens the digital divide. In the EIDES, therefore, the digital affordability indicators assess the costs of mobile telephony and fixed broadband Internet, as well as the level of competition in the Internet and telephony sectors. Here we use indicators derived from the WEF database, such as the (1) *Prepaid mobile cellular tariffs*, the (2) *Fixed broadband Internet tariffs*, and the (3) *Affordability composite index*.

Speed related indicators measure the performance of digital services such as mobile and fixed broadband. To capture the speed of digital devices and services we use: (1) *Average download speed* and (2) *Average upload speed* measured by *TestMy.net*, the (3) *WEF International Internet bandwidth (kb/s) per Internet user*, and the (4) *DESI Speed* indicator.

Mobile network coverage refers to the penetration rate of portable digital devices. To express the penetration of mobile infrastructure we use the *WEF Mobile network coverage* indicator.

In addition to capacity measures, another important aspect of digital infrastructures relates to trust and safety. Poor protection of data and communications hampers digital trust and potentially undermines the degree to which citizens and businesses embrace the digital capacity available to them. The EIDES therefore employs the *WEF Secured Internet servers* indicator to capture digital trust and safety.

### **4.3.3 Systemic Framework Conditions**

As explained in the conceptual grounding, the *Systemic Framework Conditions (SFC)* relate more directly to the different stages of entrepreneurial sub-dynamics within a country's system of entrepreneurship. Each stage constitutes its own sub-index. We use the same four pillars for each stage, but pick different indicators (or indices) for each of them.

- The **Stand-up** stage covers all activities and mechanisms associated with the self-selection of individuals and teams into the entrepreneurial process: a well-

functioning stand-up framework will attract high-potential individuals and teams into entrepreneurship.

- The **Start-up** stage covers all activities and mechanisms associated with the actual start-up of new ventures, including concept search and refinement and business model experimentation. In our model, start-up continues beyond the actual incorporation of the new venture and covers the business model experimentation to discover a robust and scalable business model.
- The **Scale-up** stage covers scale-up activities once a robust and scalable business model has been discovered.

The EIDES also distinguishes between those conditions that are *not* affected by digitalisation (*Systemic Framework Conditions, SFC*) and those that *are* affected by digitalisation (*Systemic Digital Conditions, SDC*). Both groups use the same pillar structure, but the composition of each individual pillar is different. The pillar structure of both the *Systemic Framework Conditions (SFC)* and *Systemic Digital Conditions (SDC)* is listed below:

1. Human Capital (*SFC\_P1* and *SDC\_P1*)
2. Knowledge Creation and Dissemination (*SFC\_P2* and *SDC\_P2*)
3. Finance (*SFC\_P3* and *SDC\_P3*)
4. Networking and Support (*SFC\_P4* and *SDC\_P4*)

### **Digital Entrepreneurship Stand-up sub-index (S1)**

This Stand-up sub-index captures measures and mechanisms that influence the self-selection of individuals into entrepreneurship – i.e., the decision of whether or not to start a new business. The EIDES structure includes both digital and non-digital versions of this sub-index.

#### **Human Capital (S1\_SFC\_P1 and S1\_SDC\_P1)**

Human capital constitutes an important determinant of the quality of entrepreneurial businesses. Individuals with a higher human capital will be better able to recognise and pursue high-quality opportunities for entrepreneurship (Davidsson & Honig, 2003). The opportunity costs associated with the allocation of high-quality human capital among alternative occupational pursuits will also ensure that entrepreneurs with high human capital will be more motivated to pursue potential growth opportunities (Autio & Acs, 2010).

The availability of high-quality human capital is determined by the quality of the education system. We measure two aspects of this human capital, namely, general human capital (general quality of the education system) and entrepreneurial human capital, as shaped by the ability of the education system to encourage entrepreneurial attitudes: *WEF Quality of Education* is an aggregate index based on PISA<sup>2</sup> results, and the survey-type indicator of *Flash Eurobarometer Survey* measures *Entrepreneurial attitudes at school*.

The digital counterpart of the *Human Capital* pillar captures the availability of digital infrastructure in educational institutions and the basic digital skills of the population. To evaluate the digitalisation of education we use two survey-type indicators: the *Eurostat Internet access at places of education* and the *WEF Internet access in schools*. To measure people's digital skills we employ the *Eurostat Individuals above basic digital skills* indicator.

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<sup>2</sup> Programme for International Student Assessment is a worldwide study by the Organisation for Economic Co-operation and Development (OECD).

### **Knowledge Creation and Dissemination (S1\_SFC\_P2 and S1\_SDC\_P2)**

Entrepreneurial stand-up in a country is shaped by the degree to which potential entrepreneurs can access valuable knowledge to fuel their business ventures. Much of this knowledge is carried by individuals, in the form of their human and social capital. A country's ability to attract and retain talent not only provides entrepreneurial ventures with access to valuable human resources, such talent will also boost knowledge creation in the country, facilitating potential knowledge spill-overs to new ventures. The EIDES uses WEF index data to capture this aspect: *Country capacity to retain talent (WEF)* and the *Country capacity to attract talent (WEF)*.

Digitalisation shapes the process of knowledge creation, transfer and dissemination. With digitalisation, access to knowledge becomes less constrained by spatial distance, as the Internet can facilitate access to digitalised knowledge resources regardless of location. The indicator *Open access of scientific documents* offered by *OECD* and indicators of *Global Innovation Index* such as *Wikipedia yearly edits* and *YouTube video uploads* are therefore used in the EIDES as proxies of the impact of digital technologies and infrastructures on the creation and dissemination of knowledge.

### **Finance (S1\_SFC\_P3 and S1\_SDC\_P3)**

Availability of finance is widely recognised as a key regulator of the entrepreneurial dynamic in countries, including the Stand-up stage. Both the amount of funding matters, as does the accessibility by entrepreneurial ventures to such funding. The *Domestic credit (International Monetary Fund, International Financial Statistics)* indicator measures the generally prevalent forms of funding, such as loans, non-equity securities, and trade credits and other accounts receivable. Additionally, the *Ease of access to loan (WEF)* indicator helps to get an insight into citizens' perception how easy it is for new businesses to obtain a bank loan.

As digital proxies we use indicators as *Digital payment transactions* and *Number of cashless payment transactions*. Both indicators are offered by *Statista* and *Internet Banking* measured by *Eurostat*. On the one hand, these indicators capture the effect of digital technologies and infrastructures on the functional operation of financial institutions. On the other hand, these proxies offer insight into the new generation of digitalised financial products and services.

### **Networking and Support (S1\_SFC\_P4 and S1\_SDC\_P4)**

Positive attitudes towards entrepreneurship encourage entrepreneurial stand-up, as does informal access to resources through social networks. We therefore included the *Opinion about Entrepreneurs* indicator offered by *Flash Eurobarometer Survey* in the EIDES. To capture networking and digitalisation, we included the *Use of virtual social networks (WEF)* and *Participating in social networks (Eurostat)* in this pillar.

### **Digital Entrepreneurship Start-up sub-index (S2)**

#### **Human Capital (S2\_SFC\_P1 and S2\_SDC\_P1)**

Societies with high-quality educational systems are better able to supply entrepreneurial start-ups with high-quality human capital. In the Start-up sub-index, we therefore included several proxies of different aspects of the education system. These included *Tertiary education enrolment (WEF)* and *Percentage of universities with top rankings in international league tables (Webometrix)*. Furthermore, human resources in science and technology are particularly relevant for new start-ups. This pillar therefore employs indicators such as the *STEM education* and the *Human resources in science and technology* indicator offered by *Eurostat*. As digital proxy of the educational system, we included the *Employed ICT specialists (Eurostat)* indicator to capture the availability of digitally skilled human capital.

### **Knowledge Creation and Dissemination (S2\_SFC\_P2 and S2\_SDC\_P2)**

Start-ups need access to advanced research-based knowledge in order to nurture distinctive capabilities and create sophisticated products and services. In order to convert this knowledge into a source of distinctive competitive advantage, however, start-ups also need absorptive capacity – i.e., a capacity to recognise valuable knowledge and integrate it into their products and service. Scientific institutions constitute an important source of research advances, and the Start-up sub-index therefore includes the WEF *Quality of scientific research institutions*, which provides insight into the quality of a country's knowledge production system. To capture the start-ups' ability to take advantage of research-based knowledge spillovers, we use the *Technology absorption* indicator derived from WEF database. This indicator measures the availability of the latest technology in a country and the absorptive abilities of business firms.

To capture the digital aspect of knowledge creation, transfer, and absorption, we use *Employment in high tech and KIBs (Eurostat)* and *Software developers (Developer survey)*. These indicators provide proxies of the degree to which the processes of knowledge creation, transferring and dissemination are digitalised.

### **Finance (S2\_SFC\_P3 and S2\_SDC\_P3)**

Venture capital funding and other forms of equity investment are an important determinant of the risk-taking capacity of start-ups and therefore play an important and growing role in supporting the exploitation of as yet undiscovered and therefore risky entrepreneurial opportunities. The indicators chosen for the *Finance* pillar of the Start-up sub-index therefore measure different forms of formal and informal investment: (1) *Venture capital availability (WEF)*, (2) *Venture Capital funding (dealroom.co)*, (3) *Number of VC investors (dealroom.co)*, (4) *Number of VC invested firms (dealroom.co)*, (5) *Business angel investment (dealroom.co)* and (6) *Early phase VC (Venture Source, Dow Jones)*.

As a digital proxy of start-up *Finance* pillar we used the *Alternative finance indicator (Cambridge Centre)* which provides insight into new forms of alternative finance (such as crowdfunding, peer-to-peer markets, invoice trading, debt-based securities etc.) triggered by the development of digital technologies and infrastructures.

### **Networking and Support (S2\_SFC\_P4 and S2\_SDC\_P4)**

To progress from the Stand-up stage to the Start-up stage, a positive and supportive attitude towards domestic and international networks and collaborations is important. Among other things, and specific to the Start-up stage, such networks serve as a forum for cultivating and disseminating cluster-specific architectural knowledge on 'what works' in terms of business model design and facilitate horizontal sharing of knowledge regarding novel business model practices among start-ups. Specific to this aspect, the *Enterprise Europe Network* offers a large online database of new business opportunities containing thousands of business, technology and research cooperation requests and offers from companies and research and development institutions.

As digital proxy of *Networking and Support* pillar, we used the *Accelerators (European Accelerators Report)* and the *Meetup Events and members (meetup.com)* indicators. These are distinctive structural elements of entrepreneurial ecosystems. The new venture accelerator phenomenon is largely driven by advances in digitalisation, and new venture accelerators have become far more important than simple business-service providers or investment vehicles. Networking events bring together different participants of entrepreneurial ecosystems facilitating their access to resources, as well as dissemination of experiential knowledge regarding business model innovation.

## **Digital Entrepreneurship Scale-up sub-index (S3)**

### **Human Capital (S3\_SFC\_P1 and S3\_SDC\_P1)**

In order to scale, start-ups need both access to managerial knowledge and an ability to upgrade their workforce during the scale-up phase. Scale-up firms also need access to advanced managerial knowledge in order to build and run efficient organisations around their business models. Staff training and lifelong learning practices and institutions in a country are designed to constantly upgrade the skills of the labour force in order to adjust to technological progress and new economic opportunities. Management schools provide an important source of managerial skills. The *Human capital* pillar of the Scale-up sub-index therefore includes proxies of these: (1) *Eurostat Lifelong learning*, (2) *WEF Extent of staff training*, (3) *WEF and Quality of management schools*. In addition to these supply-side indicators, and as a reflection of the ability of scale-ups to re-adjust their business models in the face of rapidly shifting opportunities characteristic of dynamic markets (including the possibility of reducing employment size when necessary, the *Labour Freedom* composite index from Heritage Foundation proxies this aspect. This index covers regulation relating to minimum wages, hiring and firing practices, hours of work, and severance requirements, among others.

Opportunity-driven scale-up entrepreneurs often leverage digital technologies and infrastructures when searching for information about market opportunities. Therefore, as digital proxies we use the *Eurostat* (1) *Internet use: looking for information* and (2) *Internet use: doing online course* indicators to capture the influence of digitalisation on conditions affecting entrepreneurial scale-up process.

### **Knowledge Creation and Dissemination (S3\_SFC\_P2 and S3\_SDC\_P2)**

Constant access to cutting-edge knowledge is important to fuel scale-ups. The *Knowledge Creation and Dissemination* pillar includes proxies of both knowledge inputs (in the form of the availability of knowledge-intensive human capital and investment in R&D) and outputs (in the form of patents). The *Eurostat GERD*, *WEF Availability of scientists and engineers* and *Number of PCT patent applications* were selected as proxies of these.

Similar to start-ups, absorptive capacity is needed in order for business firms to translate knowledge inputs into distinctive products and services. As proxies of these, we used the *WEF Firm-level technology absorption* and *Capacity for innovation* indicators.

In addition to knowledge production, the accessibility of it is important for knowledge spill-overs to materialise. Accessing external sources of knowledge implies the need to participate in multi-stakeholder networks and knowledge-intensive collaborations with others, often as participants of innovation ecosystems. As proxies of these processes we included two indicators: (*WEF*) *University-industry collaboration in R&D* and (*Atlas Media*) *Economic Complexity index*.

Absorbing digital technologies in business operations is an important determinant of scale-up ability due to the inherent scalability of many digital resources, as well as due to the potential of digital tools to support the coordination of complex operations. To this end, we EIDES Scale-up sub-index includes two indicators: the *Eurostat Enterprises who have ERP software* and the *Website has online ordering, reservation or booking* offered by *Eurostat*.

### **Finance (S3\_SFC\_P3 and S3\_SDC\_P3)**

Access to finance is of obvious importance for scale-ups. The finance pillar of the EIDES Scale-up sub-index includes the *Later phase VC (Venture Source, Dow Jones)* and *Local equity market (WEF)* indicators. In addition, the *European Private Equity* data source is the most comprehensive and authoritative source for European private equity fundraising, investment, and divestment data. Finally, the *Depth of Capital Market* is a complex index that measures the access to different capital markets by new ventures.

As noted previously, digitalisation has led to the introduction of many alternative financial instruments. Financial technology (Fintech) is the new digital technology and innovation that aims to compete with traditional financial methods in the delivery of financial services. The use of smartphones for mobile banking and investing services are examples of technologies aiming to make financial services more accessible to the general public. Financial technology companies consist of both start-ups and established financial and technology companies trying to replace or enhance the usage of financial services provided by existing financial companies. [Dealroom.co Fintech](#) indicator measures the number of financial technology business.

### ***Networking and Support (S2\_SFC\_P4 and S2\_SDC\_P4)***

Scale-ups need resource munificent environments to grow their operations, ones that are rich in the kind of specialised resources and business infrastructure they rely on. In order to capture this aspect, the networking and support pillar of the EIDES Scale-up sub-index includes one indicator of cluster development, one indicator of business sophistication, and one indicator of the quality of the physical business infrastructure. Clusters provide good access to sophisticated resources, and also, to beneficial demand and supply conditions. The business sophistication indicator provides insight into the quality of potential partners. The logistic index provides an indication of the quality of the physical infrastructure: (1) [State of cluster development \(WEF\)](#), (2) [Business sophistication \(WEF\)](#) and (3) [Logistic index](#).

Clustering takes into account that businesses are supported by other cluster members contributing to counterbalance missing individual resources and to get further support for high growth. According to the evidence of the literature, we assume that clustering of firms refers to considerable cost saving for those firms participating in a cluster and promote their growth both domestically and abroad.

Both domestic and international logistics are central to economic growth and competitiveness of countries. Efficient logistics connects firms to domestic and international markets in a reliable and cost efficient manner. Conversely, businesses in countries characterised by low logistics performance face high costs, not merely because of transportation costs, but also because of unreliable supply chains, a major handicap in integrating and competing in global value chains.

Business sophistication is conducive to higher efficiency in the production of goods and services. The quality of a country's business networks and supporting industries, as measured by the quantity and quality of local suppliers and the extent of their interaction, is important for a variety of reasons. When companies and suppliers from a particular sector are interconnected in geographically proximate clusters, efficiency is enhanced, opportunities for innovation are opened, and barriers to entry for new firms are reduced. Individual firms' operations and strategies (branding, marketing, the presence of a value chain, and the production of unique and sophisticated products) all support modern, sophisticated business processes (Porter & Schwab, 2008).

The digital aspect of the networking and support pillar captures the effect of digital infrastructures and technologies on networking. The [WEF Business and business](#) and [Business to consumer](#) networking indicators provide insight into what extent businesses in a given country rely on digital solutions in their interactions with other businesses and consumers.

## 5 EIDES results

### 5.1 Country rankings

The EIDES 2018 index for the EU28 countries is shown in Table 4. The table shows the digitalised versions of the index for the three sub-systems – i.e., the Stand-up, the Start-up and the Scale-up. These sub-indices represent a combination of the General Framework Conditions and the sub-index score for each of the three sub-systems, as composed of Systemic Framework Conditions. The rightmost column shows the overall EIDES score, which represents the arithmetic average of the three sub-index scores. The range for all scales is from a low of 0 to a high of 100.

We have divided the countries into four groups: leaders (EIDES score above 70), followers (EIDES score above 45 and up to 70), catchers-up (EIDES score above 35 and up to 45) and laggards (EIDES score below 35). The four groups are highlighted using different colours. These cut-off points emerge naturally from the data, as shown in Figure 3.

In the EIDES 2018 ranking, four countries emerge as leaders in terms of their digitalised General and Systemic Framework Conditions for entrepreneurship. These are: Denmark, Sweden, Luxembourg, and Finland. Of these, Denmark's score is ahead of the other three, which are clustered closer together in terms of their overall EIDES score. Denmark scores first for all sub-indices (Stand-up, Start-up and Scale-up). Sweden scores second for Start-up and Scale-up sub-indices but fourth for the Stand-up sub-index. Finland scores 3<sup>rd</sup> for the Stand-up system, 4<sup>th</sup> for the rest.

After the group of four leading countries, there is a notable gap of nearly 10 index score points to the second group, followers. This group comprises nine countries: Germany, United Kingdom, Netherlands, Ireland, Belgium, Austria, Malta, Estonia and France. Of these, Germany and the United Kingdom are virtually tied, and the top four countries are ahead of the bottom four countries in the group, with Belgium falling in between the two sub-groups.

The catchers-up group comprises five countries: Spain, Czech Republic, Lithuania, Slovenia, Portugal and Cyprus. The EIDES scores for this group range from 36,3 (Cyprus) to 44,2 (Spain), which is clearly behind the leader group, whose index scores average well above 70.

Finally, the group of laggards comprises nine countries: Poland, Latvia, Italy, Croatia, Hungary, Slovakia, Greece, Bulgaria and Romania. It is notable that Italy is ranked in this group, in spite of being one of the G7 countries. Other than Italy, this group comprises former centrally planned economies and Greece.

Several patterns are notable in this grouping. The Nordic EU28 countries all rank in the leader group, together with Luxembourg. The follower group comprises mostly Western European countries plus Malta and Estonia – the latter being the only former centrally planned economy to rank in the top half of the ranking. The catchers-up group includes mostly Southern European countries and leading new member countries. The follower group includes mostly new member countries plus Italy and Greece.

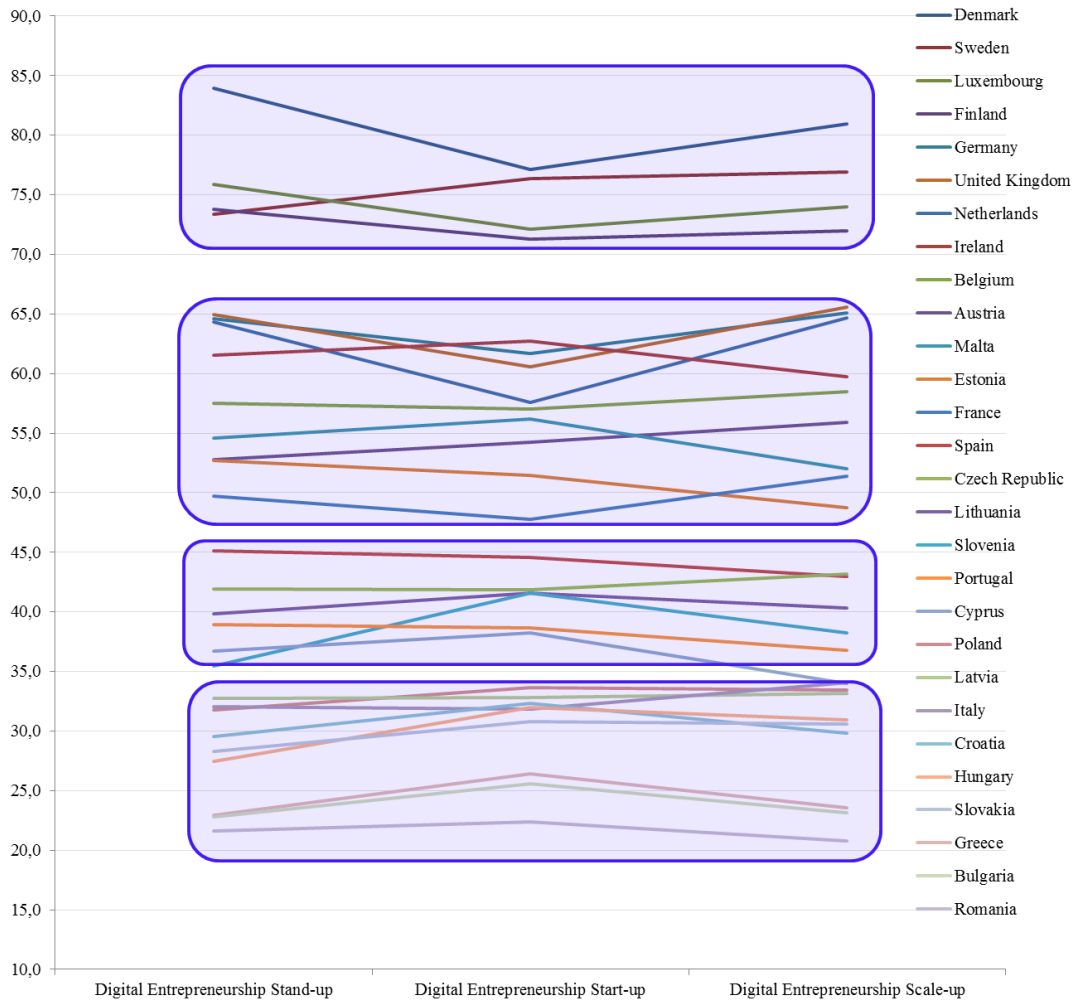
**Table 4. EIDES scores for EU28 countries**

Country	Stand-up sub-index		Start-up sub-index		Scale-up sub-index		EIDES	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Denmark	84.0	1	77.1	1	80.9	1	80.7	1
Sweden	73.4	4	76.4	2	76.9	2	75.6	2
Luxembourg	75.9	2	72.1	3	74.0	3	74.0	3
Finland	73.8	3	71.3	4	72.0	4	72.4	4
Leaders	76.8		74.2		76.0		75.7	
Germany	64.6	6	61.7	6	65.1	6	63.8	5
United Kingdom	65.0	5	60.6	7	65.6	5	63.7	6
Netherlands	64.3	7	57.6	8	64.7	7	62.2	7
Ireland	61.5	8	62.7	5	59.7	8	61.3	8
Belgium	57.5	9	57.0	9	58.5	9	57.6	9
Austria	52.8	11	54.2	11	55.9	10	54.3	10
Malta	54.6	10	56.2	10	52.0	11	54.3	11
Estonia	52.7	12	51.5	12	48.7	13	51.0	12
France	49.7	13	47.7	13	51.4	12	49.6	13
Followers	52.5		52.4		52.0		52.3	
Spain	45.2	14	44.6	14	42.9	15	44.2	14
Czech Republic	41.9	15	41.9	15	43.2	14	42.3	15
Lithuania	39.8	16	41.6	17	40.3	16	40.6	16
Slovenia	35.5	19	41.6	16	38.2	17	38.4	17
Portugal	38.9	17	38.7	18	36.8	18	38.1	18
Cyprus	36.7	18	38.3	19	34.0	20	36.3	19
Catchers-up	37.7		40.1		37.3		38.4	
Poland	31.8	22	33.6	20	33.4	21	32.9	20
Latvia	32.7	20	32.8	21	33.2	22	32.9	21
Italy	32.0	21	31.8	24	34.0	19	32.6	22
Croatia	29.5	23	32.3	22	29.9	25	30.6	23
Hungary	27.4	25	32.0	23	30.9	23	30.1	24
Slovakia	28.3	24	30.8	25	30.6	24	29.9	25
Greece	22.9	26	26.4	26	23.5	26	24.3	26
Bulgaria	22.8	27	25.6	27	23.2	27	23.9	27
Romania	21.6	28	22.4	28	20.8	28	21.6	28
Laggards	23.9		26.3		24.5		24.9	
EU28 average	47.0		47.2		47.2		47.1	

Source: Own calculation



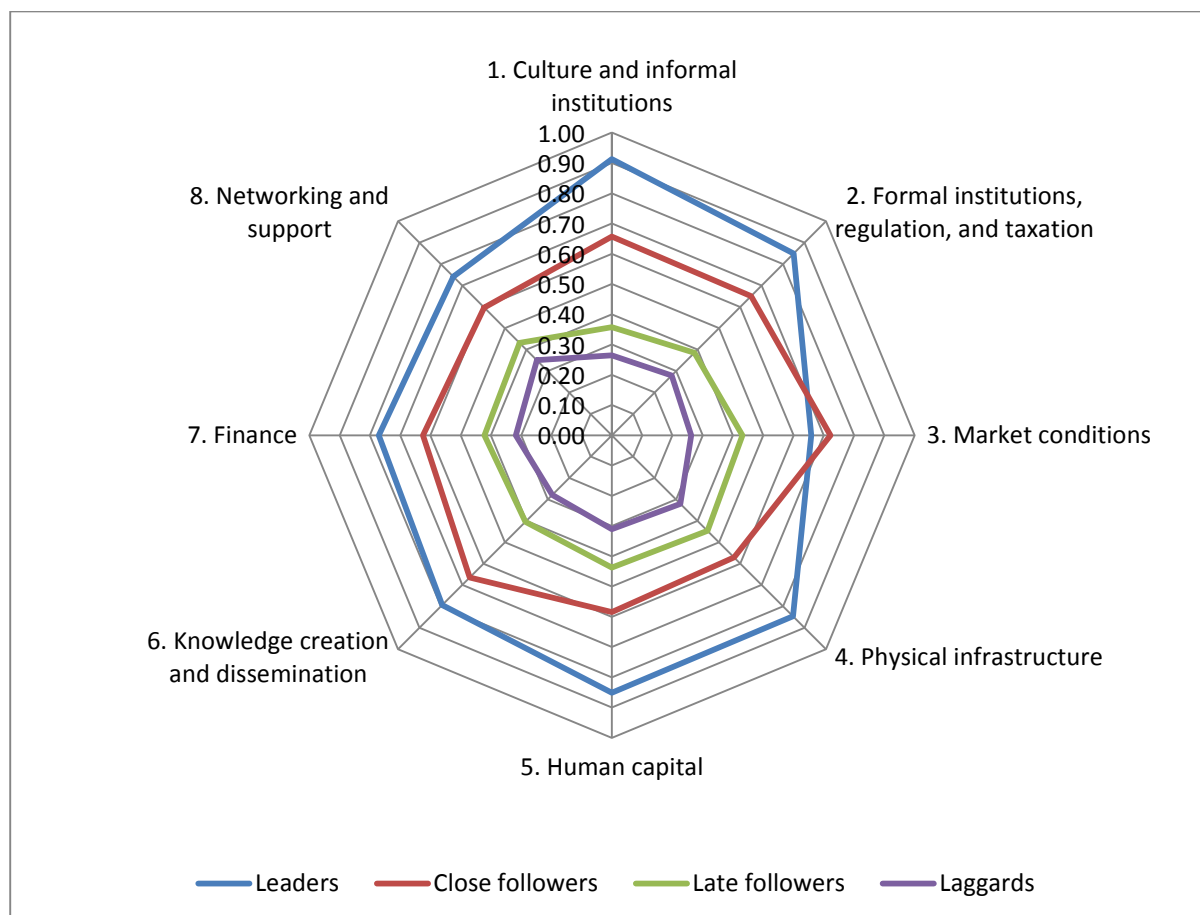
**Figure 3. Country groupings for EIDES 2018**



Source: Own creation

Figure 4 shows the EIDES profiles of the four country groups in terms of their average performance for the eight index pillars that represent General and Systemic Framework Conditions. For the systemic conditions, the combined score of the three sub-systems is shown. This figure confirms the visual grouping based on the three sub-index scores by showing that for all except for one pillar, the ranking of group means is consistent with the grouping. The only exception is the Market Conditions pillar, where the average for the follower group is slightly higher than the average for the leader group, possibly reflecting the smaller market size of the leader group.

**Figure 4. EIDES profiles of the four country groups**



Source: Own creation

Table 5 shows individual pillar values for the EU28 countries, grouped by leaders, followers, catchers-up and laggards. This table allows a more close-up inspection and comparison of the profiles of different countries<sup>3</sup>. Overall, the individual pillar values appear consistent with the overall rankings, with a few notable exceptions:

- For the Culture and Informal Institutions pillar, The Netherlands stands out for its positive culture, ranking third among the EU28 countries for this pillar
- For the Formal Institutions, Regulation, and Taxation pillar, Sweden ranks behind The Netherlands, UK, and Germany
- For the Market Conditions pillar, large countries tend to be close to the top while the Leader group countries tend to score lower than their overall ranking due to their smaller domestic market size. Ireland is the exception to this rule, ranking 3<sup>rd</sup> overall for this pillar
- For the Physical Infrastructure pillar, Portugal ranks significantly higher than for its overall EIDES score, at 10<sup>th</sup> – ahead of, e.g., Estonia and Ireland
- For the Human Capital pillar, Finland ranks clearly ahead of the other countries, with a significant gap to the second ranking country, Denmark. Spain also ranks significantly above its overall score, at 6<sup>th</sup>
- For the Knowledge Creation and Dissemination pillar, The Netherlands ranks first. Both the Czech Republic and Slovenia also rank ahead of their overall ranking

<sup>3</sup> One-page close-ups of each EU28 country are provided in Chapter 6.

- For the Finance pillar, the UK ranks first among the EU28 countries. Latvia ranks significantly ahead of its overall EIDES ranking, whereas Austria ranks significantly behind its overall EIDES ranking
- For the Networking and Support pillar, Luxembourg leads the pack. Spain ranks significantly ahead of its overall EIDES ranking, whereas Finland ranks significantly behind. Italy scores its best ranking for this pillar, at 14<sup>th</sup> and significantly ahead of its EIDES overall ranking. Austria exhibits a notably weaker score for this pillar relative to its overall EIDES score, similar to the Czech Republic and Slovenia, which rank at the bottom of the EU28 countries for this pillar

**Table 5. Pillar values of the EIDES**

Country	Culture and informal institutions	Formal institutions, regulation, and taxation	Market conditions	Physical infrastructure	Human capital	Knowledge creation and dissemination	Finance	Networking and support	EIDES scores
Denmark	100.0	83.9	93.7	98.1	87.4	81.9	68.2	72.5	80.7
Sweden	87.4	74.6	73.8	71.9	85.9	93.4	71.4	66.3	75.6
Luxembourg	80.4	100.0	45.1	100.0	68.9	66.0	90.2	98.6	74.0
Finland	97.3	81.4	51.1	68.7	98.4	75.9	78.3	59.2	72.4
Leaders	91.3	85.0	65.9	84.7	85.2	79.3	77.0	74.1	75.6
Germany	72.2	79.2	100.0	61.3	54.4	85.6	57.7	55.2	63.8
United Kingdom	80.0	80.6	97.4	63.0	78.3	71.8	96.4	62.5	63.7
Netherlands	95.2	83.1	69.1	76.9	76.1	95.4	70.5	61.4	62.2
Ireland	69.4	62.9	97.7	43.1	51.3	63.0	52.0	77.9	61.3
Belgium	63.4	51.4	69.3	55.3	53.6	61.7	54.2	56.0	57.6
Austria	62.5	61.3	48.2	66.7	54.6	66.3	44.7	45.3	54.3
Malta	39.3	67.8	77.9	52.4	47.3	61.9	50.5	59.9	54.3
Estonia	55.2	54.7	30.0	45.8	66.9	46.3	75.1	62.3	51.0
France	53.9	44.9	60.8	49.0	43.7	46.4	60.8	56.8	49.6
Followers	65.7	65.1	72.3	57.1	58.5	66.5	62.4	59.7	57.5
Spain	36.8	36.4	42.4	48.5	58.9	34.6	47.0	58.1	44.2
Czech Republic	45.5	36.8	68.9	39.8	40.6	61.1	39.3	29.5	42.3
Lithuania	32.1	35.7	47.0	48.2	42.9	31.6	51.1	47.3	40.6
Slovenia	36.4	36.5	40.6	36.7	43.6	47.6	32.5	42.5	38.4
Portugal	29.4	40.2	30.6	52.6	45.1	35.8	35.2	42.2	38.1
Cyprus	34.1	45.4	29.1	42.5	31.2	31.7	47.5	39.4	36.3
Catchers-up	35.7	38.5	43.1	44.7	43.7	40.4	42.1	43.2	40.0
Poland	34.5	32.0	33.3	41.0	29.0	28.8	36.9	31.3	32.9
Latvia	32.9	29.6	20.6	43.2	34.2	25.8	51.3	35.7	32.9
Italy	24.7	27.5	33.7	34.4	30.1	34.1	29.2	53.4	32.6
Croatia	25.7	31.6	42.0	30.8	35.7	21.8	30.6	35.6	30.6
Hungary	25.0	30.5	27.6	33.6	34.5	34.8	33.4	31.1	30.1
Slovakia	35.7	29.4	33.5	19.8	34.4	37.1	37.0	21.9	29.9
Greece	25.7	20.3	26.4	24.3	29.0	21.6	19.2	32.4	24.3
Bulgaria	17.0	25.9	11.1	28.8	26.3	25.0	27.6	39.3	23.9
Romania	16.7	24.7	7.7	32.4	26.0	21.5	20.6	35.1	21.6
Laggards	26.4	27.9	26.2	32.0	31.0	27.8	31.8	35.1	28.8

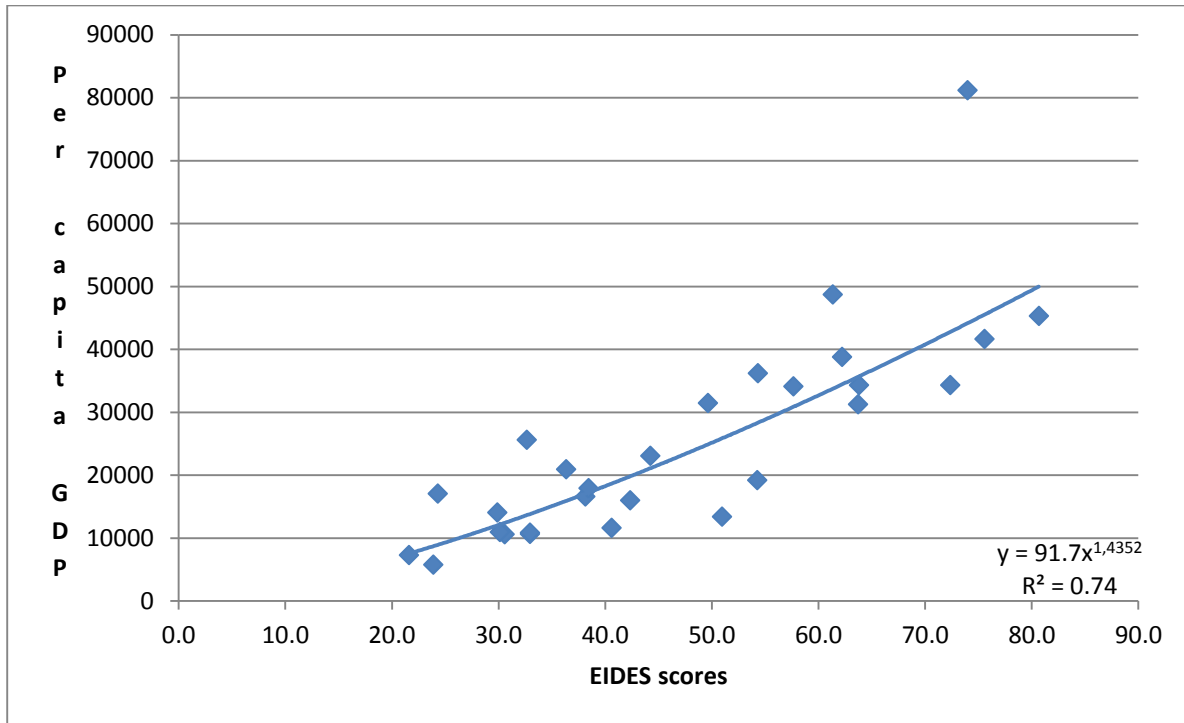
Source: Own calculation

## 5.2 Comparison between EIDES and other measures of country-level entrepreneurship

How does the EIDES compare with a country's GDP per capita and country-level measures of entrepreneurial activity? We compare EIDES against GDP per capita to check if there is any top-level association between the two. We also explore top-level associations between EIDES and the ESIS (Van Roy & Nepelski, 2016). For entrepreneurial attitude and activity measures, we explore associations between measures of preferences for self-employment, for self-employment in general, as well as measures of growth-oriented entrepreneurship, high-growth performance and the importance of 'modern' start-ups.

The EIDES scores exhibit a positive association with a country's GDP per capita (see Figure 5). The coefficient for the bivariate correlation is 0.82 and 'variance explained' in this bivariate association (i.e., the R2 score) is 0.74. This association is not surprising and should not be interpreted as indicating a causal effect. This is because wealthy economies will have more resources and will be able to better invest in the kinds of infrastructures and institutions that are captured in the EIDES. In this association, the outlier is Luxembourg due to its high per-capita GDP.

**Figure 5. Correlation between EIDES scores and GDP per capita**



Source: Own creation

Table 6 shows bivariate correlations between the EIDES, its sub-indices, and the two ESIS indices. The strong correlations between EIDES and its sub-indices are a direct consequence of the index methodology. Not surprisingly, EIDES and its sub-indices also correlate strongly with the two sub-indices of ESIS, which followed a similar methodology.

**Table 6. Correlations between EIDES and ESIS**

	1	2	3	4	5	6
1 EIDES	1.000	.998**	.996**	.997**	.846**	.922**
2 EIDES Stand-up sub-index		1.000	.990**	.993**	.851**	.920**
3 EIDES Start-up sub-index			1.000	.989**	.827**	.925**
4 EIDES Scale-up sub-index				1.000	.852**	.915**
5 ESIS Entrepreneurship Index					1.000	.851**
6 ESIS Scale-up Index						1.000

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

\* Correlation is significant at the 0.05 level (2-tailed)

Source: Own calculation

Table 7 contains the correlation coefficients between EIDES and various entrepreneurial outcome measures. We can see that the EIDES scores tend to correlate negatively with measures reflecting self-employment or the preference for it. Notably, there is a strong negative bivariate association between the EIDES score and the population preference for self-employment as a career choice, as reported in the 2012 Flash Eurobarometer report. EIDES also correlates negatively with the prevalence of self-employment activity in the economy. These correlations are consistent with the notion that self-employment activity is not the same thing as ambitious, growth-oriented entrepreneurial activity. There are qualitative differences among forms of self-employment, small business, and

entrepreneurial activity, with only a small proportion of new firms contributing disproportionately to economic growth [references]. It is notable that also the GEM-based measures of overall entrepreneurial activity (i.e., the GEM 'TEA' measure) and GEM's high-growth aspiration measure correlate negatively, although not statistically significantly, with the EIDES score. This may reflect the high share of self-employment activity in GEM data.

The only positive associations for the EIDES score are shown for the share of high-growth enterprises among businesses employing 10 or more employees (not statistically significant) and the start-up ranking score (statistically significant). The start-up ranking score is maintained by [startupranking.com](http://startupranking.com), and it provides a proxy of the start-up's visibility in the Internet and social media. The advantage of this ranking is that it focuses on 'modern' start-ups, defined as: "*An organization with high innovation competence and strong technological base, which has the faculty of an accelerated growth and maintains independence through time. The max lifespan should be of 10 years.*" This definition fits well the population of start-ups that inhabit new business incubators and similar installations and that constitute the target group of the EIDES<sup>4</sup>. For calculating the start-up ranking score, we used the global visibility score of the top 10% of registered start-ups for each country. The positive correlation between the EIDES score and the start-up ranking score suggests an association between EIDES and the visibility of the country's start-ups in the global start-up community.

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<sup>4</sup> The downside of the start-up ranking is that it is not a random sample, but rather, based on the self-registration by businesses that self-identify as start-ups that fit the ranking's criteria.

**Table 7. Bivariate correlations between EIDES and entrepreneurial outcome measures**

	1	2	3	4	5	6	7
1 EIDES	1.000	-.738**	-.531**	-0.087	-0.238	0.280	.648**
2 Preference for self-employment (2012) <sup>5</sup>		1.000	.397*	0.199	0.299	-0.156	-.519**
3 Self-employment (2015-2017 average) <sup>6</sup>			1.000	-0.114	-0.075	-.422*	-.448*
4 TEA (2015-2017 average) <sup>7</sup>				1.000	.560**	0.068	0.070
5 TEA high-growth aspiration (2012-2016) <sup>8</sup> Share of high-growth enterprises (2013- 2015 average) <sup>9</sup>					1.000	0.177	-0.088
6 Start-up ranking score, top ten percent (2018) <sup>10</sup>						1.000	0.297
7							1.000

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

\* Correlation is significant at the 0.05 level (2-tailed)

Source: Own calculation

We also explored associations between the EIDES and other indices that estimate the quality of the framework conditions for innovation, entrepreneurship, and competitiveness in general. These correlations are shown in Table 8. All the indices compared correlate positively with each other and the EIDES. Since all these indices use exclusively or mostly closely correlated institutional variables, this is not surprising. Note that the reason for building different framework indices, even if highly correlated, is not to measure development in general but to highlight different aspects of development potential. Although these are generally positively associated with one another, the differences between different aspects can be informative. Note that the EIDES also correlates strongly with the only index of national systems of entrepreneurship, the Global Entrepreneurship Index.

5 Preference for self-employment is from the Flash Eurobarometer 354 Report (Entrepreneurship in the EU and Beyond), p. 16. [http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl\\_354\\_en.pdf](http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_354_en.pdf)

6 Self-employment data are from the World Bank database, <https://data.worldbank.org/indicator/SL.EMP.SELF.ZS>

7 TEA is The Total early-stage Entrepreneurial Activity measure of the Global Entrepreneurship Monitor dataset, <http://gemconsortium.org/data>

8 'Gazelle' represents the share of TEA businesses in the GEM data (see item 3 above) that aspire to employ more than 10 employees and grow their sales by over 50% in the coming five years. (<http://gemconsortium.org/data>)

9 Share of high-growth enterprises measured in employment: number of high-growth enterprises divided by the number of active enterprises with at least 10 employees – percentage ([http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=bd\\_9pm\\_r2&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=bd_9pm_r2&lang=en))

10 Start-up ranking score reflects the importance of a startup on the internet and its social influence. It is calculated based on SR Web and SR Social. Data are calculated from Startupranking website <https://www.startupranking.com/countries>

**Table 8. Bivariate correlations between EIDES and indices tracking framework conditions**

	1	2	3	4	5	6
1 EIDES	1.000	.908**	.917**	.924**	.942**	.923**
2 Global Competitiveness Index (2017-2018) <sup>11</sup>		1.000	.939**	.824**	.939**	.909**
3 Global Innovation Index (2017) <sup>12</sup>			1.000	.836**	.910**	.900**
4 Digital Economy and Society Index (2017) <sup>13</sup>				1.000	.921**	.882**
5 Networked Readiness Index (2016) <sup>14</sup>					1.000	.928**
6 Global Entrepreneurship Index (2011-2015 average) <sup>15</sup>						1.000

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

\* Correlation is significant at the 0.05 level (2-tailed)

Source: Own calculation

11 Global Competitiveness Index score is the World Economic Forum's flagship product, measuring presents a framework and a corresponding set of indicators in three principal categories (sub-indices) and twelve policy domains (pillars) for the economies. Present data are from the 2017-2018 edition. (<https://www.weforum.org/reports/the-global-competitiveness-report-2017-2018>)

12 Global Innovation Index score is from the Global Innovation Index 2017 INSEAD report measuring various aspect of the innovation system. Data are from the 2017 issue (<https://www.globalinnovationindex.org/>)

13 Digital Economy and Society Index is a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU member states in digital competitiveness (<https://ec.europa.eu/digital-single-market/en/desi>). We used the most recent 2017 data.

14 Networked Readiness Index (NRI) scores are from the World Economic Forum Global information Technology Report. NRI is a tool assessing countries' preparedness to reap the benefits of emerging technologies and capitalize on the opportunities presented by the digital transformation and beyond. (<http://reports.weforum.org/global-information-technology-report-2016/1-1-the-networked-readiness-index-2016/>)

15 Global Entrepreneurship Index is a measure of countries' entrepreneurship system in fourteen categories by combining both the individual and the institutional aspects of potentially high impact start-ups. Data are from the 2011-2015 GEI reports and GEDI dataset (<http://thegedi.org/downloads/>)

## 6 Country pages

### 6.1 Country page guide

1. **General information** starts with the official country name, followed by population size (millions, average for years 2014-2016) and GDP per capita (purchasing power parity based on euro averages for years 2014-2016). This data is retrieved from the Eurostat database<sup>16</sup> on the 31<sup>st</sup> of March 2018.
2. **Performance overview** provides the country's overall performance in the EIDES.
3. **Country group** indicates the country's performance relative to others, grouped in four categories:
  - Laggards (EIDES score below 35)
  - Catchers-up (35 < EIDES score ≤ 45)
  - Followers (45 < EIDES score ≤ 70)
  - Leaders (EIDES score over 70)
4. **EIDES rank** is the country's EIDES ranking among the EU28 countries.
5. **EIDES score** is the EIDES overall index score on a scale from 0 (low) to 100 (high).
6. **The three sub-indices** show the country's EU28 ranking and the country's score (bracketed) for each of the three sub-indices: the Digital Entrepreneurship Stand-up sub-index, the Digital Entrepreneurship Start-up sub-index, and the Digital Entrepreneurship Scale-up sub-index. Sub-index scores are on a scale from 0 to 100 index points.
7. **EIDES profile** is a spider diagram that shows the performance of each country for the eight EIDES pillars. The country performance is compared against the average pillar scores of each country group. For individual countries in the Leader and the Follower groups, the country's pillar score is compared against the Leader and Follower group averages. For countries in the Catchers-up group, the country's pillar score is compared against the Follower and Catchers-up group averages. For countries in the Laggards group, the country's pillar score is shown against the group averages for the Catchers-up and the Followers groups. All scales are from 0 to 100.
8. **Pillar performance.** Below the EIDES profile diagram we show the country's scores for its strongest and weakest index pillar (bracketed). Pillar scores are from 0 to 100.
9. **EIDES pillar and component values.** On page two of the individual country reports we present the pillar values for each of the eight EIDES pillars. We also list the non-digitalised value of the pillar ('non-digital score'), as well as the value of the digitalisation parameter ('digital'). It is important to recognise that the scores of individual pillar components are NOT the result of a simple multiplication of the non-digital (i.e., 'non-digital score') and the digital (i.e., 'digital') components. The EIDES pillar scores are calculated from 'raw' values. In columns 'non-digital score' and 'digital' we report normalised and average adjusted values for the respective pillar components. The colours in each cell of the table denote the quartile within which the country is grouped for each component. Dark blue colour of the cell indicates the top quartile; light blue the second quartile; light brown the third quartile; and dark brown the bottom quartile.

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<sup>16</sup> <http://ec.europa.eu/eurostat/data/database>



- (a) **Pillar:** In the first column we list the eight pillar names and the three sub-index names as well as the EIDES score.
- (b) **Pillar score** column shows the country's pillar scores on a 0-100 point scale.
- (c) **Non-digital score** column shows the country's non-digitalised pillar scores. The calculation of these scores is described in Appendix 1 (scale from 0 to 100).
- (d) **Digital** column shows the digital component scores on a scale from 0 to 100. The calculation of these scores is described in Appendix 1.
- (e) **EIDES score** shows the overall index score, as well as the scores for non-digital and digital components on a scale from 0 to 100.
- (f) **Sub-index scores** are shown for each of the digital entrepreneurship sub-indices on a scale from 0 to 100. Colour codes are as described above.

10. **Policy optimisation simulation.** Finally, we present a policy optimisation simulation for each country. This simulation informs on the 'optimal' allocation of policy attention and policy resources for improving the country's EIDES performance. This simulation assumes that the country's entrepreneurial dynamic is held back most by its 'weakest', or 'bottleneck' pillar – i.e., the pillar with the lowest pillar score. Under this assumption, the 'optimal' allocation of policy resources should always target the weakest pillar first. Once the individual pillar performance has improved such that the pillar no longer constitutes a bottleneck, policy attention should shift to focus on the second weakest pillar, and so on. An 'optimal' policy therefore systematically and dynamically addresses 'bottleneck' pillars until the desired improvement in the EIDES score has been achieved.

This simulation assumes that the marginal cost of performance improvement is the same for each index pillar. Because of this simplifying assumption, the scenario shown in the policy optimisation simulation should NOT be taken as prescriptive. Instead, the simulation simply suggests potential bottlenecks in each country's digital entrepreneurship system, providing material for policy debates.

In the simulation, we have set the target for each country as reaching a 10% increase in the EIDES score. The graph then shows the 'optimal' allocation of policy resources across the four General Framework Condition pillars (GFC) and the twelve Systemic Framework Condition pillars (SFC; remember that separate SFC pillar values are calculated for the stand-up, start-up, and scale-up stages, creating a total of 12 SFC pillar values).

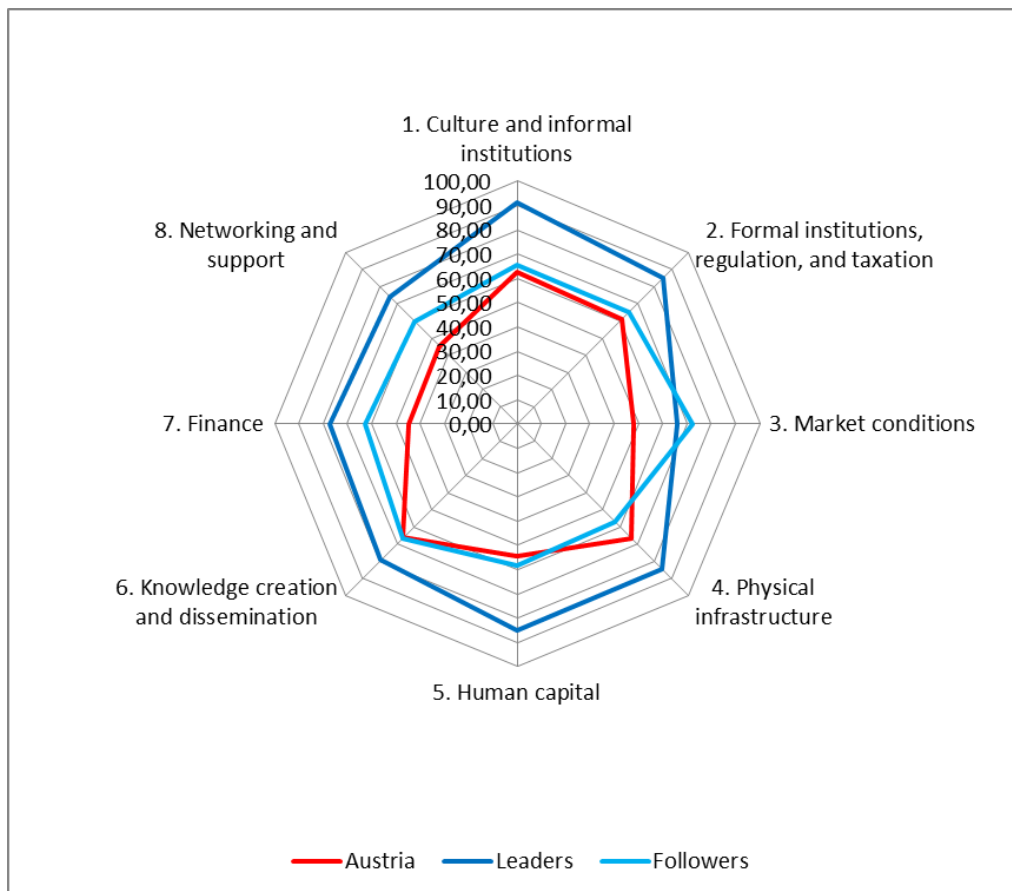
11. **Sum of additional resources** (in unit per population): Below the policy simulation table we report the sum of the addition units that is required to reach a 10 point increase in the EIDES score. While the monetary value of the unit is unknown its magnitude reflects to the amount of additional money for the 10 point EIDES score increase. We also know that this value is expressed in unit per population. The additional unit for this 10% increase ranges from 12.0 (Romania) to 96.0 (Denmark).

## 6.2 Country cases

### 6.2.1 Austria

Size of population 2012-2016 (in Millions)	8.6
Per capita GDP in Euro 2014-2016 average (PPP)	36 233
Country group	Followers
EIDES rank (score)	10 (54.3)
Digital Entrepreneurship Stand-up sub-index rank (score)	11 (52.8)
Digital Entrepreneurship Start-up sub-index rank (score)	11 (54.2)
Digital Entrepreneurship Scale-up sub-index rank (score)	10 (55.9)

**Figure 6. Austria's position in the eight EIDES pillars**



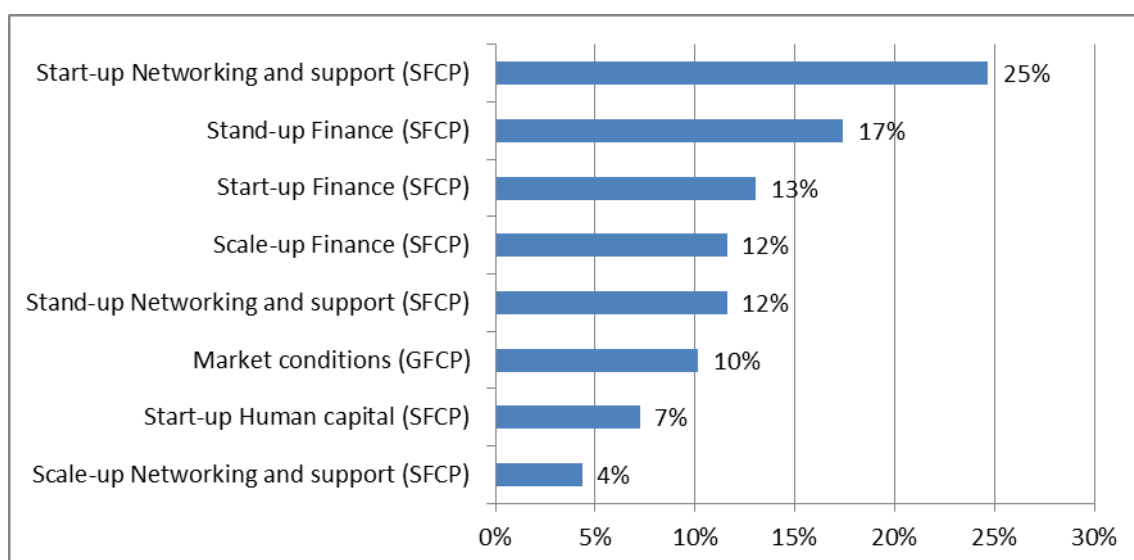
Weakest pillar  
Strongest pillar

Finance and Networking and Support (45.3)  
Physical Infrastructure (66.7)

**Table 9. Austria's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	62.5	84.6	76.2
	Formal Institutions, Regulation, and Taxation	61.3	75.8	86.3
	Market Conditions	48.2	70.6	69.5
	Physical Infrastructure	66.7	88.2	74.8
<b>Systemic Framework Conditions</b>	Human Capital	54.6	84.2	68.0
	Knowledge Creation and Dissemination	66.3	87.7	78.7
	Finance	44.7	75.5	62.2
	Networking and Support	45.3	77.7	59.8
<b>EIDES SCORE</b>		<b>54.3</b>	<b>80.5</b>	<b>71.9</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	52.8		
	Digital Entrepreneurship Start-up	54.2		
	Digital Entrepreneurship Scale-up	55.9		

**Table 10. Austria's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

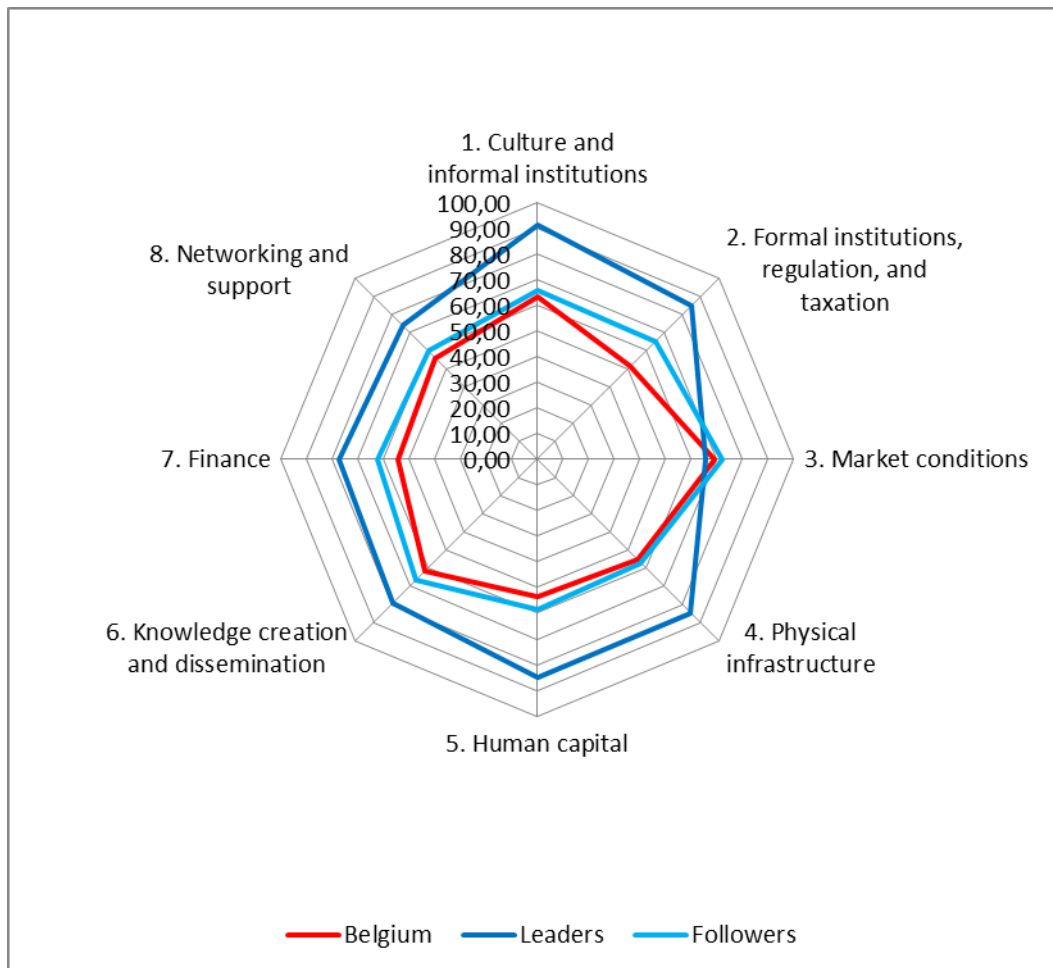


Sum of additional resources for 10% EIDES score increase (in unit per population) 69.0

### 6.2.2 Belgium

Size of population 2012-2016 (in Millions)	11.2
Per capita GDP in Euro 2014-2016 average (PPP)	34 133
Country group	Followers
EIDES rank (score)	9 (57.6)
Digital Entrepreneurship Stand-up sub-index rank (score)	9 (57.5)
Digital Entrepreneurship Start-up sub-index rank (score)	9 (57.0)
Digital Entrepreneurship Scale-up sub-index rank (score)	9 (58.5)

**Figure 7. Belgium's position in the eight EIDES pillars**



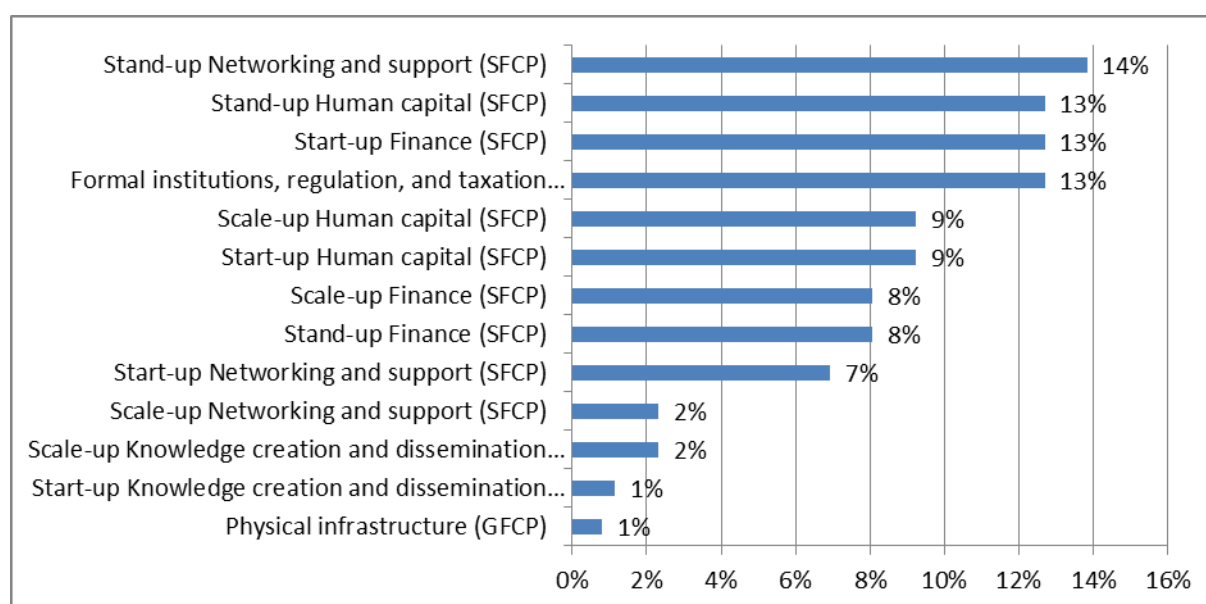
Weakest pillar  
Strongest pillar

Formal Institutions, Regulation, and Taxation (51.4)  
Market Conditions (69.3)

**Table 11. Belgium's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	63.4	85.6	75.6
	Formal Institutions, Regulation, and Taxation	51.4	74.2	74.5
	Market Conditions	69.3	83.9	78.4
	Physical Infrastructure	55.3	78.2	71.3
<b>Systemic Framework Conditions</b>	Human Capital	53.6	78.3	70.7
	Knowledge Creation and Dissemination	61.7	88.3	70.9
	Finance	54.2	79.9	70.1
	Networking and Support	56.0	81.2	69.6
<b>EIDES SCORE</b>		<b>57.6</b>	<b>81.2</b>	<b>72.6</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	57.5		
	Digital Entrepreneurship Start-up	57.0		
	Digital Entrepreneurship Scale-up	58.5		

**Table 12. Belgium's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



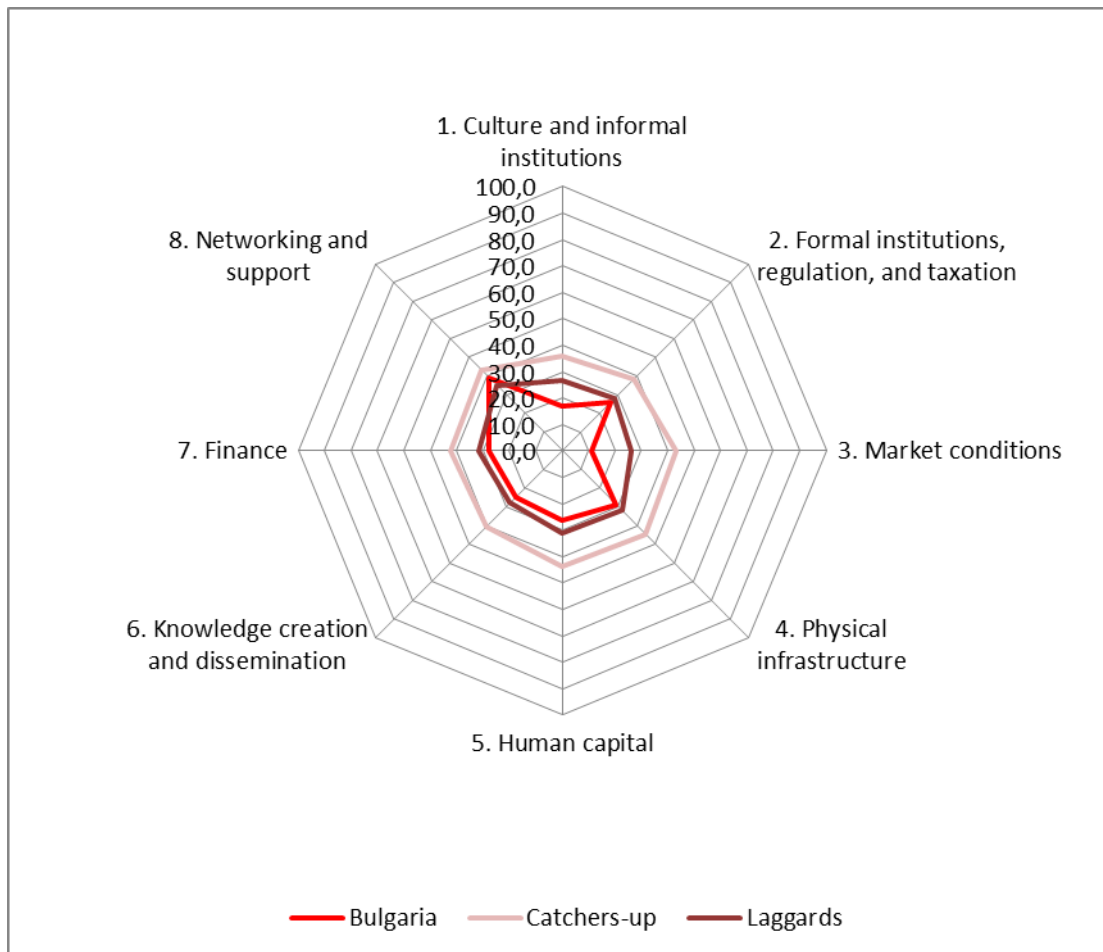
Sum of additional resources for 10% EIDES score increase (in unit per population)

86.7

### 6.2.3 Bulgaria

Size of population 2012-2016 (in Millions)	7.2
Per capita GDP in Euro 2014-2016 average (PPP)	5 767
Country group	Laggards
EIDES rank (score)	27 (23.9)
Digital Entrepreneurship Stand-up sub-index rank (score)	27 (22.8)
Digital Entrepreneurship Start-up sub-index rank (score)	27 (25.6)
Digital Entrepreneurship Scale-up sub-index rank (score)	27 (23.2)

**Figure 8. Bulgaria's position in the eight EIDES pillars**



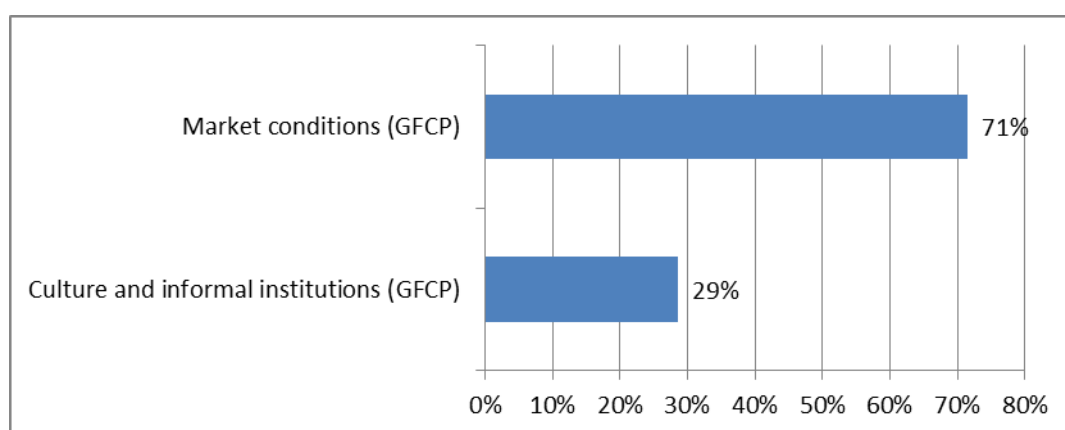
Weakest pillar  
Strongest pillar

Market Conditions (11.2)  
Networking and Support (39.3)

**Table 13. Bulgaria's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	17.0	57.9	30.4
	Formal Institutions, Regulation, and Taxation	25.9	70.0	40.0
	Market Conditions	11.1	60.6	36.2
	Physical Infrastructure	28.8	56.1	57.0
<b>Systemic Framework Conditions</b>	Human Capital	26.3	63.7	44.0
	Knowledge Creation and Dissemination	25.0	57.7	46.8
	Finance	27.6	66.7	43.7
	Networking and Support	39.3	66.8	59.8
<b>EIDES SCORE</b>		<b>23.9</b>	<b>62.4</b>	<b>44.8</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	22.8		
	Digital Entrepreneurship Start-up	25.6		
	Digital Entrepreneurship Scale-up	23.2		

**Table 14. Bulgaria's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

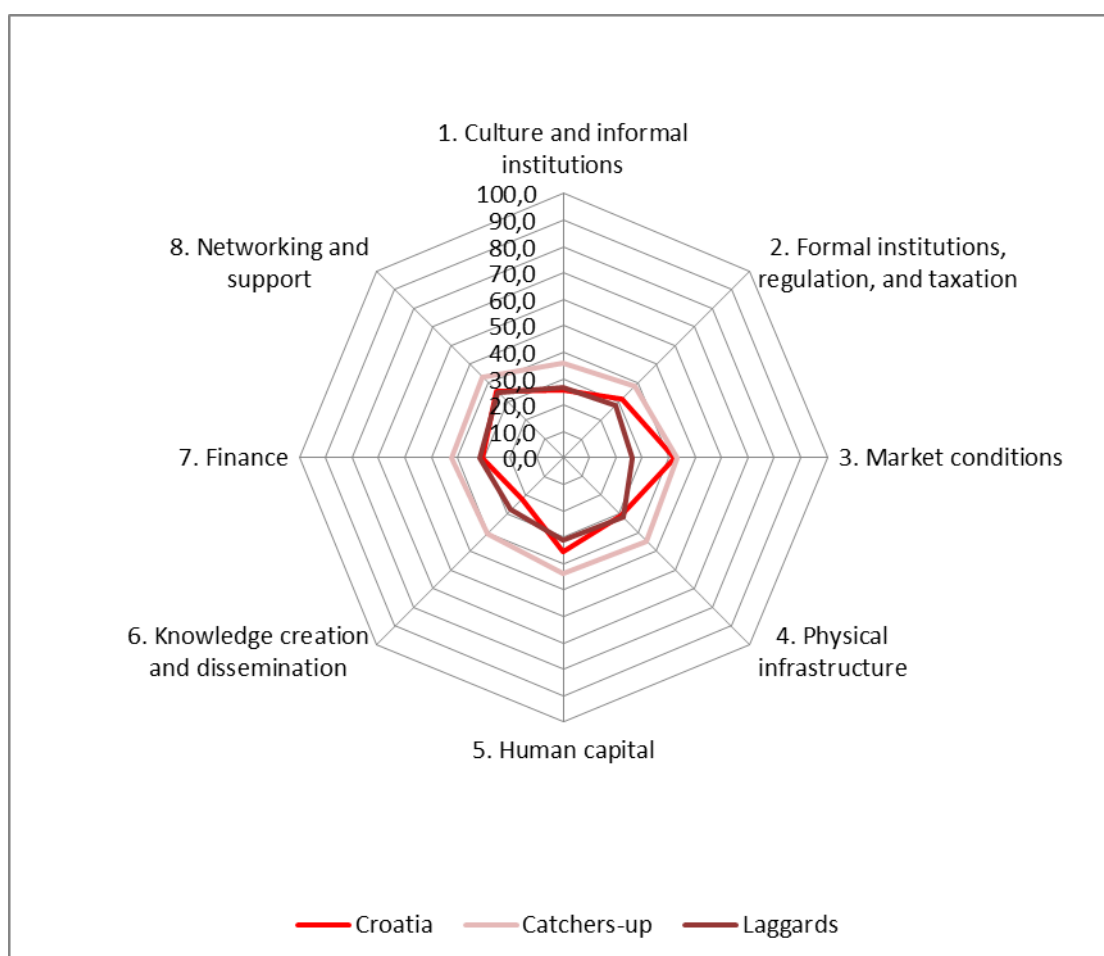


Sum of additional resources for 10% EIDES score increase (in unit per population) 14.0

### 6.2.4 Croatia

Size of population 2012-2016 (in Millions)	4.2
Per capita GDP in Euro 2014-2016 average (PPP)	10 633
Country group	Laggards
EIDES rank (score)	23 (30.6)
Digital Entrepreneurship Stand-up sub-index rank (score)	23 (29.5)
Digital Entrepreneurship Start-up sub-index rank (score)	22 (33.2)
Digital Entrepreneurship Scale-up sub-index rank (score)	25 (29.9)

**Figure 9. Croatia's position in the eight EIDES pillars**



Weakest pillar  
Strongest pillar

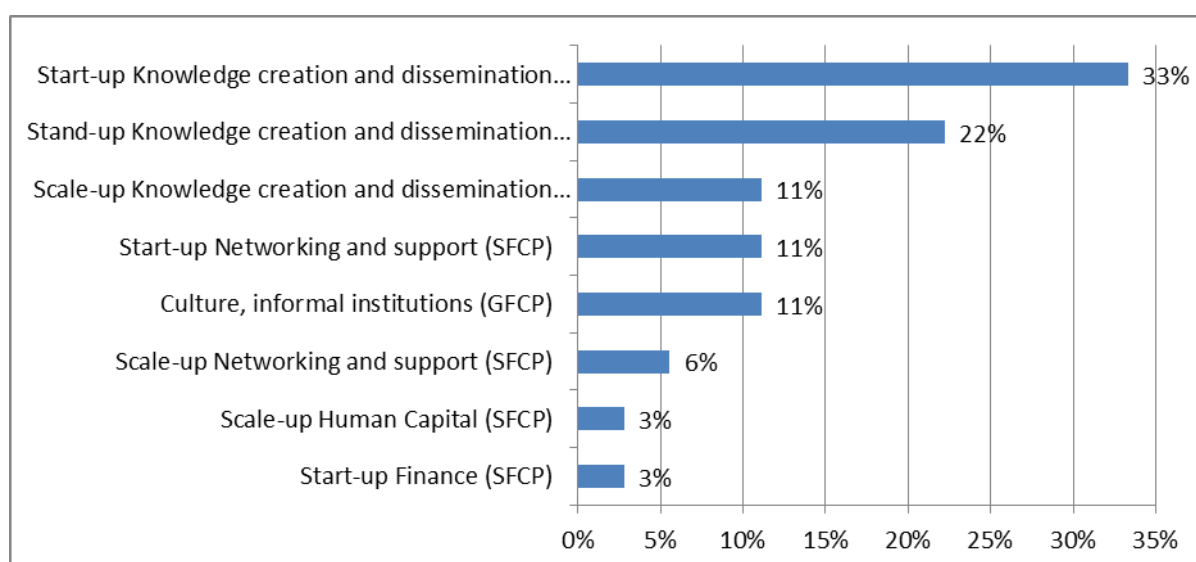
Knowledge Creation and Dissemination (21.8)  
Market Conditions (42.0)



**Table 15. Croatia's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	25.7	60.0	50.0
	Formal Institutions, Regulation, and Taxation	31.6	67.2	52.7
	Market Conditions	42.0	57.6	69.2
	Physical Infrastructure	30.8	67.9	52.6
<b>Systemic Framework Conditions</b>	Human Capital	35.7	61.3	59.6
	Knowledge Creation and Dissemination	21.8	51.8	47.1
	Finance	30.6	62.1	52.7
	Networking and Support	35.6	62.2	58.1
<b>EIDES SCORE</b>		<b>30.6</b>	<b>61.3</b>	<b>55.2</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	29.5		
	Digital Entrepreneurship Start-up	32.3		
	Digital Entrepreneurship Scale-up	29.9		

**Table 16. Croatia's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



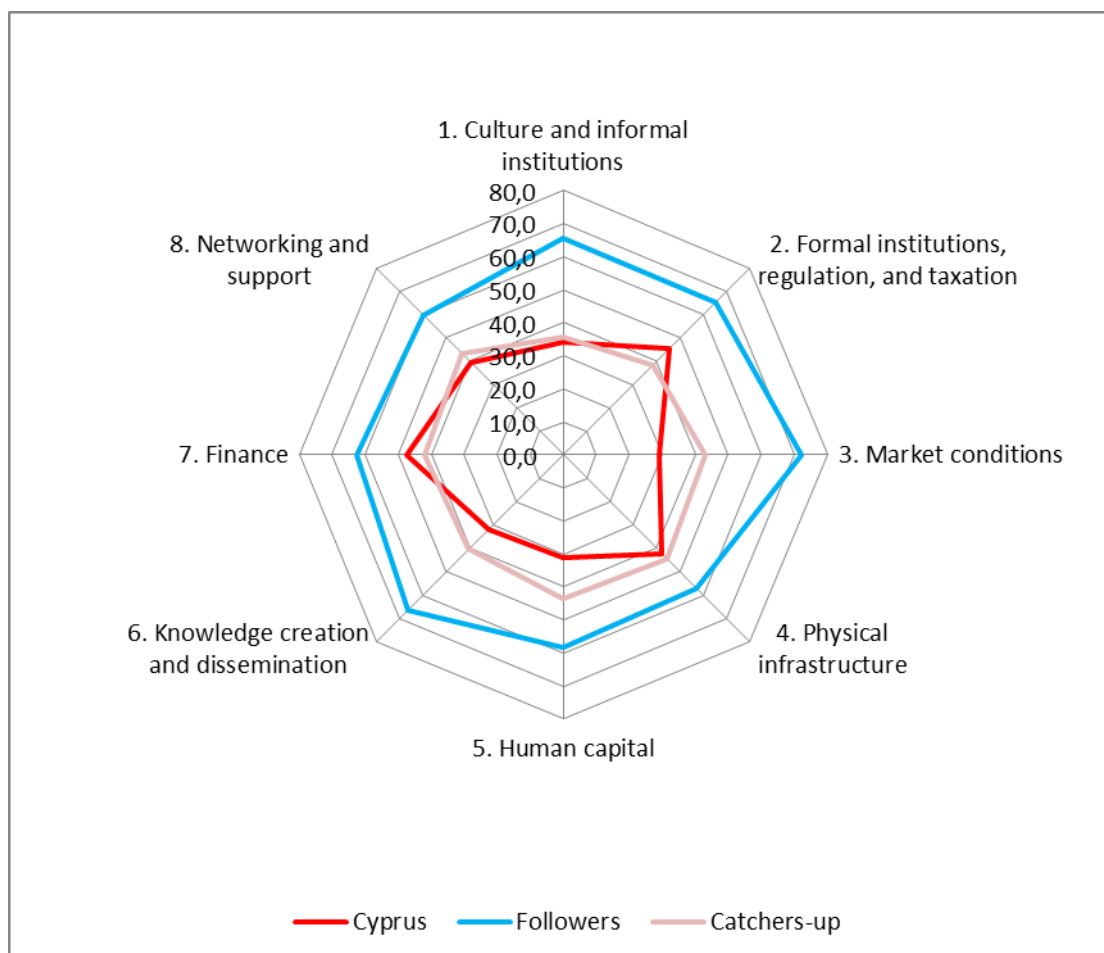
Sum of additional resources for 10% EIDES score increase (in unit per population)

36.0

### 6.2.5 Cyprus

Size of population 2012-2016 (in Millions)	0.85
Per capita GDP in Euro 2014-2016 average (PPP)	20 933
Country group	Catchers-up
EIDES rank (score)	19 (36.3)
Digital Entrepreneurship Stand-up sub-index rank (score)	18 (36.7)
Digital Entrepreneurship Start-up sub-index rank (score)	19 (38.3)
Digital Entrepreneurship Scale-up sub-index rank (score)	20 (34.0)

**Figure 10. Cyprus's position in the eight EIDES pillars**



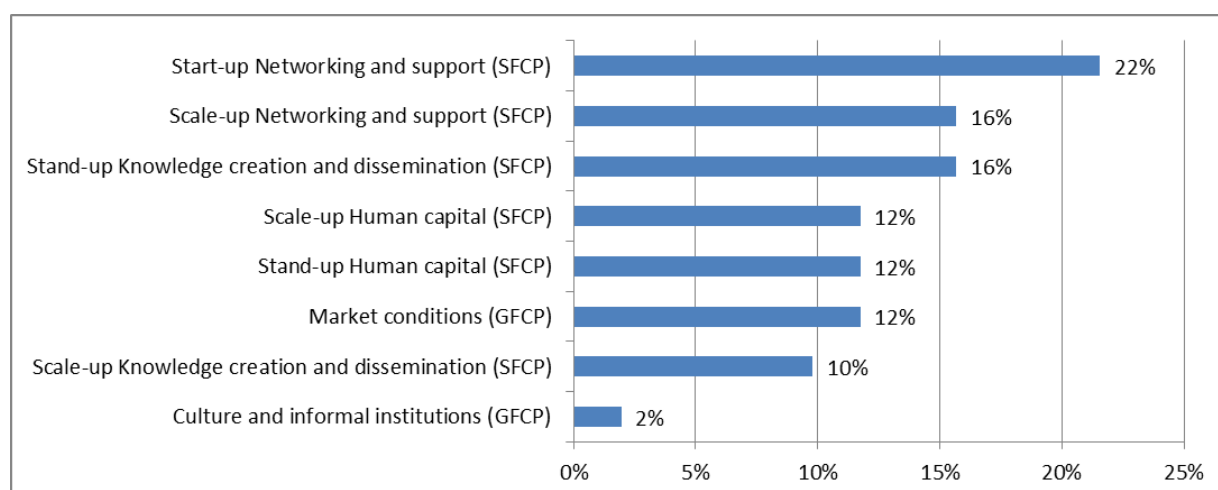
Weakest pillar  
Strongest pillar

Market Conditions (29.1)  
Formal Institutions, Regulation, and Taxation (45.4)

**Table 17. Cyprus's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	34.1	68.3	54.4
	Formal Institutions, Regulation, and Taxation	45.4	84.8	52.7
	Market Conditions	29.1	62.1	56.8
	Physical Infrastructure	42.5	73.4	62.2
<b>Systemic Framework Conditions</b>	Human Capital	31.2	71.2	46.7
	Knowledge Creation and Dissemination	31.7	65.0	51.4
	Finance	47.5	78.6	63.3
	Networking and Support	39.4	76.2	51.4
<b>EIDES SCORE</b>		<b>36.3</b>	<b>72.5</b>	<b>54.9</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	36.7		
	Digital Entrepreneurship Start-up	38.3		
	Digital Entrepreneurship Scale-up	34.0		

**Table 18. Cyprus's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



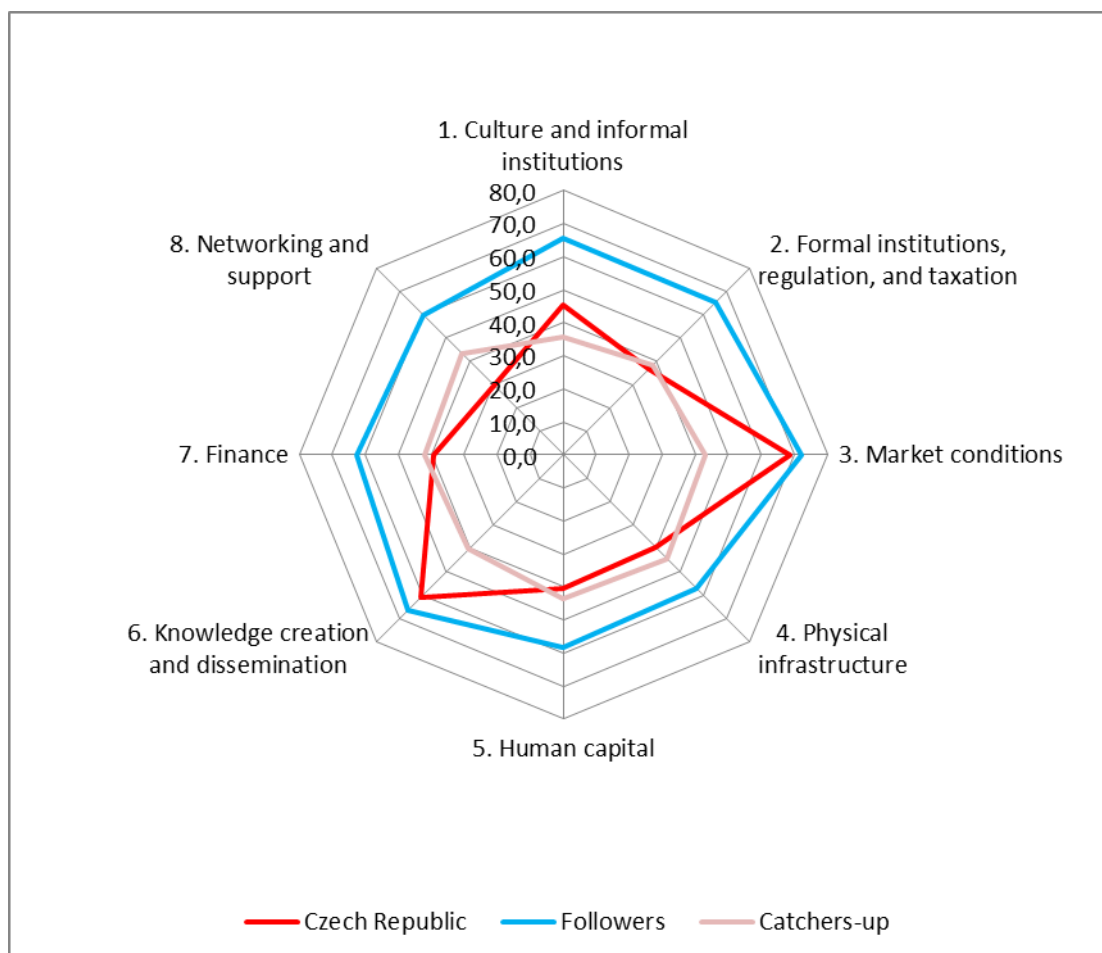
Sum of additional resources for 10% EIDES score increase (in unit per population)

51.0

## 6.2.6 Czech Republic

Size of population 2012-2016 (in Millions)	10.25
Per capita GDP in Euro 2014-2016 average (PPP)	16 033
Country group	Catchers-up
EIDES rank (score)	15 (42.3)
Digital Entrepreneurship Stand-up sub-index rank (score)	15 (41.9)
Digital Entrepreneurship Start-up sub-index rank (score)	15 (41.9)
Digital Entrepreneurship Scale-up sub-index rank (score)	14 (43.2)

**Figure 11. Czech Republic's position in the eight EIDES pillars**



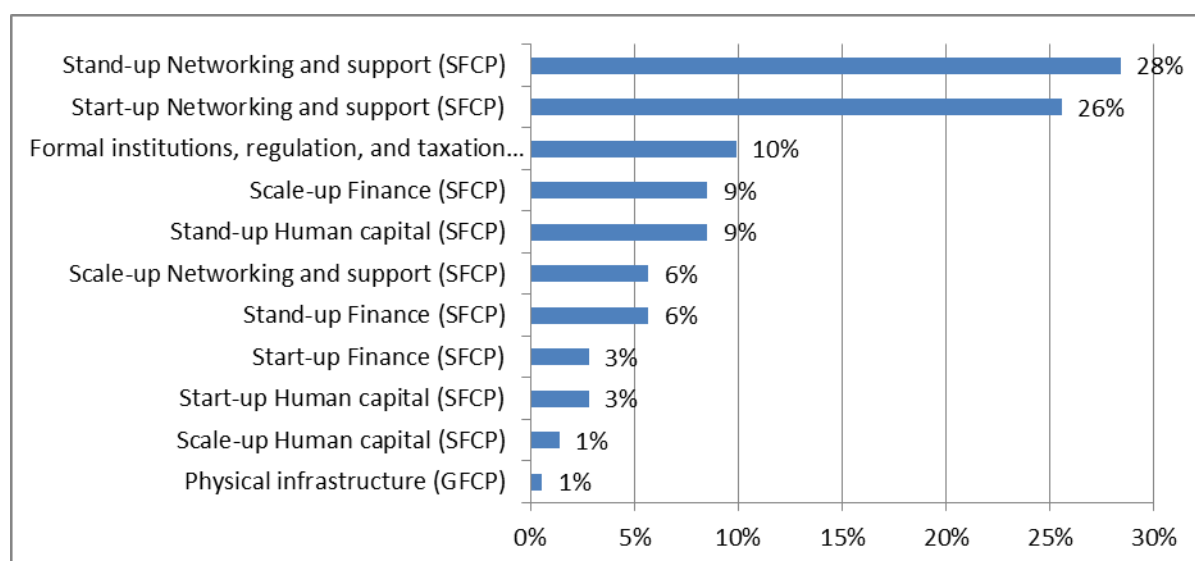
Weakest pillar  
Strongest pillar

Networking and Support (29.5)  
Market Conditions (68.9)

**Table 19. Czech Republic's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	45.5	73.4	68.5
	Formal Institutions, Regulation, and Taxation	36.8	68.2	60.2
	Market Conditions	68.9	90.6	76.4
	Physical Infrastructure	39.8	66.8	63.3
<b>Systemic Framework Conditions</b>	Human Capital	40.6	74.2	57.6
	Knowledge Creation and Dissemination	61.1	74.9	90.1
	Finance	39.3	65.9	62.3
	Networking and Support	29.5	57.9	59.0
<b>EIDES SCORE</b>		<b>42.3</b>	<b>71.5</b>	<b>67.2</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	41.9		
	Digital Entrepreneurship Start-up	41.9		
	Digital Entrepreneurship Scale-up	43.2		

**Table 20. Czech Republic's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



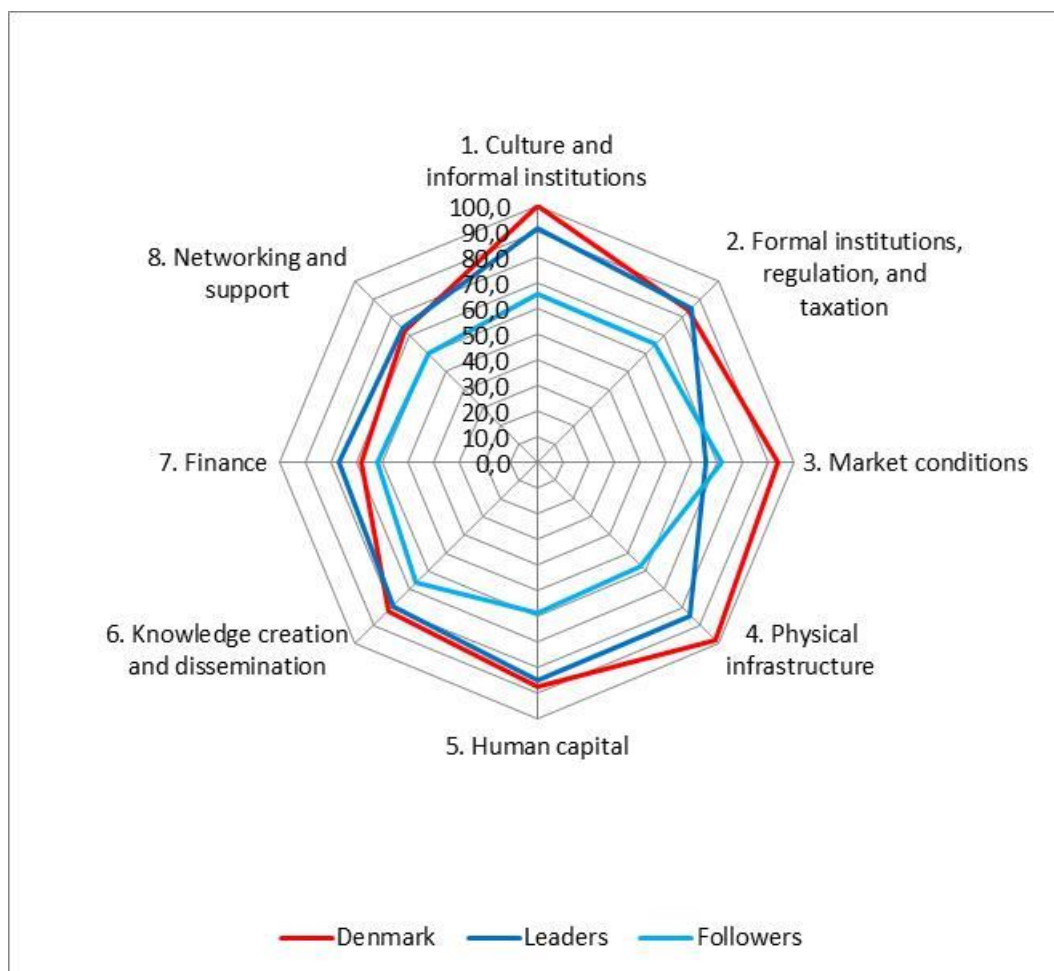
Sum of additional resources for 10% EIDES score increase (in unit per population)

41.1

### 6.2.7 Denmark

Size of population 2012-2016 (in Millions)	5.66
Per capita GDP in Euro 2014-2016 average (PPP)	45 333
Country group	Leaders
EIDES rank (score)	1 (80.7)
Digital Entrepreneurship Stand-up sub-index rank (score)	1 (84.0)
Digital Entrepreneurship Start-up sub-index rank (score)	1 (77.1)
Digital Entrepreneurship Scale-up sub-index rank (score)	1 (80.9)

**Figure 12. Denmark's position in the eight EIDES pillars**



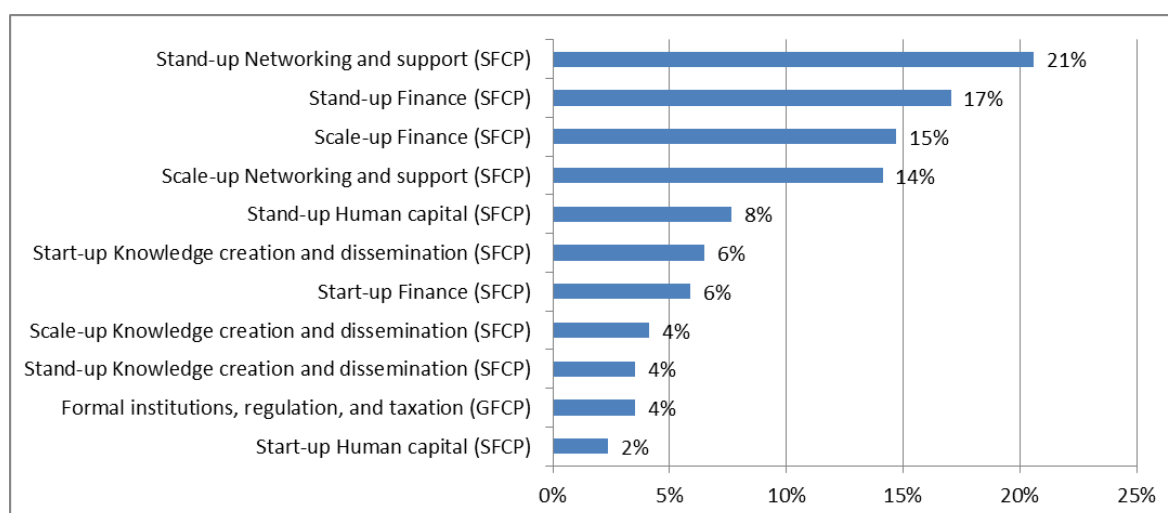
Weakest pillar  
Strongest pillar

Finance (68.2)  
Culture and Informal Institutions (100.0)

**Table 21. Denmark's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	100.0	99.6	100.0
	Formal Institutions, Regulation, and Taxation	83.9	84.7	100.0
	Market Conditions	93.7	78.1	92.4
	Physical Infrastructure	98.1	85.6	99.0
<b>Systemic Framework Conditions</b>	Human Capital	87.4	94.2	94.6
	Knowledge Creation and Dissemination	81.9	90.8	95.9
	Finance	68.2	85.6	81.2
	Networking and Support	72.5	91.4	76.3
<b>EIDES SCORE</b>		<b>80.7</b>	<b>88.8</b>	<b>92.4</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	84.0		
	Digital Entrepreneurship Start-up	77.1		
	Digital Entrepreneurship Scale-up	80.9		

**Table 22. Denmark's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

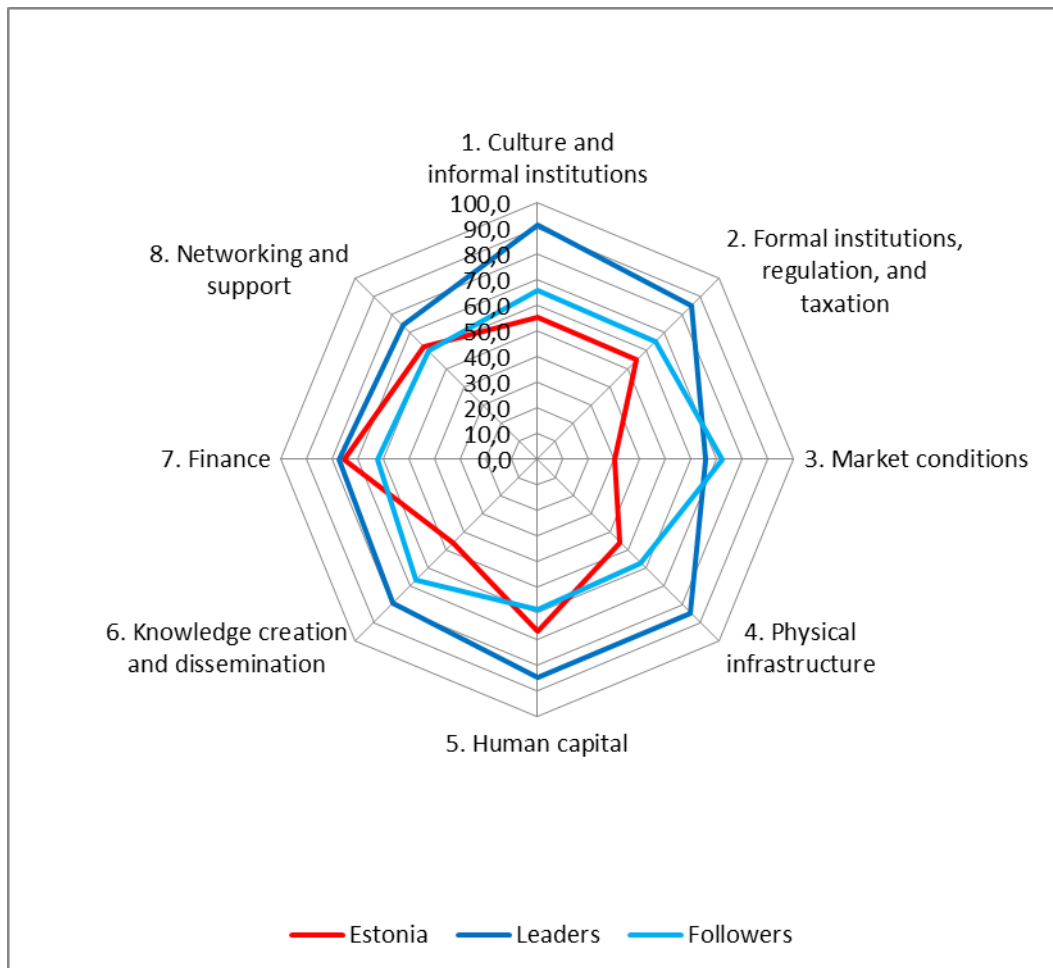


Sum of additional resources for 10% EIDES score increase (in unit per population) 96.0

### 6.2.8 Estonia

Size of population 2012-2016 (in Millions)	1.32
Per capita GDP in Euro 2014-2016 average (PPP)	13 433
Country group	Followers
EIDES rank (score)	12 (50.0)
Digital Entrepreneurship Stand-up sub-index rank (score)	12 (52.7)
Digital Entrepreneurship Start-up sub-index rank (score)	12 (51.5)
Digital Entrepreneurship Scale-up sub-index rank (score)	13 (48.7)

**Figure 13. Estonia's position in the eight EIDES pillars**



Weakest pillar  
Strongest pillar

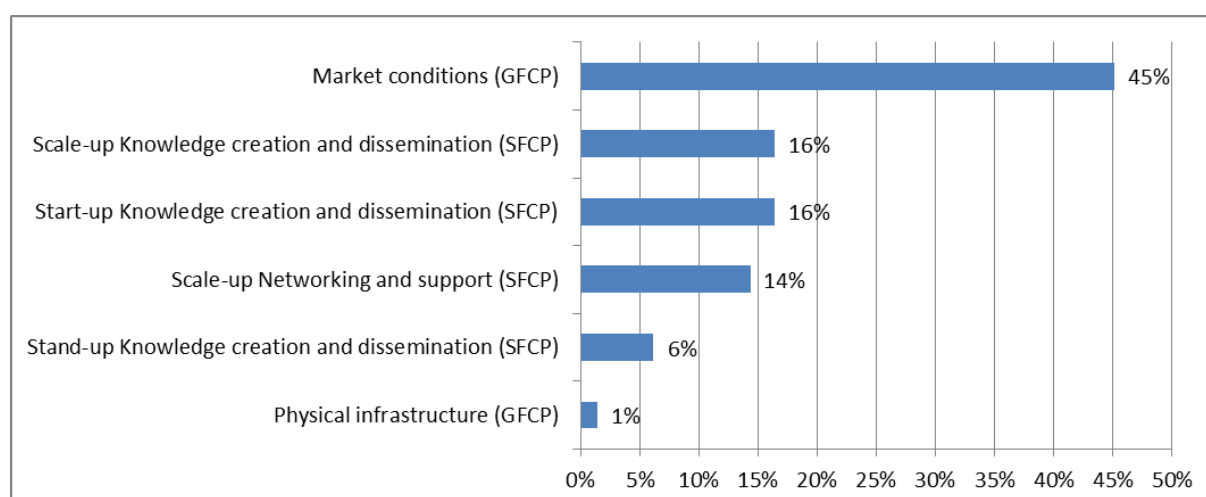
Market Conditions (30.0)  
Finance (75.1)



**Table 23. Estonia's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	55.2	80.1	73.1
	Formal Institutions, Regulation, and Taxation	54.7	83.2	66.0
	Market Conditions	30.0	60.9	57.9
	Physical Infrastructure	45.8	77.4	63.2
<b>Systemic Framework Conditions</b>	Human Capital	66.9	77.4	87.0
	Knowledge Creation and Dissemination	46.3	74.9	64.6
	Finance	75.1	76.5	98.0
	Networking and Support	62.3	87.8	71.2
<b>EIDES SCORE</b>		<b>51.0</b>	<b>77.3</b>	<b>72.6</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	52.7		
	Digital Entrepreneurship Start-up	51.5		
	Digital Entrepreneurship Scale-up	48.7		

**Table 24. Estonia's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



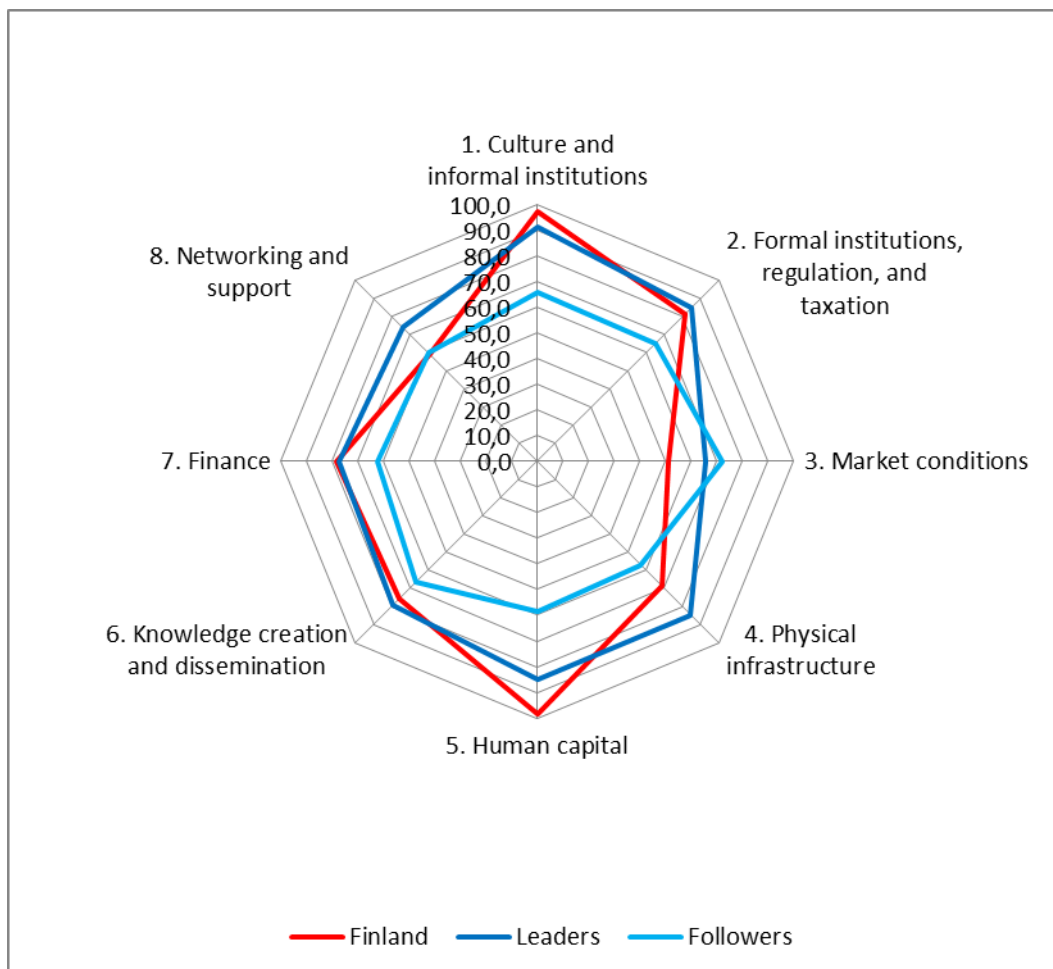
Sum of additional resources for 10% EIDES score increase (in unit per population)

25.1

### 6.2.9 Finland

Size of population 2012-2016 (in Millions)	5.47
Per capita GDP in Euro 2014-2016 average (PPP)	34 333
Country group	Leaders
EIDES rank (score)	4 (72.4)
Digital Entrepreneurship Stand-up sub-index rank (score)	3 (73.8)
Digital Entrepreneurship Start-up sub-index rank (score)	4 (71.3)
Digital Entrepreneurship Scale-up sub-index rank (score)	4 (72.0)

**Figure 14. Finland's position in the eight EIDES pillars**



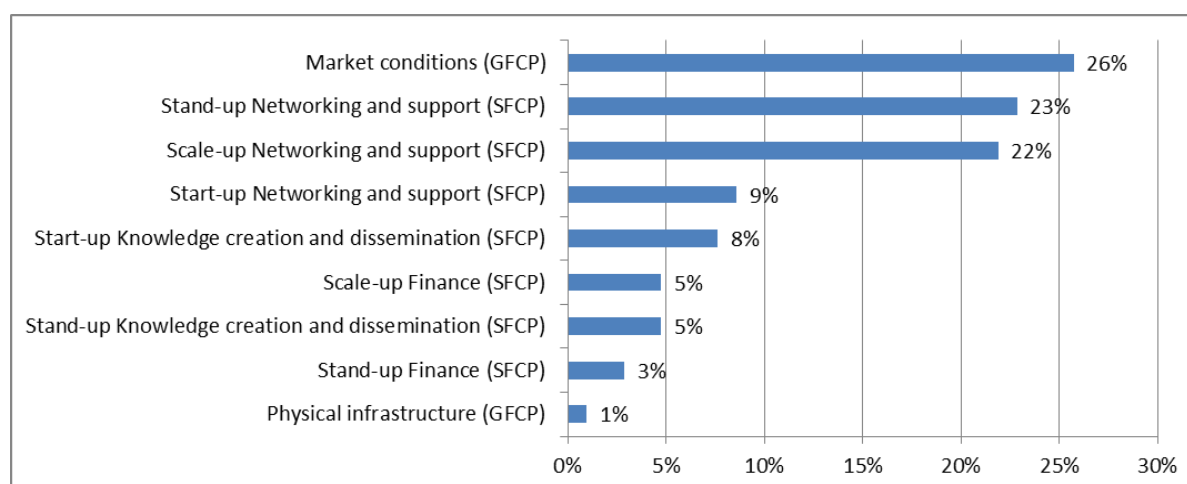
Weakest pillar  
Strongest pillar

Market Conditions (51.1)  
Human Capital (98.4)

**Table 25. Finland's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	97.3	100.0	95.4
	Formal Institutions, Regulation, and Taxation	81.4	93.7	82.4
	Market Conditions	51.1	59.9	75.0
	Physical Infrastructure	68.7	86.1	77.5
<b>Systemic Framework Conditions</b>	Human Capital	98.4	100.0	100.0
	Knowledge Creation and Dissemination	75.9	96.2	80.2
	Finance	78.3	88.0	90.2
	Networking and Support	59.2	89.7	65.1
<b>EIDES SCORE</b>		<b>72.4</b>	<b>89.2</b>	<b>83.2</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	73.8		
	Digital Entrepreneurship Start-up	71.3		
	Digital Entrepreneurship Scale-up	72.0		

**Table 26. Finland's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



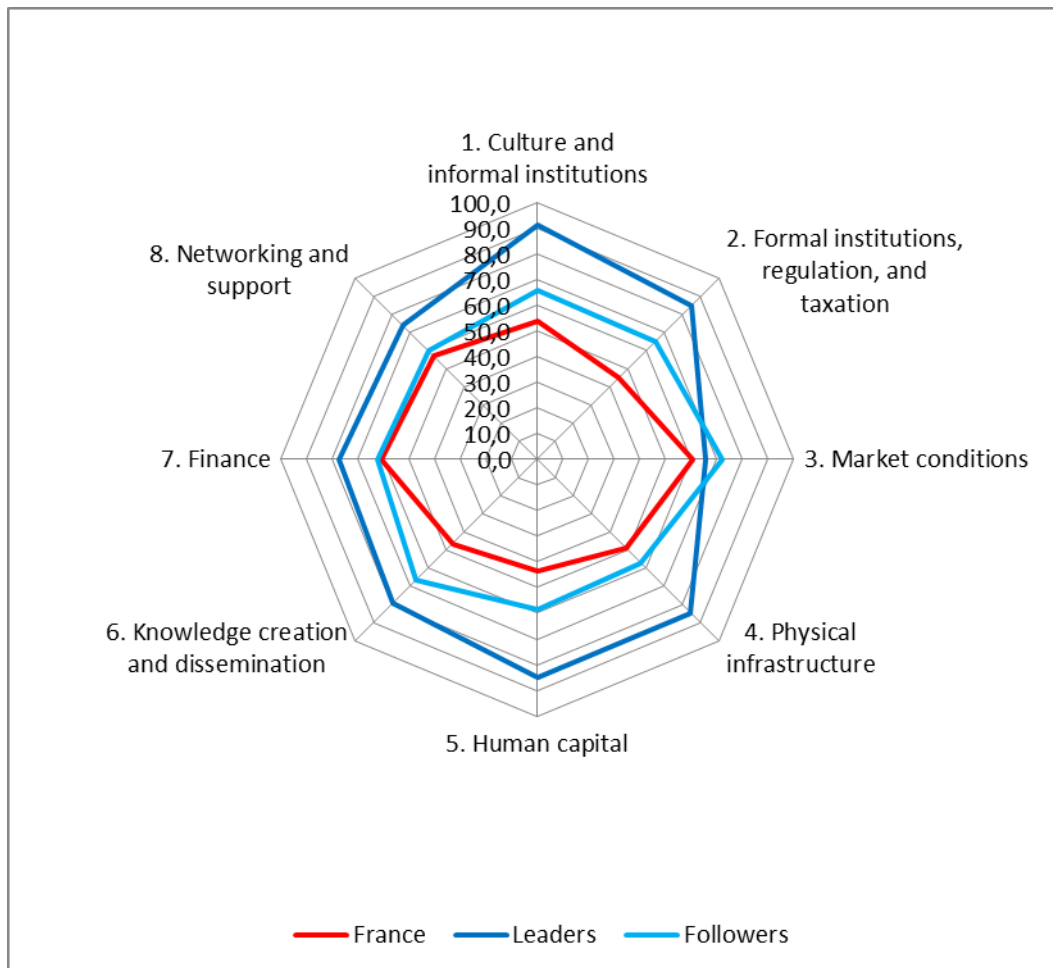
Sum of additional resources for 10% EIDES score increase (in unit per population)

61.3

### 6.2.10 France

Size of population 2012-2016 (in Millions)	66.38
Per capita GDP in Euro 2014-2016 average (PPP)	31 500
Country group	Followers
EIDES rank (score)	13 (49.6)
Digital Entrepreneurship Stand-up sub-index rank (score)	13 (49.7)
Digital Entrepreneurship Start-up sub-index rank (score)	13 (47.7)
Digital Entrepreneurship Scale-up sub-index rank (score)	12 (51.4)

**Figure 15. France's position in the eight EIDES pillars**



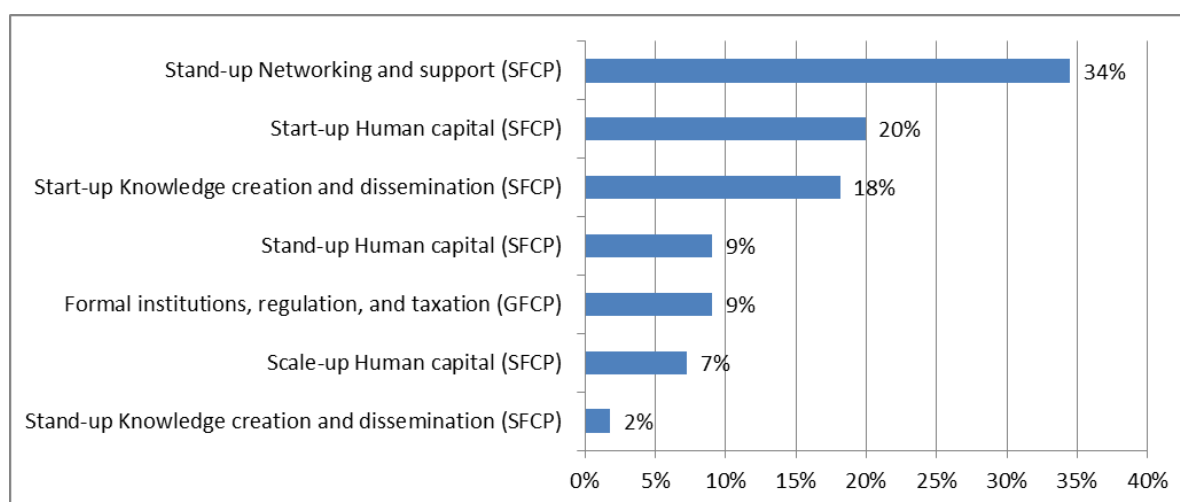
Weakest pillar  
Strongest pillar

Human Capital (43.7)  
Finance (60.8)

**Table 27. France's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	53.9	81.4	68.1
	Formal Institutions, Regulation, and Taxation	44.9	71.7	68.3
	Market Conditions	60.8	72.9	76.9
	Physical Infrastructure	49.0	94.5	58.0
<b>Systemic Framework Conditions</b>	Human Capital	43.7	78.0	59.2
	Knowledge Creation and Dissemination	46.4	80.6	57.7
	Finance	60.8	85.5	73.6
	Networking and Support	56.8	76.7	76.4
<b>EIDES SCORE</b>		<b>49.6</b>	<b>80.2</b>	<b>67.3</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	49.7		
	Digital Entrepreneurship Start-up	47.7		
	Digital Entrepreneurship Scale-up	51.4		

**Table 28. France's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



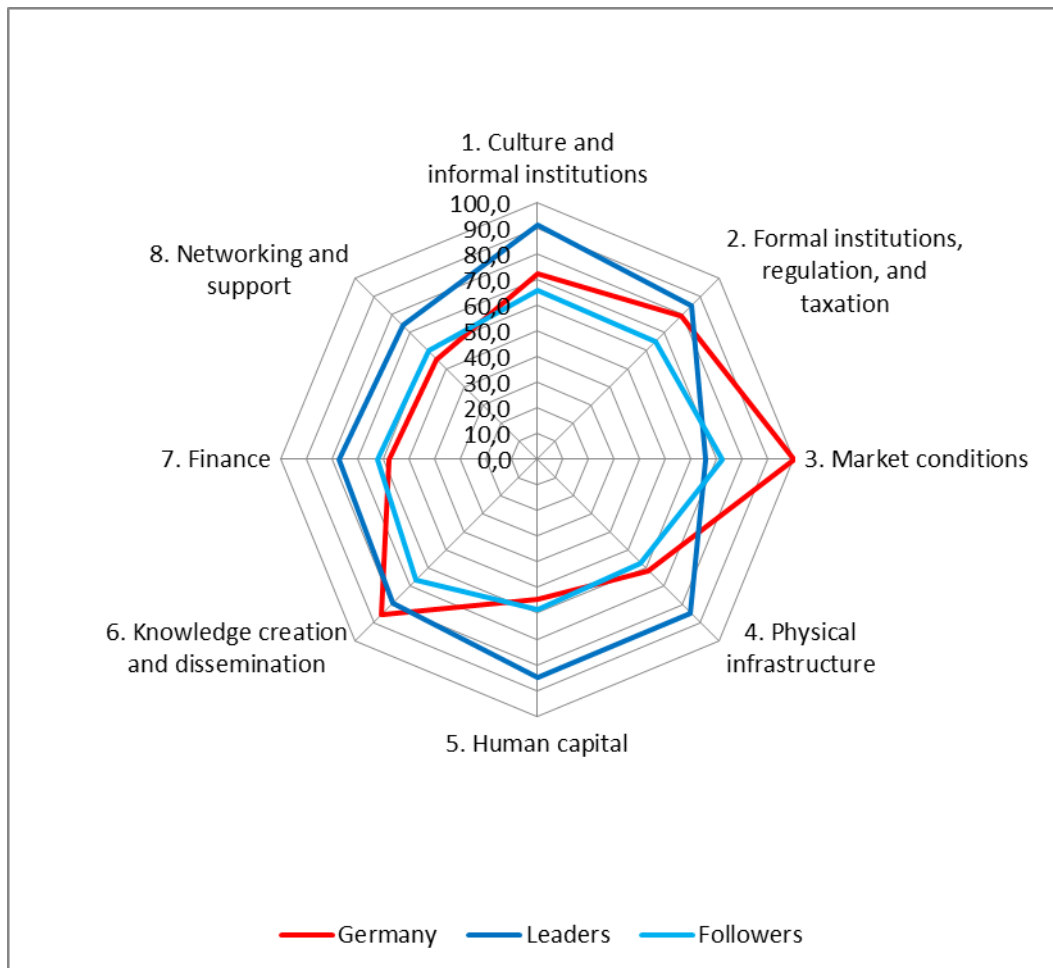
Sum of additional resources for 10% EIDES score increase (in unit per population)

55.1

### 6.2.11 Germany

Size of population 2012-2016 (in Millions)	81.4
Per capita GDP in Euro 2014-2016 average (PPP)	34 333
Country group	Followers
EIDES rank (score)	5 (63.8)
Digital Entrepreneurship Stand-up sub-index rank (score)	6 (64.6)
Digital Entrepreneurship Start-up sub-index rank (score)	6 (61.7)
Digital Entrepreneurship Scale-up sub-index rank (score)	6 (65.1)

**Figure 16. Germany's position in the eight EIDES pillars**



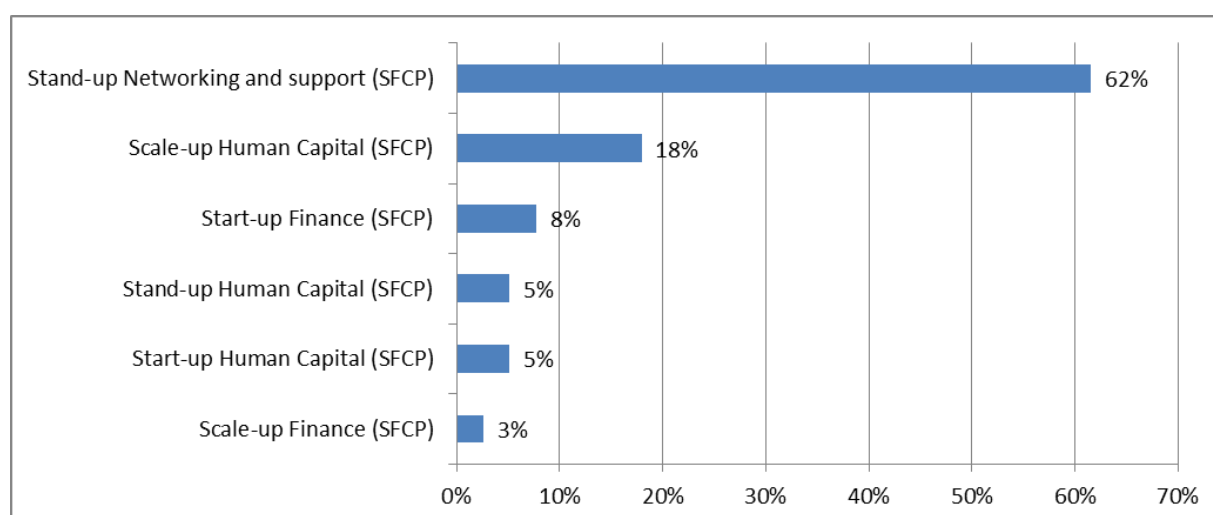
Weakest pillar  
Strongest pillar

Human Capital (54.4)  
Market Conditions (100.0)

**Table 29. Germany's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	72.2	86.9	87.6
	Formal Institutions, Regulation, and Taxation	79.2	92.0	82.4
	Market Conditions	100.0	100.0	88.6
	Physical Infrastructure	61.3	90.6	69.4
<b>Systemic Framework Conditions</b>	Human Capital	54.4	79.6	70.6
	Knowledge Creation and Dissemination	85.6	98.9	89.2
	Finance	57.7	86.6	69.1
	Networking and Support	55.2	78.1	73.1
<b>EIDES SCORE</b>		<b>63.8</b>	<b>89.1</b>	<b>78.8</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	64.6		
	Digital Entrepreneurship Start-up	61.7		
	Digital Entrepreneurship Scale-up	65.1		

**Table 30. Germany's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

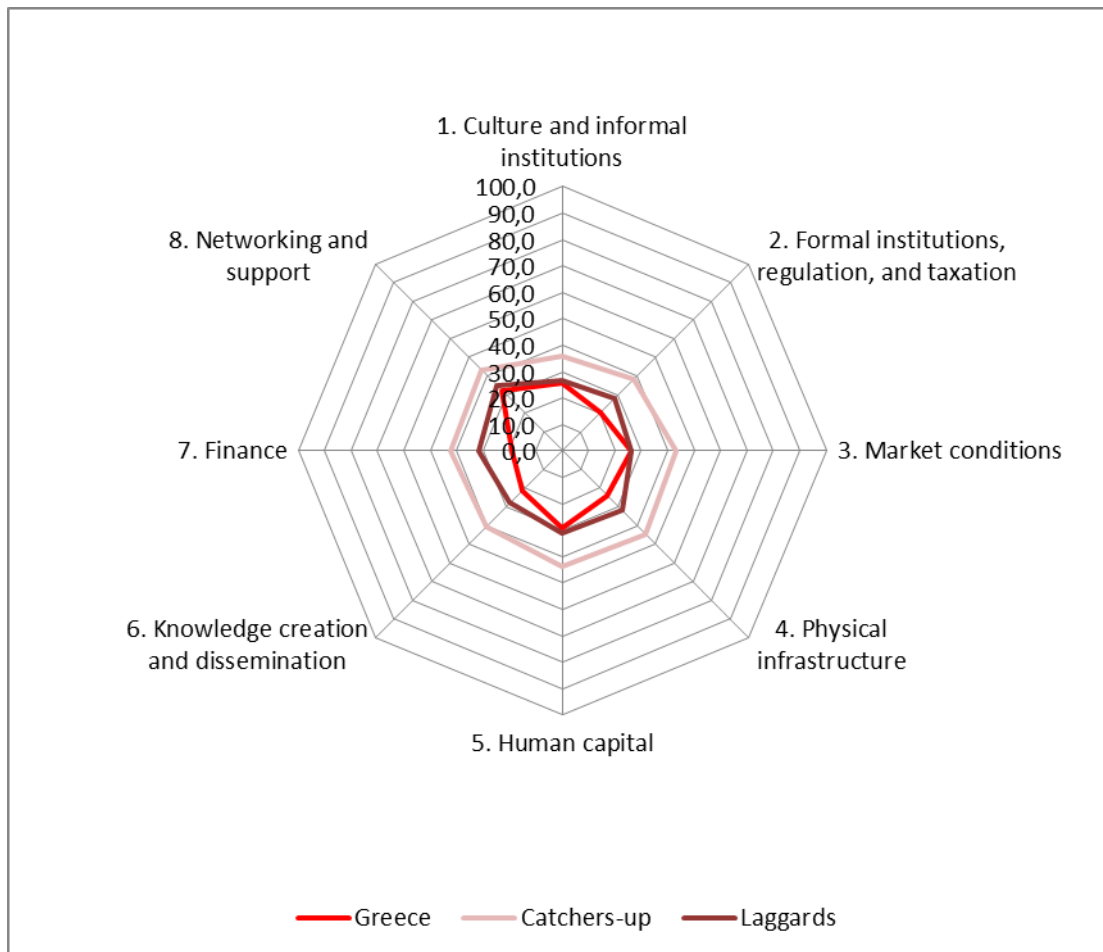


Sum of additional resources for 10% EIDES score increase (in unit per population) 39.0

### 6.2.12 Greece

Size of population 2012-2016 (in Millions)	10.9
Per capita GDP in Euro 2014-2016 average (PPP)	17 067
Country group	Laggards
EIDES rank (score)	26 (24.3)
Digital Entrepreneurship Stand-up sub-index rank (score)	26 (22.9)
Digital Entrepreneurship Start-up sub-index rank (score)	26 (26.4)
Digital Entrepreneurship Scale-up sub-index rank (score)	26 (23.5)

**Figure 17. Greece's position in the eight EIDES pillars**



Weakest pillar  
Strongest pillar

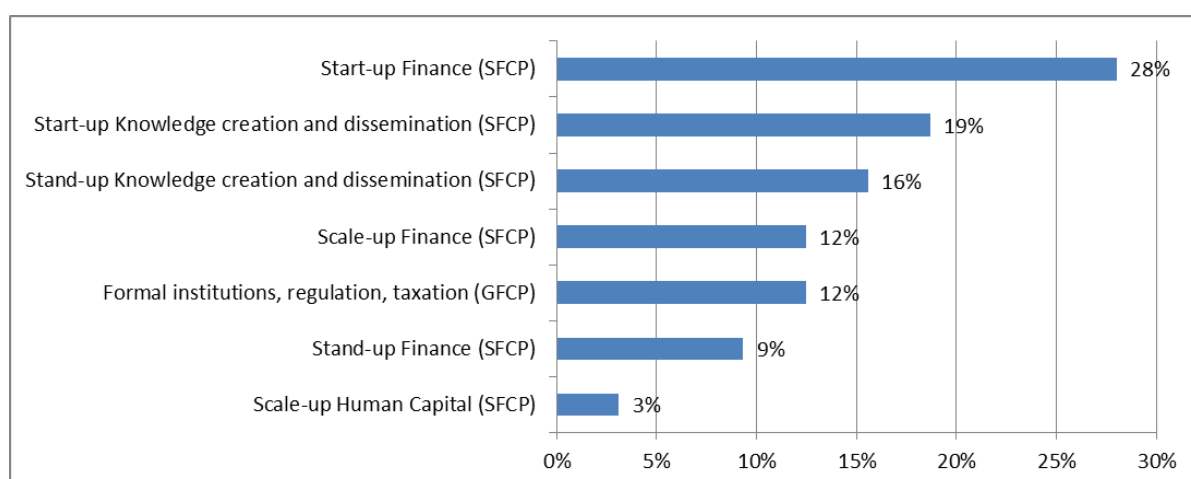
Finance (19.2)  
Networking and Support (32.8)



**Table 31. Greece's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	25.7	64.0	42.8
	Formal Institutions, Regulation, and Taxation	20.3	53.8	47.7
	Market Conditions	26.4	83.5	49.7
	Physical Infrastructure	24.3	68.5	44.6
<b>Systemic Framework Conditions</b>	Human Capital	29.0	71.0	43.7
	Knowledge Creation and Dissemination	21.6	55.2	42.1
	Finance	19.2	58.0	35.8
	Networking and Support	32.4	65.0	50.7
<b>EIDES SCORE</b>		<b>24.3</b>	<b>64.9</b>	<b>44.6</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	22.9		
	Digital Entrepreneurship Start-up	26.4		
	Digital Entrepreneurship Scale-up	23.5		

**Table 32. Greece's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



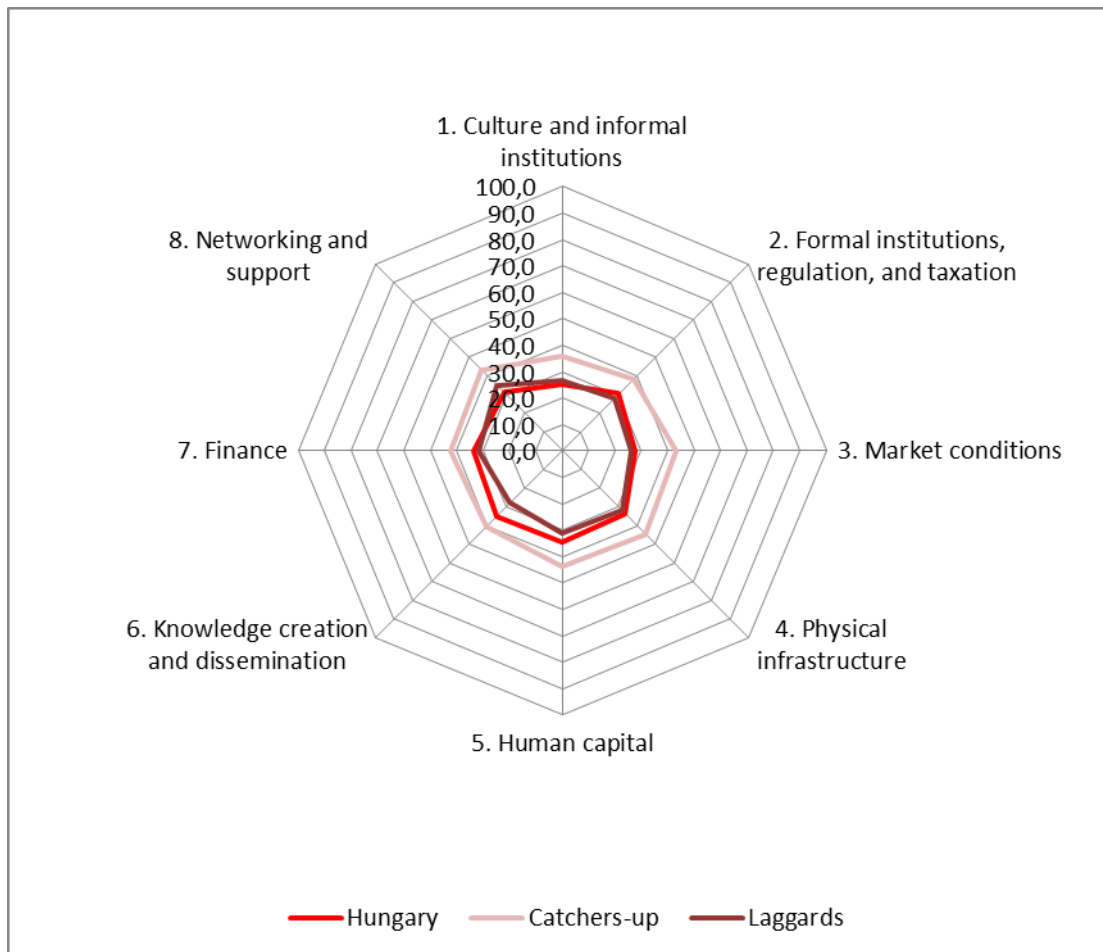
Sum of additional resources for 10% EIDES score increase (in unit per population)

32.1

### 6.2.13 Hungary

Size of population 2012-2016 (in Millions)	9.9
Per capita GDP in Euro 2014-2016 average (PPP)	11 000
Country group	Laggards
EIDES rank (score)	24 (20.1)
Digital Entrepreneurship Stand-up sub-index rank (score)	25 (27.4)
Digital Entrepreneurship Start-up sub-index rank (score)	23 (32.0)
Digital Entrepreneurship Scale-up sub-index rank (score)	23 (30.2)

**Figure 18. Hungary's position in the eight EIDES pillars**



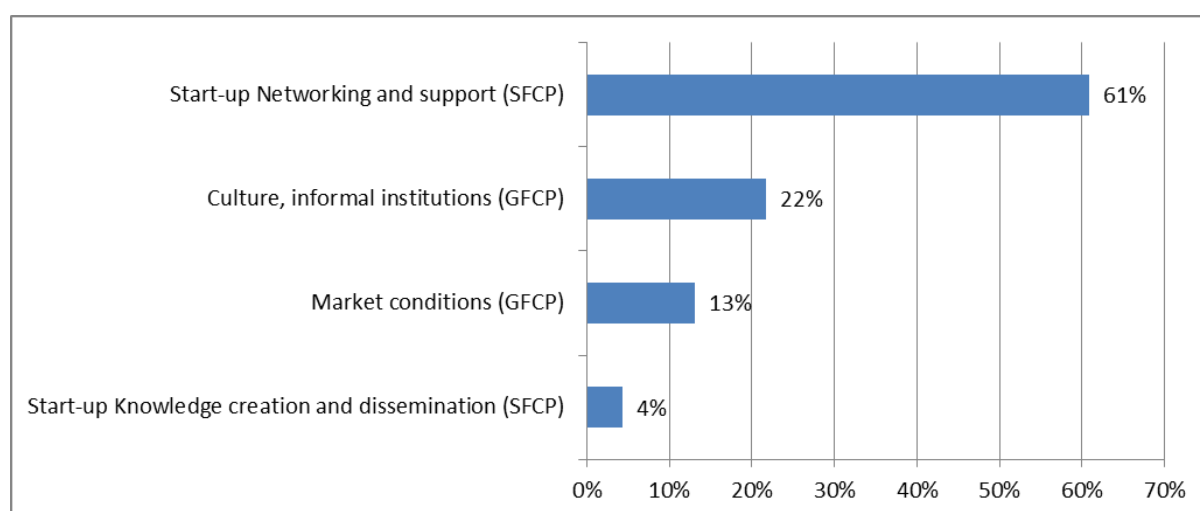
Weakest pillar  
Strongest pillar

Culture and Informal Institutions (25.0)  
Knowledge Creation and Dissemination (34.8)

**Table 33. Hungary's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	25.0	55.3	58.3
	Formal Institutions, Regulation, and Taxation	30.5	65.4	53.0
	Market Conditions	27.6	77.1	51.9
	Physical Infrastructure	33.6	63.5	58.4
<b>Systemic Framework Conditions</b>	Human Capital	34.5	59.6	59.9
	Knowledge Creation and Dissemination	34.8	61.4	62.7
	Finance	33.4	65.7	53.3
	Networking and Support	31.1	53.5	60.8
<b>EIDES SCORE</b>		<b>30.1</b>	<b>62.7</b>	<b>57.3</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	27.4		
	Digital Entrepreneurship Start-up	32.0		
	Digital Entrepreneurship Scale-up	30.9		

**Table 34. Hungary's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

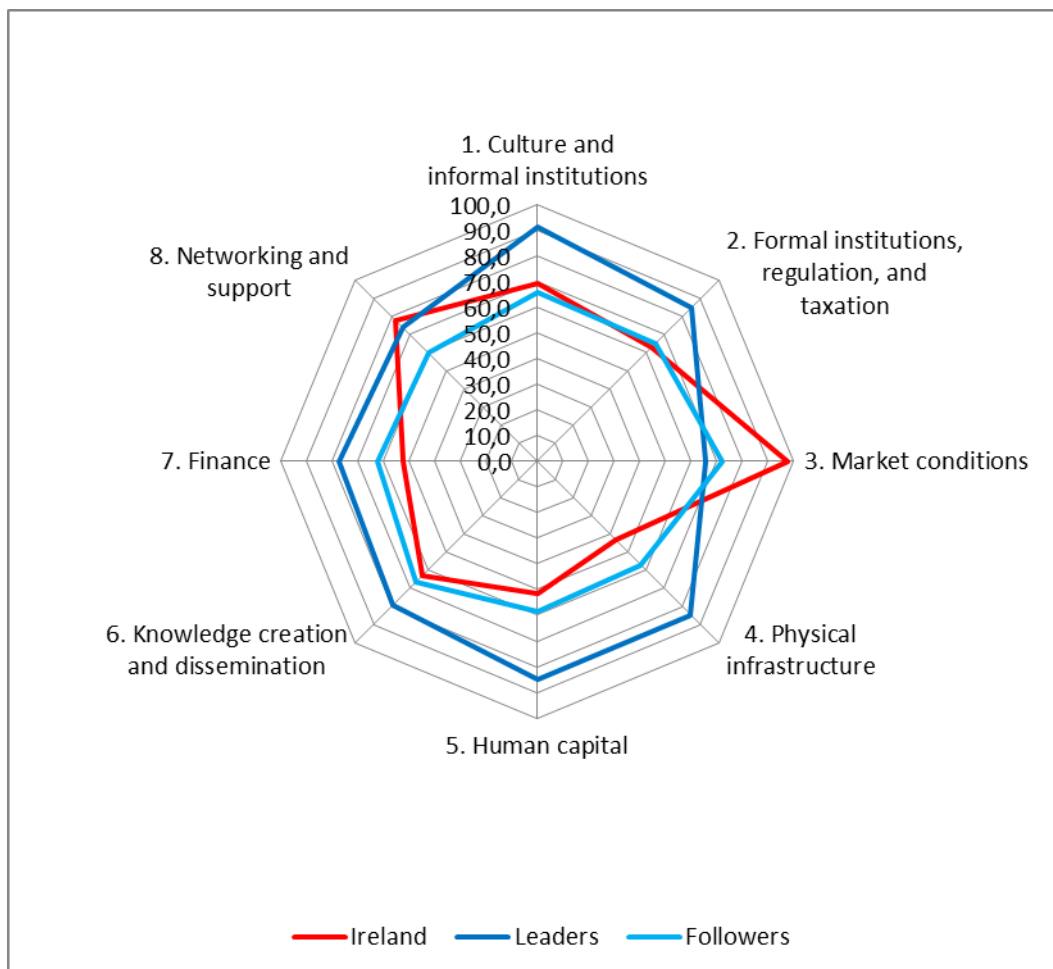


Sum of additional resources for 10% EIDES score increase (in unit per population) 23.0

### 6.2.14 Ireland

Size of population 2012-2016 (in Millions)	4.7
Per capita GDP in Euro 2014-2016 average (PPP)	48 733
Country group	Followers
EIDES rank (score)	8 (61.3)
Digital Entrepreneurship Stand-up sub-index rank (score)	8 (61.5)
Digital Entrepreneurship Start-up sub-index rank (score)	5 (62.7)
Digital Entrepreneurship Scale-up sub-index rank (score)	8 (59.7)

**Figure 19. Ireland's position in the eight EIDES pillars**



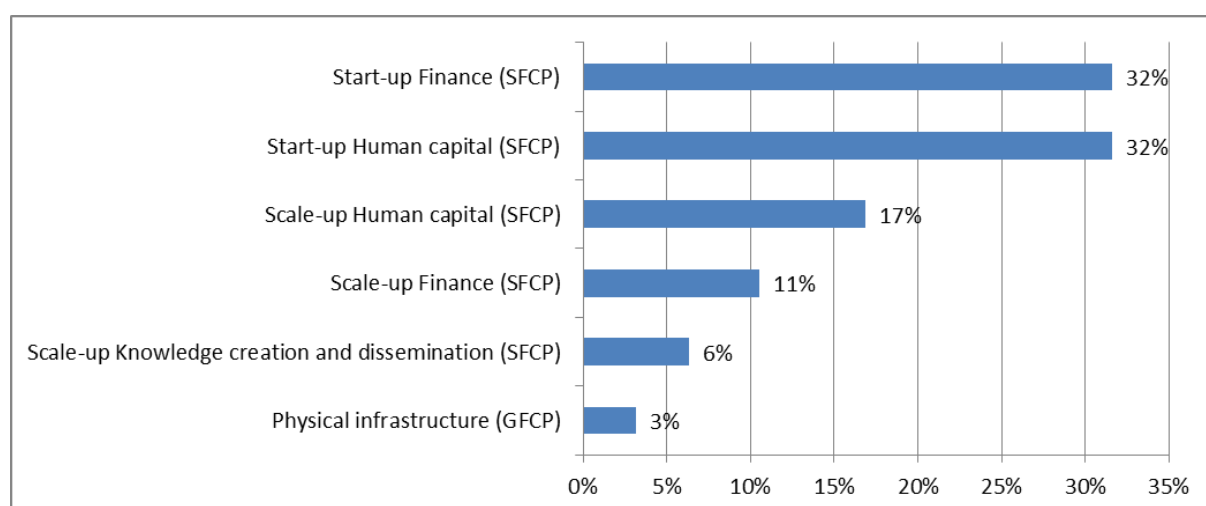
Weakest pillar  
Strongest pillar

Physical Infrastructure (43.1)  
Market Conditions (97.7)

**Table 35. Ireland's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	69.4	93.1	70.3
	Formal Institutions, Regulation, and Taxation	62.9	89.6	67.7
	Market Conditions	97.7	64.2	100.0
	Physical Infrastructure	43.1	71.2	64.1
<b>Systemic Framework Conditions</b>	Human Capital	51.3	83.9	64.4
	Knowledge Creation and Dissemination	63.0	88.9	72.1
	Finance	52.0	75.7	70.8
	Networking and Support	77.9	96.0	79.7
<b>EIDES SCORE</b>		<b>61.3</b>	<b>82.8</b>	<b>73.6</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	61.5		
	Digital Entrepreneurship Start-up	62.7		
	Digital Entrepreneurship Scale-up	59.7		

**Table 36. Ireland's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

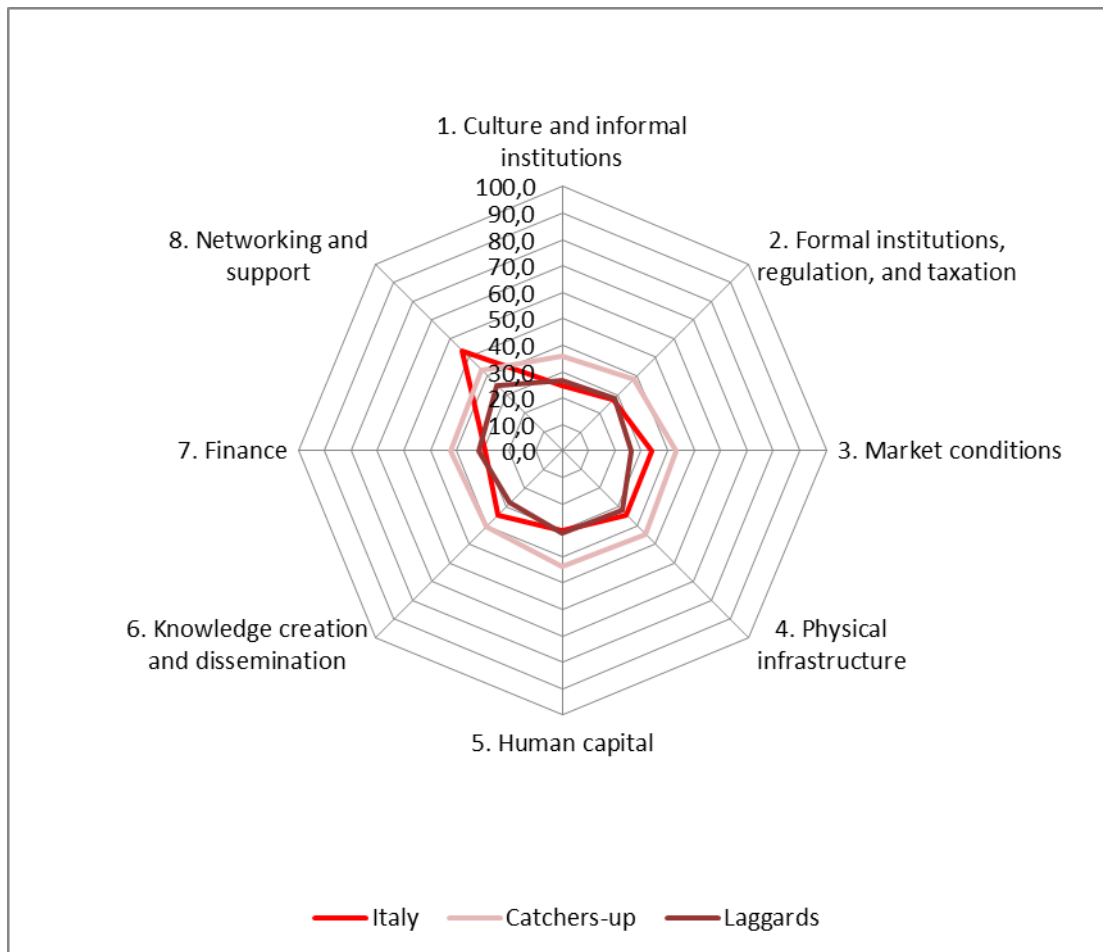


Sum of additional resources for 10% EIDES score increase (in unit per population) 47.5

### 6.2.15 Italy

Size of population 2012-2016 (in Millions)	60.8
Per capita GDP in Euro 2014-2016 average (PPP)	25 633
Country group	Laggards
EIDES rank (score)	22 (32.6)
Digital Entrepreneurship Stand-up sub-index rank (score)	21 (32.0)
Digital Entrepreneurship Start-up sub-index rank (score)	24 (31.8)
Digital Entrepreneurship Scale-up sub-index rank (score)	19 (34.0)

**Figure 20. Italy's position in the eight EIDES pillars**



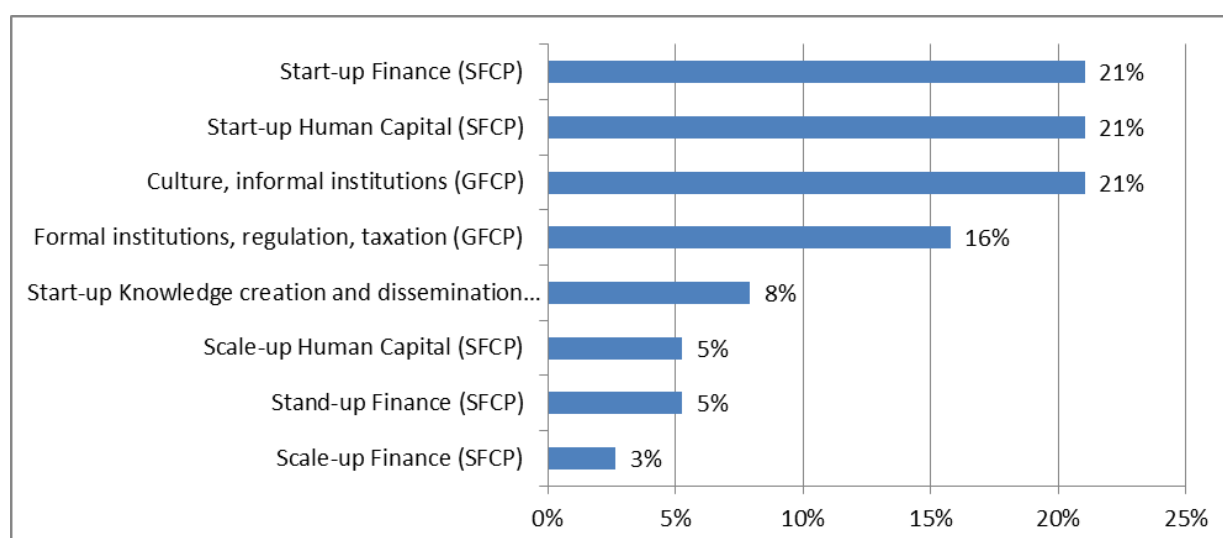
Weakest pillar  
Strongest pillar

Culture and Informal Institutions (24.7)  
Networking and Support (53.4)

**Table 37. Italy's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	24.7	57.8	51.4
	Formal Institutions, Regulation, and Taxation	27.5	57.0	59.3
	Market Conditions	33.7	85.6	55.4
	Physical Infrastructure	34.4	73.9	53.7
<b>Systemic Framework Conditions</b>	Human Capital	30.1	65.9	48.5
	Knowledge Creation and Dissemination	34.1	66.5	54.2
	Finance	29.2	66.6	46.7
	Networking and Support	53.4	79.6	68.4
<b>EIDES SCORE</b>		<b>32.6</b>	<b>69.1</b>	<b>54.7</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	32.0		
	Digital Entrepreneurship Start-up	31.8		
	Digital Entrepreneurship Scale-up	34.0		

**Table 38. Italy's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



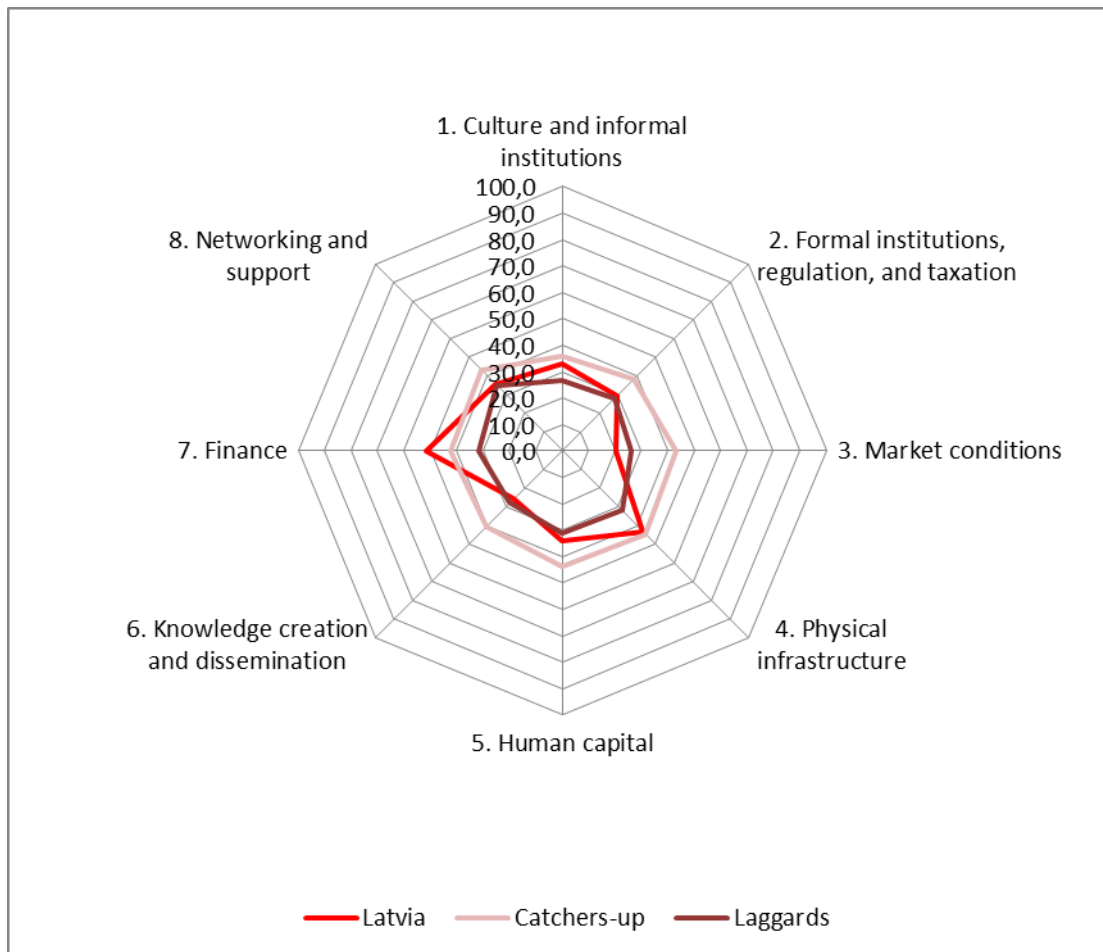
Sum of additional resources for 10% EIDES score increase (in unit per population)

38.0

### 6.2.16 Latvia

Size of population 2012-2016 (in Millions)	2.0
Per capita GDP in Euro 2014-2016 average (PPP)	10 667
Country group	Laggards
EIDES rank (score)	22 (32.6)
Digital Entrepreneurship Stand-up sub-index rank (score)	21 (32.0)
Digital Entrepreneurship Start-up sub-index rank (score)	24 (31.8)
Digital Entrepreneurship Scale-up sub-index rank (score)	19 (34.0)

**Figure 21. Latvia's position in the eight EIDES pillars**



Weakest pillar  
Strongest pillar

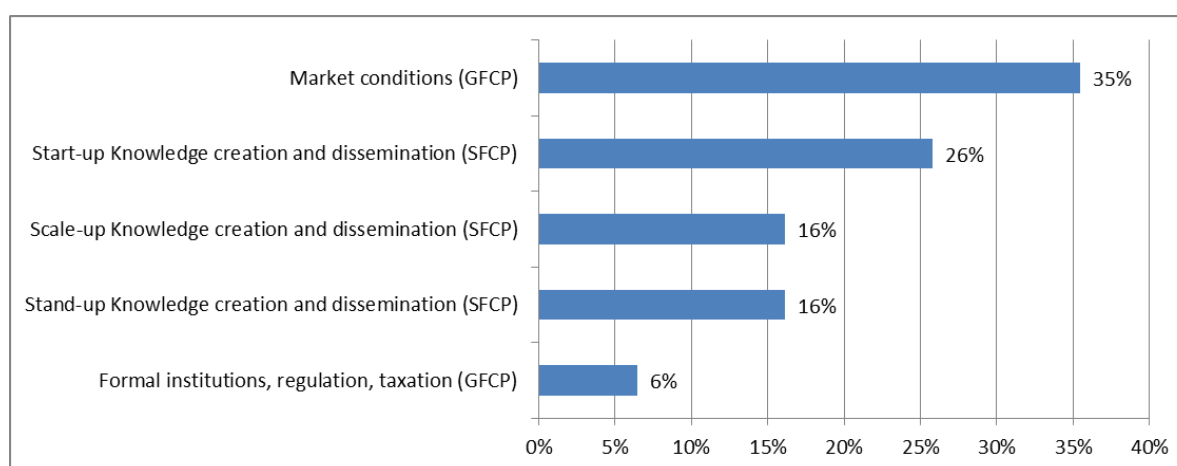
Market Conditions (20.6)  
Finance (50.3)



**Table 39. Latvia's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	32.9	67.1	53.9
	Formal Institutions, Regulation, and Taxation	29.6	66.4	50.2
	Market Conditions	20.6	60.9	48.5
	Physical Infrastructure	43.2	62.4	70.0
<b>Systemic Framework Conditions</b>	Human Capital	34.2	64.9	55.4
	Knowledge Creation and Dissemination	25.8	57.7	48.6
	Finance	51.3	64.5	80.9
	Networking and Support	35.7	62.1	60.9
<b>EIDES SCORE</b>		<b>32.9</b>	<b>63.2</b>	<b>58.5</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	32.7		
	Digital Entrepreneurship Start-up	32.8		
	Digital Entrepreneurship Scale-up	33.2		

**Table 40. Latvia's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

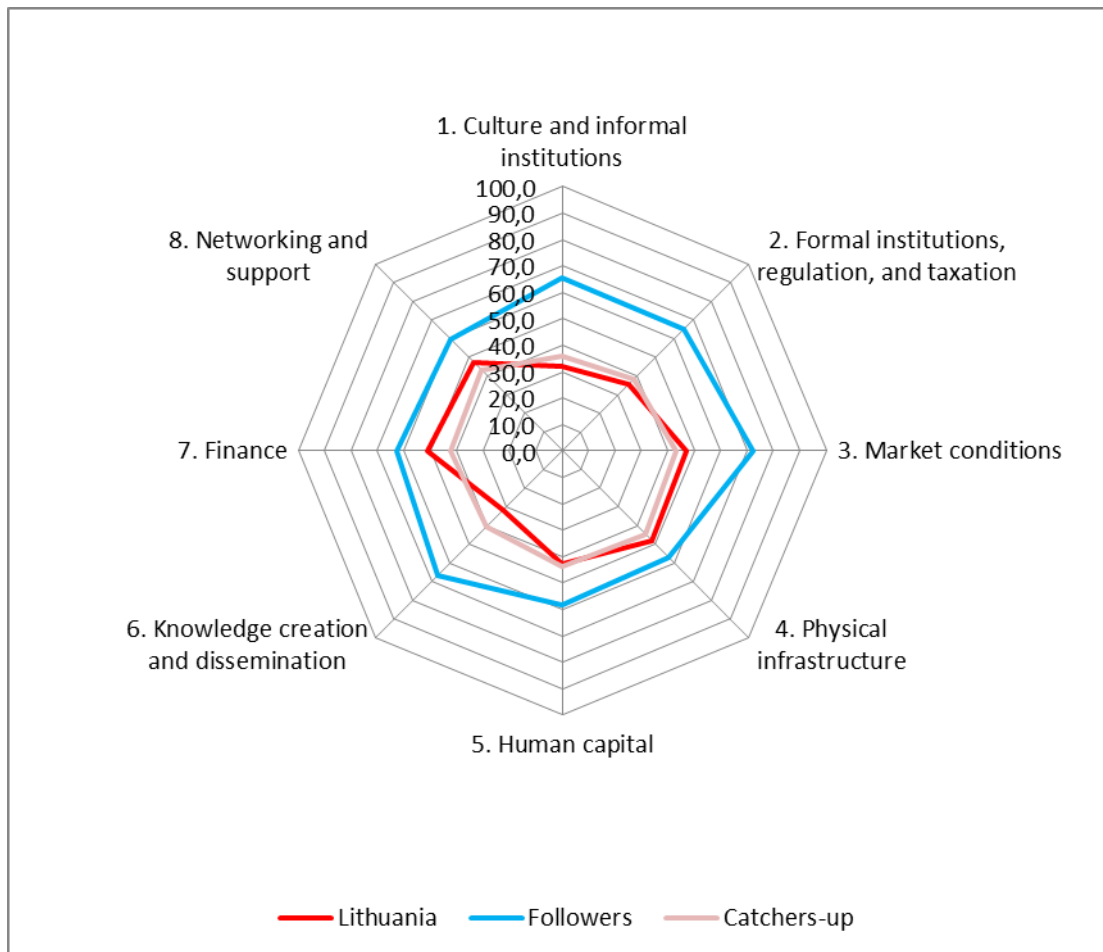


Sum of additional resources for 10% EIDES score increase (in unit per population) 31.0

### 6.2.17 Lithuania

Size of population 2012-2016 (in Millions)	2.9
Per capita GDP in Euro 2014-2016 average (PPP)	11 633
Country group	Catchers-up
EIDES rank (score)	16 (40.6)
Digital Entrepreneurship Stand-up sub-index rank (score)	16 (39.8)
Digital Entrepreneurship Start-up sub-index rank (score)	17 (41.6)
Digital Entrepreneurship Scale-up sub-index rank (score)	16 (40.3)

**Figure 22. Lithuania's position in the eight EIDES pillars**



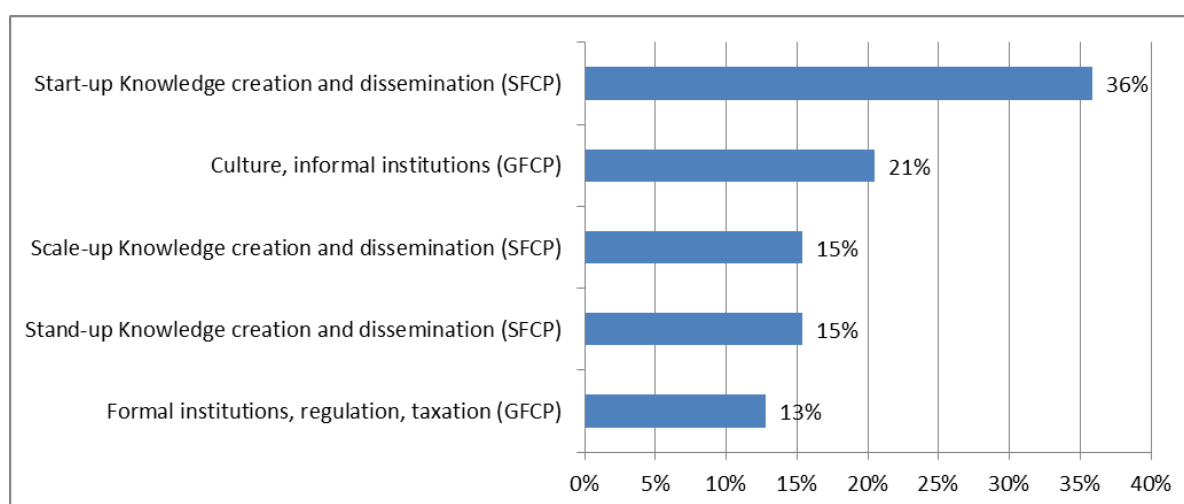
Weakest pillar  
Strongest pillar

Culture and Informal Institutions (32.1)  
Finance (51.1)

**Table 41. Lithuania's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	32.1	66.7	52.9
	Formal Institutions, Regulation, and Taxation	35.7	68.5	58.0
	Market Conditions	47.0	75.3	67.3
	Physical Infrastructure	48.2	69.5	70.2
<b>Systemic Framework Conditions</b>	Human Capital	42.9	70.8	62.8
	Knowledge Creation and Dissemination	31.6	65.4	50.7
	Finance	51.1	69.4	75.2
	Networking and Support	47.3	71.8	67.4
<b>EIDES SCORE</b>		<b>40.6</b>	<b>69.7</b>	<b>63.1</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	39.8		
	Digital Entrepreneurship Start-up	41.6		
	Digital Entrepreneurship Scale-up	40.3		

**Table 42. Lithuania's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

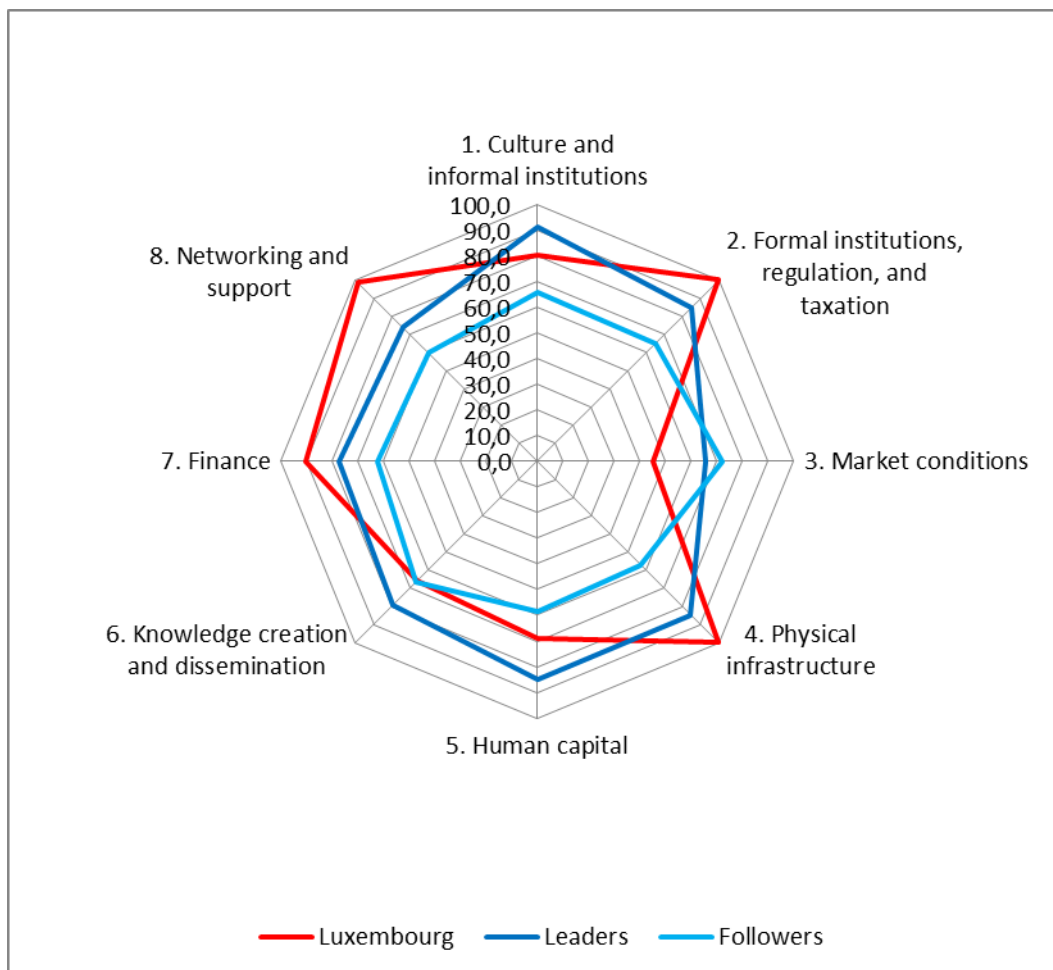


Sum of additional resources for 10% EIDES score increase (in unit per population) 39.0

### 6.2.18 Luxembourg

Size of population 2012-2016 (in Millions)	0.56
Per capita GDP in Euro 2014-2016 average (PPP)	81 200
Country group	Leaders
EIDES rank (score)	3 (74.0)
Digital Entrepreneurship Stand-up sub-index rank (score)	2 (75.9)
Digital Entrepreneurship Start-up sub-index rank (score)	3 (72.1)
Digital Entrepreneurship Scale-up sub-index rank (score)	3 (74.0)

**Figure 23. Luxembourg's position in the eight EIDES pillars**



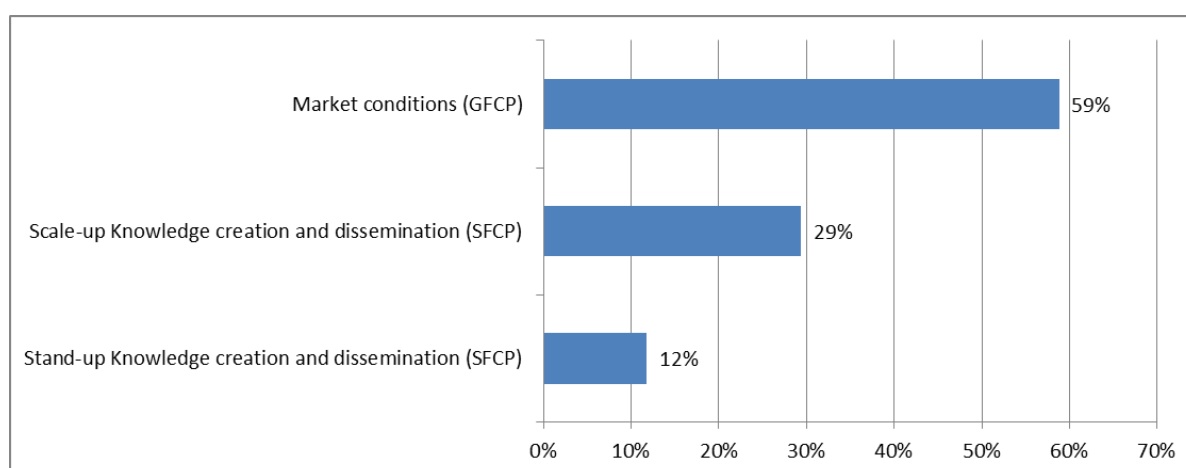
Weakest pillar  
Strongest pillar

Market Conditions (45.1)  
Formal Institutions, Regulation, and Taxation (100.0)

**Table 43. Luxembourg's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	80.4	89.8	94.3
	Formal Institutions, Regulation, and Taxation	100.0	100.0	91.8
	Market Conditions	45.1	70.4	67.4
	Physical Infrastructure	100.0	86.0	100.0
<b>Systemic Framework Conditions</b>	Human Capital	68.9	75.6	91.8
	Knowledge Creation and Dissemination	66.0	92.1	72.1
	Finance	90.2	95.4	97.0
	Networking and Support	98.6	99.7	100.0
<b>EIDES SCORE</b>		<b>74.0</b>	<b>88.6</b>	<b>89.3</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	75.9		
	Digital Entrepreneurship Start-up	72.1		
	Digital Entrepreneurship Scale-up	74.0		

**Table 44. Luxembourg's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



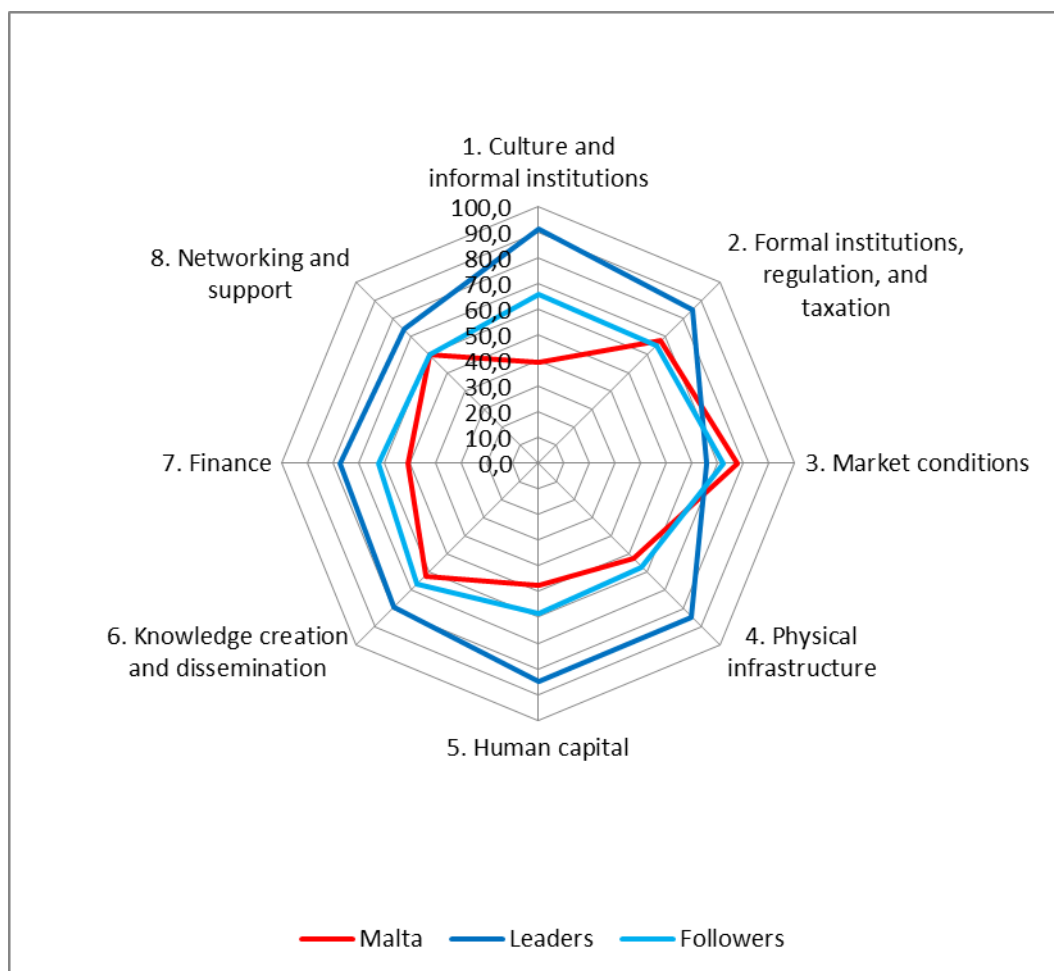
Sum of additional resources for 10% EIDES score increase (in unit per population)

34.0

### 6.2.19 Malta

Size of population 2012-2016 (in Millions)	0.44
Per capita GDP in Euro 2014-2016 average (PPP)	19 400
Country group	Followers
EIDES rank (score)	11 (54.3)
Digital Entrepreneurship Stand-up sub-index rank (score)	10 (54.6)
Digital Entrepreneurship Start-up sub-index rank (score)	10 (56.2)
Digital Entrepreneurship Scale-up sub-index rank (score)	11 (52.0)

**Figure 24. Malta's position in the eight EIDES pillars**



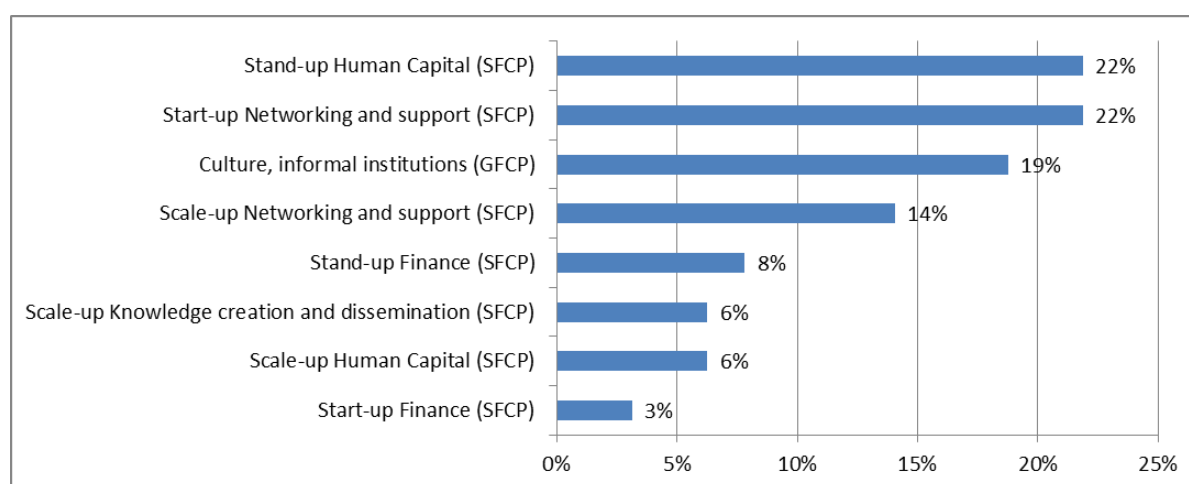
Weakest pillar  
Strongest pillar

Culture and Informal Institutions (39.3)  
Market Conditions (77.9)

**Table 45. Malta's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	39.3	67.2	69.0
	Formal Institutions, Regulation, and Taxation	67.8	78.4	90.9
	Market Conditions	77.9	83.5	83.0
	Physical Infrastructure	52.4	66.1	76.9
<b>Systemic Framework Conditions</b>	Human Capital	47.3	69.8	69.2
	Knowledge Creation and Dissemination	61.9	75.8	90.4
	Finance	50.5	79.0	66.9
	Networking and Support	59.9	100.0	64.7
<b>EIDES SCORE</b>		<b>54.3</b>	<b>77.5</b>	<b>76.4</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	54.6		
	Digital Entrepreneurship Start-up	56.2		
	Digital Entrepreneurship Scale-up	52.0		

**Table 46. Malta's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



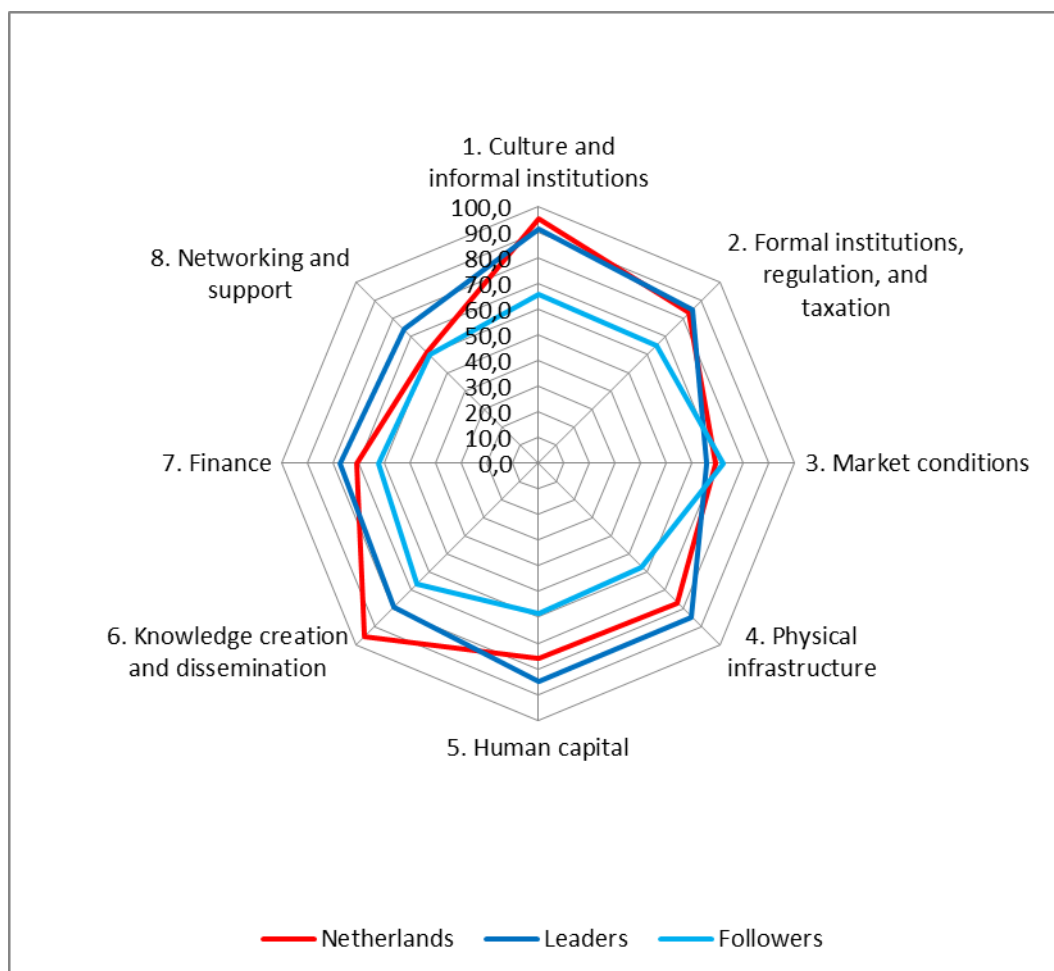
Sum of additional resources for 10% EIDES score increase (in unit per population)

64.0

### 6.2.20 Netherlands

Size of population 2012-2016 (in Millions)	16.9
Per capita GDP in Euro 2014-2016 average (PPP)	38 800
Country group	Followers
EIDES rank (score)	7 (62.2)
Digital Entrepreneurship Stand-up sub-index rank (score)	7 (64.3)
Digital Entrepreneurship Start-up sub-index rank (score)	8 (57.6)
Digital Entrepreneurship Scale-up sub-index rank (score)	7 (64.7)

**Figure 25. Netherlands's position in the eight EIDES pillars**



Weakest pillar  
Strongest pillar

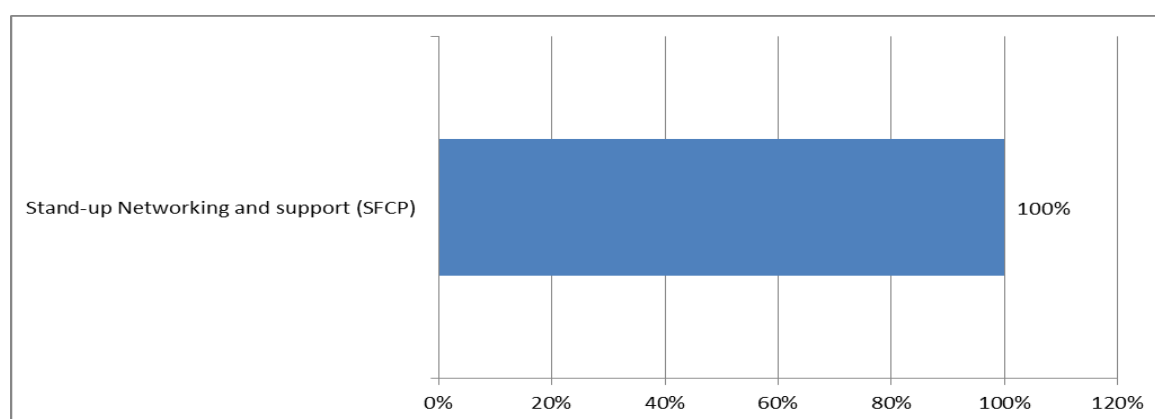
Market Conditions (69.1)  
Knowledge Creation and Dissemination (95.4)



**Table 47. Netherlands's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	95.2	97.2	99.0
	Formal Institutions. Regulation. and Taxation	83.1	92.0	86.7
	Market Conditions	69.1	96.4	75.2
	Physical Infrastructure	76.9	100.0	75.8
<b>Systemic Framework Conditions</b>	Human Capital	76.1	87.2	89.2
	Knowledge Creation and Dissemination	95.4	99.2	100.0
	Finance	70.5	83.5	86.0
	Networking and Support	61.4	76.3	85.6
<b>EIDES SCORE</b>		<b>62.2</b>	<b>91.5</b>	<b>87.2</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	64.3		
	Digital Entrepreneurship Start-up	57.6		
	Digital Entrepreneurship Scale-up	64.7		

**Table 48. Netherlands's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

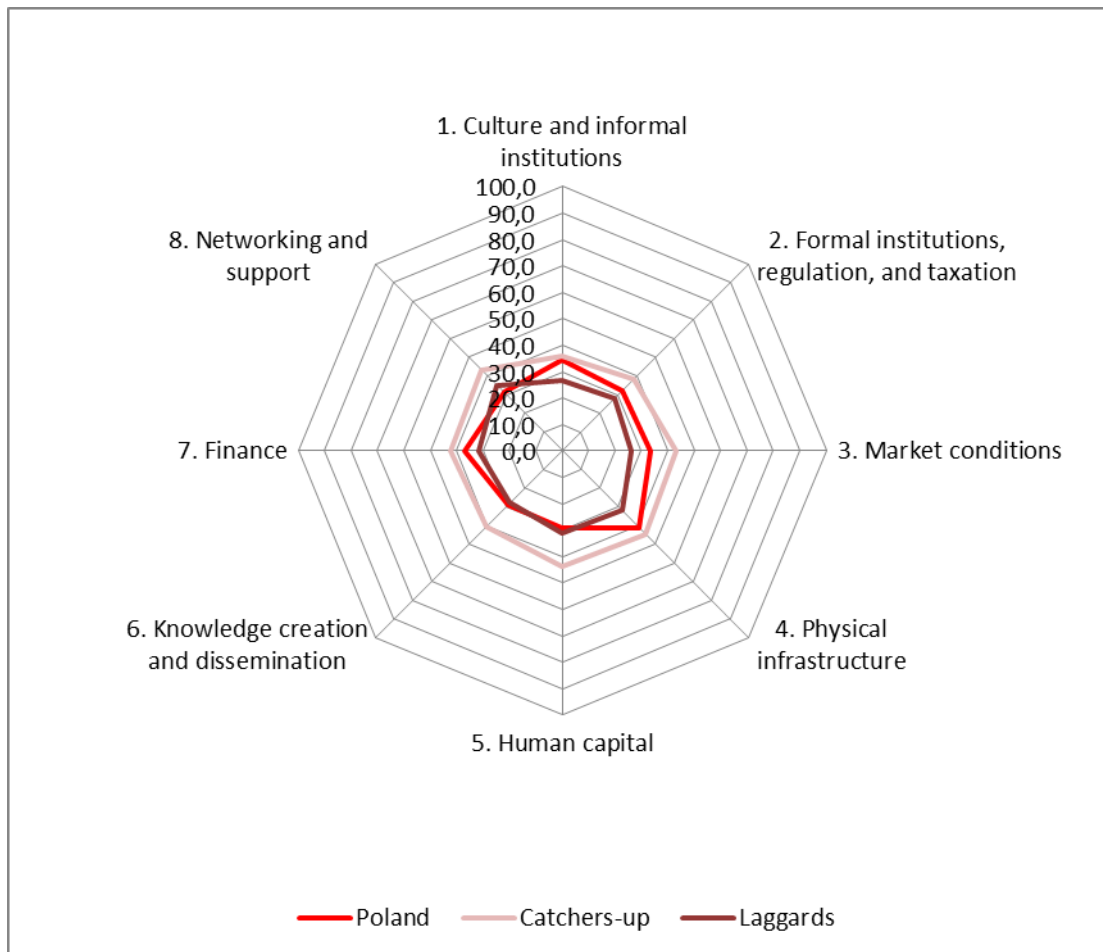


Sum of additional resources for 10% EIDES score increase (in unit per population) 22.0

### 6.2.21 Poland

Size of population 2012-2016 (in Millions)	38.0
Per capita GDP in Euro 2014-2016 average (PPP)	10 867
Country group	Laggards
EIDES rank (score)	20 (32.9)
Digital Entrepreneurship Stand-up sub-index rank (score)	22 (31.8)
Digital Entrepreneurship Start-up sub-index rank (score)	20 (33.6)
Digital Entrepreneurship Scale-up sub-index rank (score)	21 (33.4)

**Figure 26. Poland's position in the eight EIDES pillars**



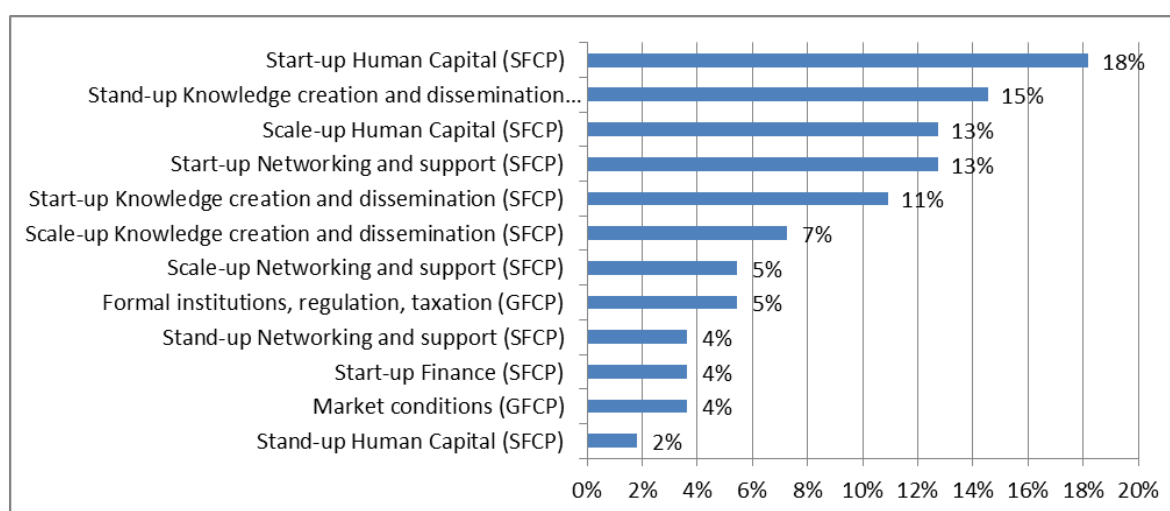
Weakest pillar  
Strongest pillar

Knowledge Creation and Dissemination (28.8)  
Physical Infrastructure (41.0)

**Table 49. Poland's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	34.5	68.9	54.0
	Formal Institutions, Regulation, and Taxation	32.0	67.4	53.1
	Market Conditions	33.3	94.8	53.4
	Physical Infrastructure	41.0	65.7	65.4
<b>Systemic Framework Conditions</b>	Human Capital	29.0	64.0	48.0
	Knowledge Creation and Dissemination	28.8	63.0	48.1
	Finance	36.9	71.0	54.6
	Networking and Support	31.3	61.2	55.1
<b>EIDES SCORE</b>		<b>32.9</b>	<b>69.5</b>	<b>54.0</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	31.8		
	Digital Entrepreneurship Start-up	33.6		
	Digital Entrepreneurship Scale-up	33.4		

**Table 50. Poland's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



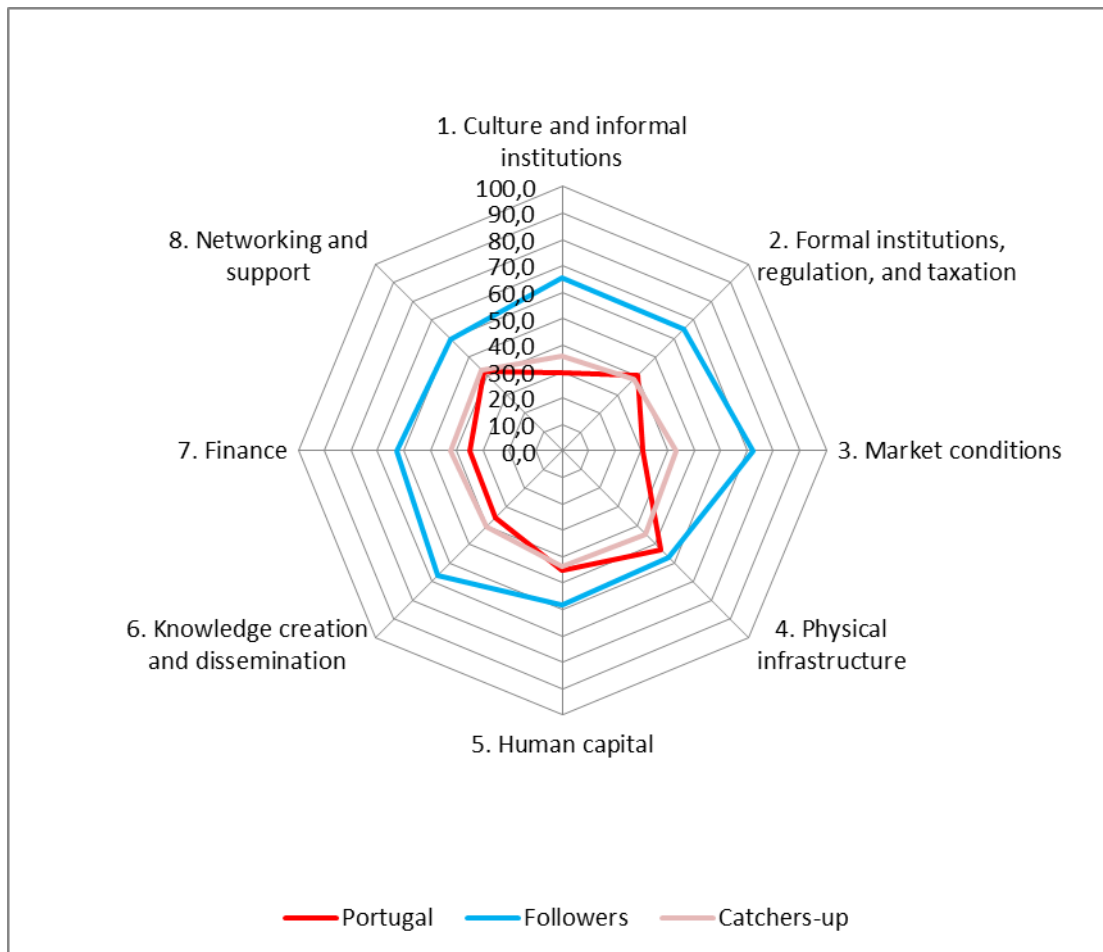
Sum of additional resources for 10% EIDES score increase (in unit per population)

55.0

## 6.2.22 Portugal

Size of population 2012-2016 (in Millions)	10.4
Per capita GDP in Euro 2014-2016 average (PPP)	16 600
Country group	Catchers-up
EIDES rank (score)	18 (38.1)
Digital Entrepreneurship Stand-up sub-index rank (score)	17 (38.9)
Digital Entrepreneurship Start-up sub-index rank (score)	18 (38.7)
Digital Entrepreneurship Scale-up sub-index rank (score)	18 (36.8)

**Figure 27. Portugal's position in the eight EIDES pillars**



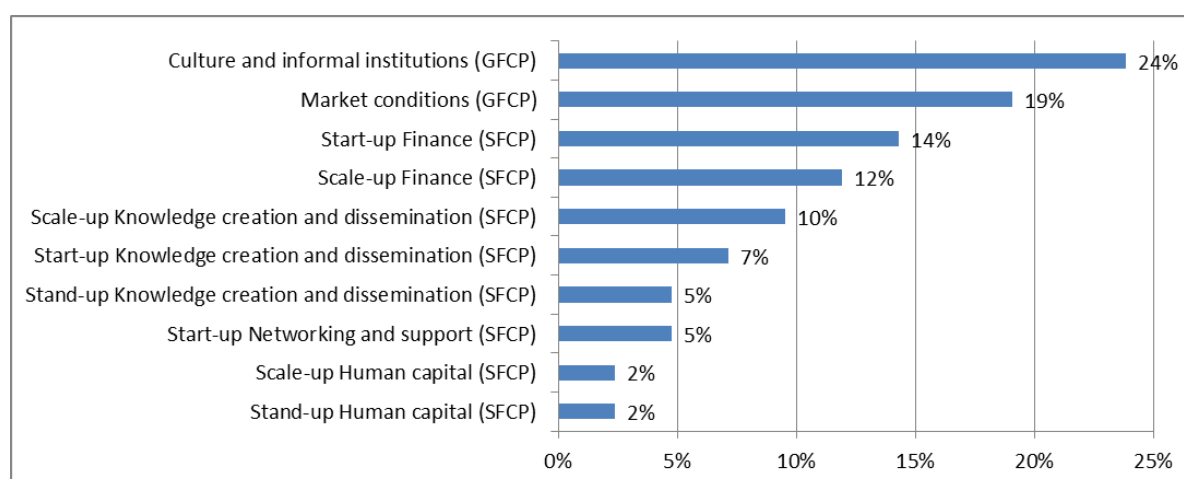
Weakest pillar  
Strongest pillar

Culture and Informal Institutions (29.4)  
Physical Infrastructure (52.6)

**Table 51. Portugal's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	29.4	67.9	44.8
	Formal Institutions, Regulation, and Taxation	40.2	71.4	61.3
	Market Conditions	30.6	71.6	55.7
	Physical Infrastructure	52.6	85.7	64.9
<b>Systemic Framework Conditions</b>	Human Capital	45.1	79.7	58.6
	Knowledge Creation and Dissemination	35.8	74.6	47.8
	Finance	35.2	72.1	51.4
	Networking and Support	42.2	70.7	61.2
<b>EIDES SCORE</b>		<b>38.1</b>	<b>74.2</b>	<b>55.7</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	38.9		
	Digital Entrepreneurship Start-up	38.7		
	Digital Entrepreneurship Scale-up	36.8		

**Table 52. Portugal's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



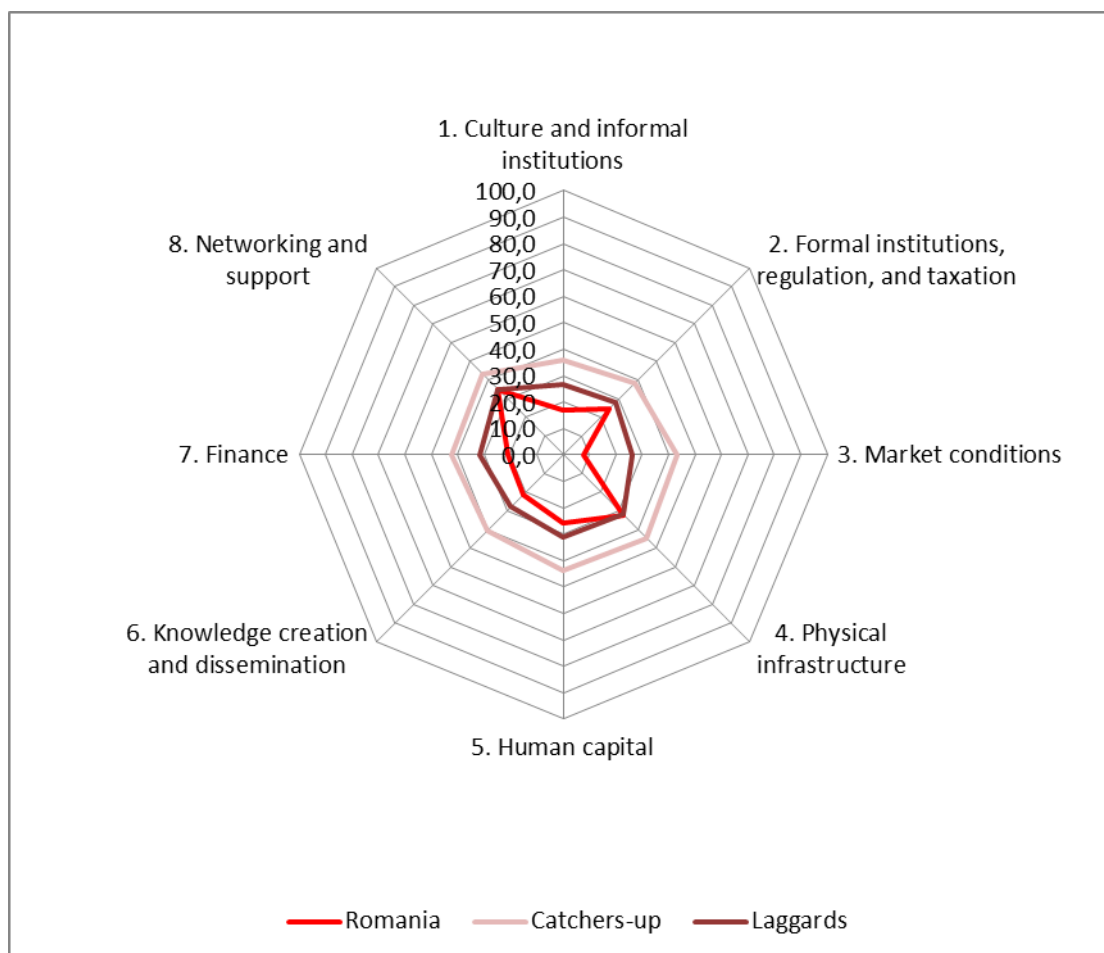
Sum of additional resources for 10% EIDES score increase (in unit per population)

42.0

### 6.2.23 Romania

Size of population 2012-2016 (in Millions)	19.9
Per capita GDP in Euro 2014-2016 average (PPP)	7 333
Country group	Laggards
EIDES rank (score)	28 (21.6)
Digital Entrepreneurship Stand-up sub-index rank (score)	28 (21.6)
Digital Entrepreneurship Start-up sub-index rank (score)	28 (22.4)
Digital Entrepreneurship Scale-up sub-index rank (score)	28 (20.8)

**Figure 28. Romania's position in the eight EIDES pillars**



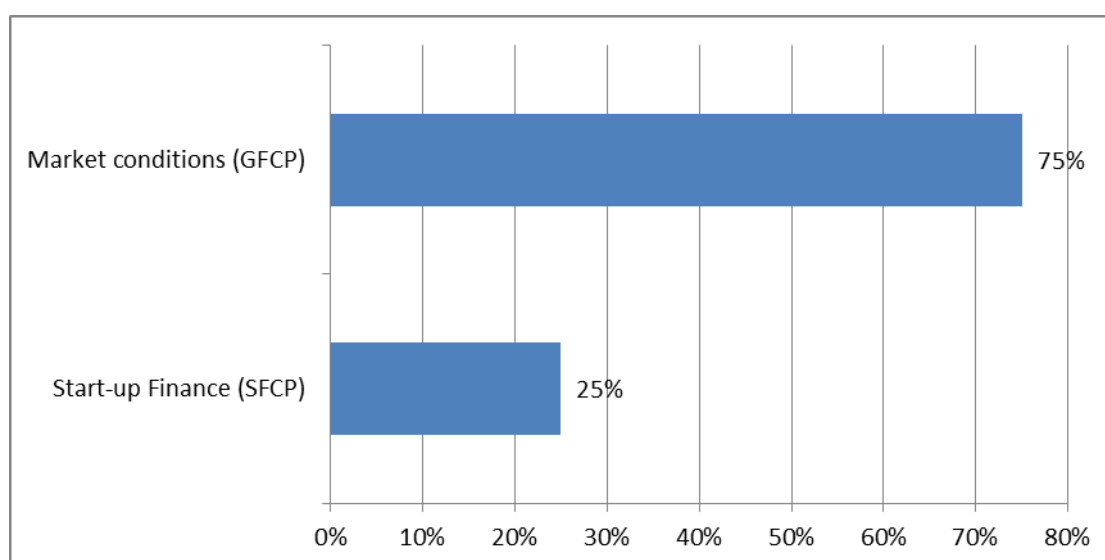
Weakest pillar  
Strongest pillar

Market Conditions (7.7)  
Networking and Support (35.1)

**Table 53. Romania's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	16.7	57.5	30.2
	Formal Institutions, Regulation, and Taxation	24.7	62.8	45.4
	Market Conditions	7.7	68.5	29.3
	Physical Infrastructure	32.4	50.0	66.6
<b>Systemic Framework Conditions</b>	Human Capital	26.0	66.9	41.7
	Knowledge Creation and Dissemination	21.5	52.9	44.8
	Finance	20.6	60.7	36.7
	Networking and Support	35.1	67.4	52.2
<b>EIDES SCORE</b>		<b>21.6</b>	<b>60.8</b>	<b>43.4</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	21.6		
	Digital Entrepreneurship Start-up	22.4		
	Digital Entrepreneurship Scale-up	20.8		

**Table 54. Romania's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

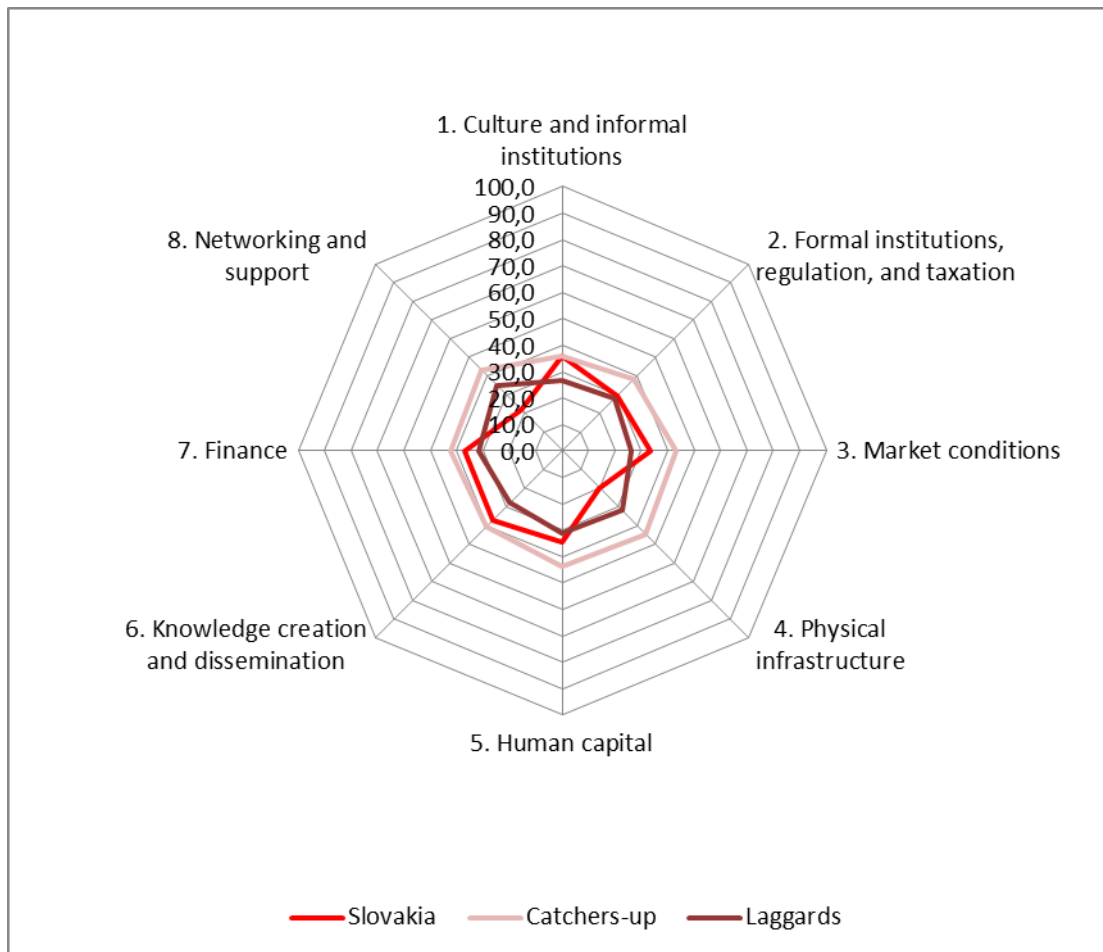


Sum of additional resources for 10% EIDES score increase (in unit per population) 12.0

### 6.2.24 Slovakia

Size of population 2012-2016 (in Millions)	5.4
Per capita GDP in Euro 2014-2016 average (PPP)	14 100
Country group	Laggards
EIDES rank (score)	25 (29.9)
Digital Entrepreneurship Stand-up sub-index rank (score)	24 (28.3)
Digital Entrepreneurship Start-up sub-index rank (score)	25 (30.8)
Digital Entrepreneurship Scale-up sub-index rank (score)	24 (30.6)

**Figure 29. Slovakia's position in the eight EIDES pillars**



Weakest pillar  
Strongest pillar

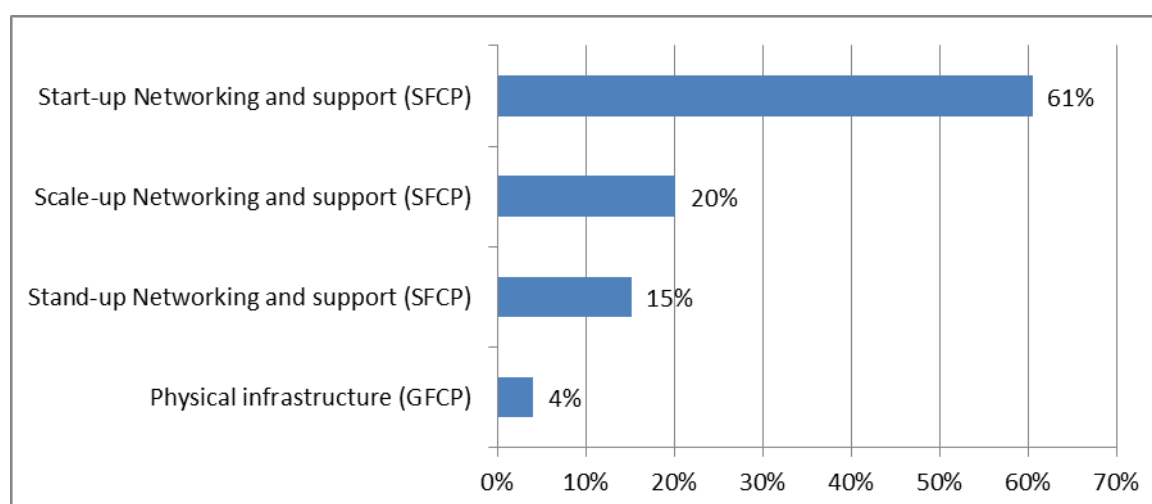
Physical Infrastructure (19.8)  
Knowledge Creation and Dissemination (37.1)



**Table 55. Slovakia's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	35.7	64.0	67.9
	Formal Institutions, Regulation, and Taxation	29.4	61.3	56.7
	Market Conditions	33.5	63.0	60.4
	Physical Infrastructure	19.8	60.8	42.1
<b>Systemic Framework Conditions</b>	Human Capital	34.4	60.1	59.0
	Knowledge Creation and Dissemination	37.1	59.1	72.0
	Finance	37.0	69.3	56.9
	Networking and Support	21.9	54.0	45.7
<b>EIDES SCORE</b>		<b>29.9</b>	<b>61.4</b>	<b>57.6</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	28.3		
	Digital Entrepreneurship Start-up	30.8		
	Digital Entrepreneurship Scale-up	30.6		

**Table 56. Slovakia's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**

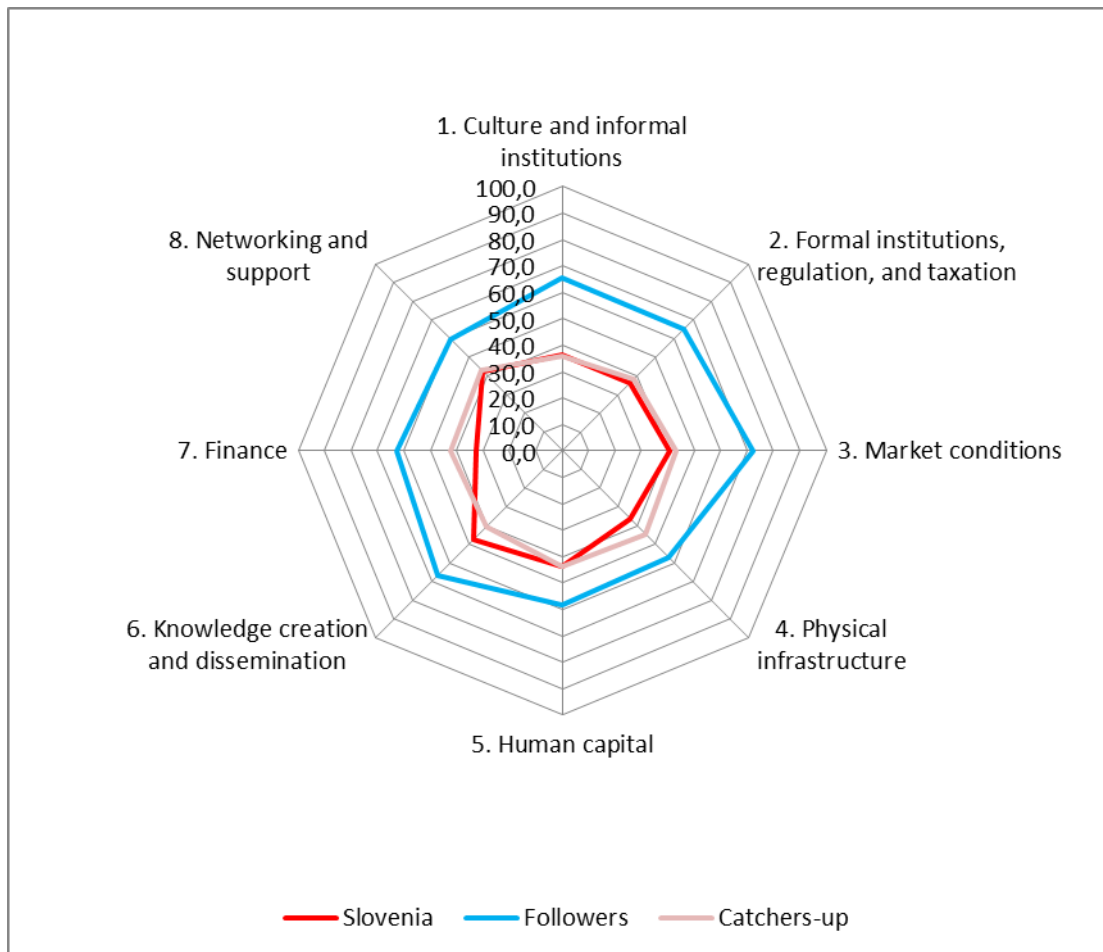


Sum of additional resources for 10% EIDES score increase (in unit per population) 19.8

### 6.2.25 Slovenia

Size of population 2012-2016 (in Millions)	2.1
Per capita GDP in Euro 2014-2016 average (PPP)	17 967
Country group	Catchers-up
EIDES rank (score)	17 (38.4)
Digital Entrepreneurship Stand-up sub-index rank (score)	19 (35.5)
Digital Entrepreneurship Start-up sub-index rank (score)	16 (41.6)
Digital Entrepreneurship Scale-up sub-index rank (score)	17 (38.2)

**Figure 30. Slovenia's position in the eight EIDES pillars**



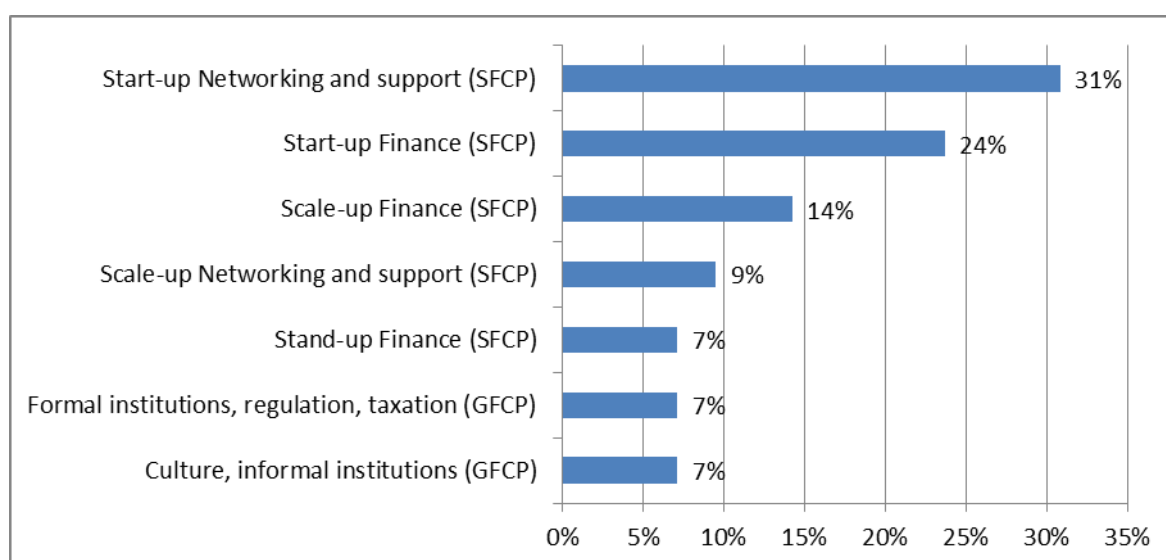
Weakest pillar  
Strongest pillar

Finance (32.5)  
Knowledge Creation and Dissemination (47.6)

**Table 57. Slovenia's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	36.4	65.8	65.2
	Formal Institutions, Regulation, and Taxation	36.5	68.8	58.9
	Market Conditions	40.6	90.8	59.4
	Physical Infrastructure	36.7	68.9	58.7
<b>Systemic Framework Conditions</b>	Human Capital	43.6	73.6	61.8
	Knowledge Creation and Dissemination	47.6	70.0	74.4
	Finance	32.5	61.1	55.2
	Networking and Support	42.5	72.4	59.7
<b>EIDES SCORE</b>		<b>38.4</b>	<b>71.4</b>	<b>61.6</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	35.5		
	Digital Entrepreneurship Start-up	41.6		
	Digital Entrepreneurship Scale-up	38.2		

**Table 58. Slovenia's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



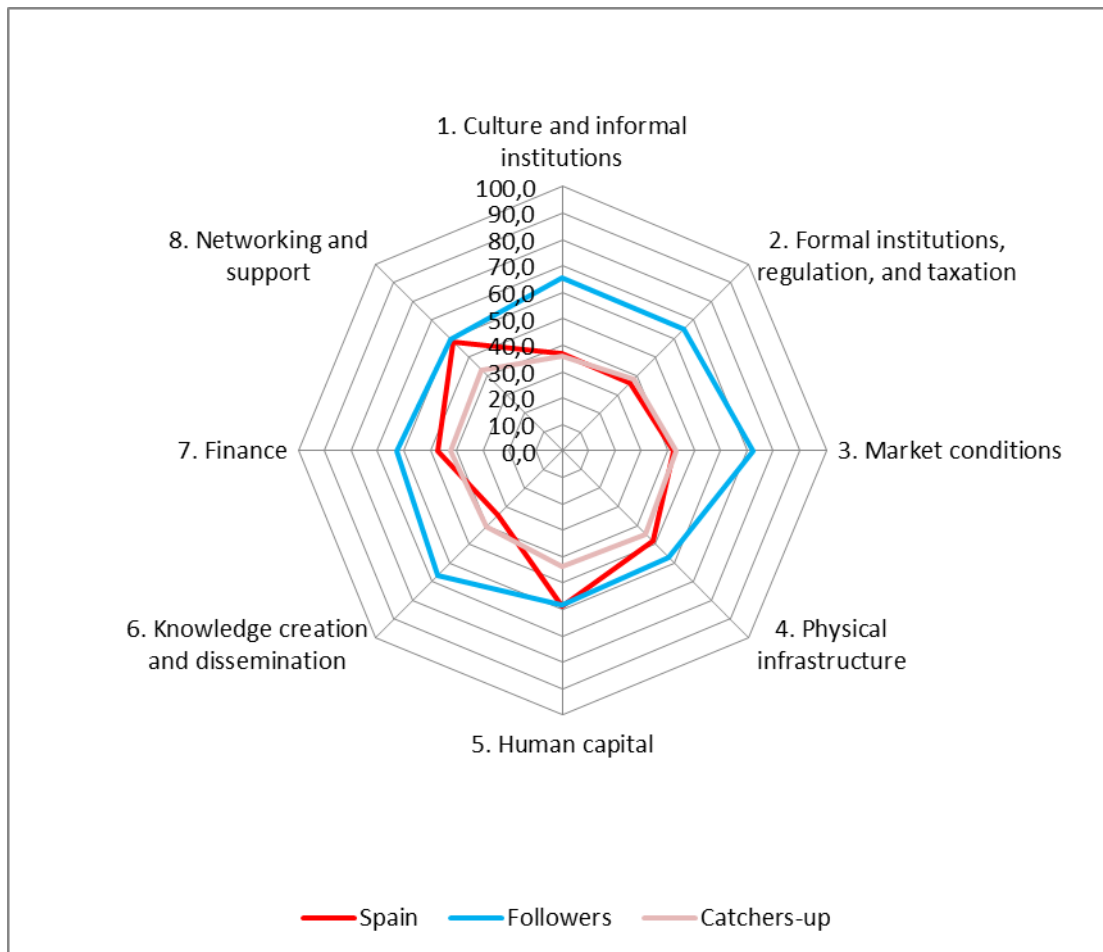
Sum of additional resources for 10% EIDES score increase (in unit per population)

42.2

### 6.2.26 Spain

Size of population 2012-2016 (in Millions)	46.5
Per capita GDP in Euro 2014-2016 average (PPP)	23 067
Country group	Catchers-up
EIDES rank (score)	14 (44.2)
Digital Entrepreneurship Stand-up sub-index rank (score)	14 (45.2)
Digital Entrepreneurship Start-up sub-index rank (score)	14 (44.6)
Digital Entrepreneurship Scale-up sub-index rank (score)	15 (42.9)

**Figure 31. Spain's position in the eight EIDES pillars**



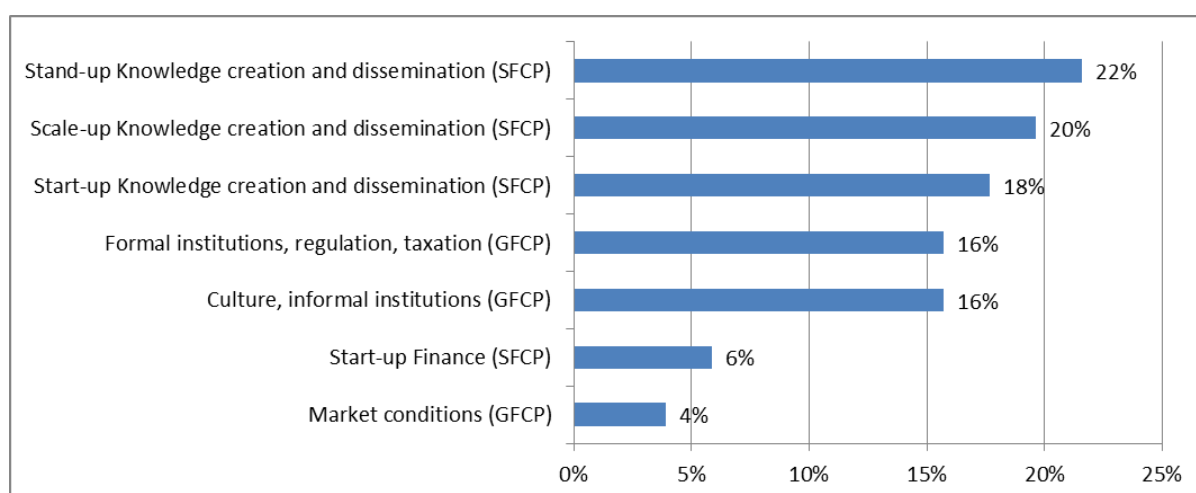
Weakest pillar  
Strongest pillar

Knowledge Creation and Dissemination (34.6)  
Human Capital (58.9)

**Table 59. Spain's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	36.8	68.6	59.9
	Formal Institutions, Regulation, and Taxation	36.4	67.7	60.3
	Market Conditions	42.4	71.6	65.1
	Physical Infrastructure	48.5	88.2	60.3
<b>Systemic Framework Conditions</b>	Human Capital	58.9	82.3	73.6
	Knowledge Creation and Dissemination	34.6	68.8	52.2
	Finance	47.0	81.0	60.4
	Networking and Support	58.1	80.4	72.1
<b>EIDES SCORE</b>		<b>44.2</b>	<b>76.1</b>	<b>63.0</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	45.2		
	Digital Entrepreneurship Start-up	44.6		
	Digital Entrepreneurship Scale-up	42.9		

**Table 60. Spain's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



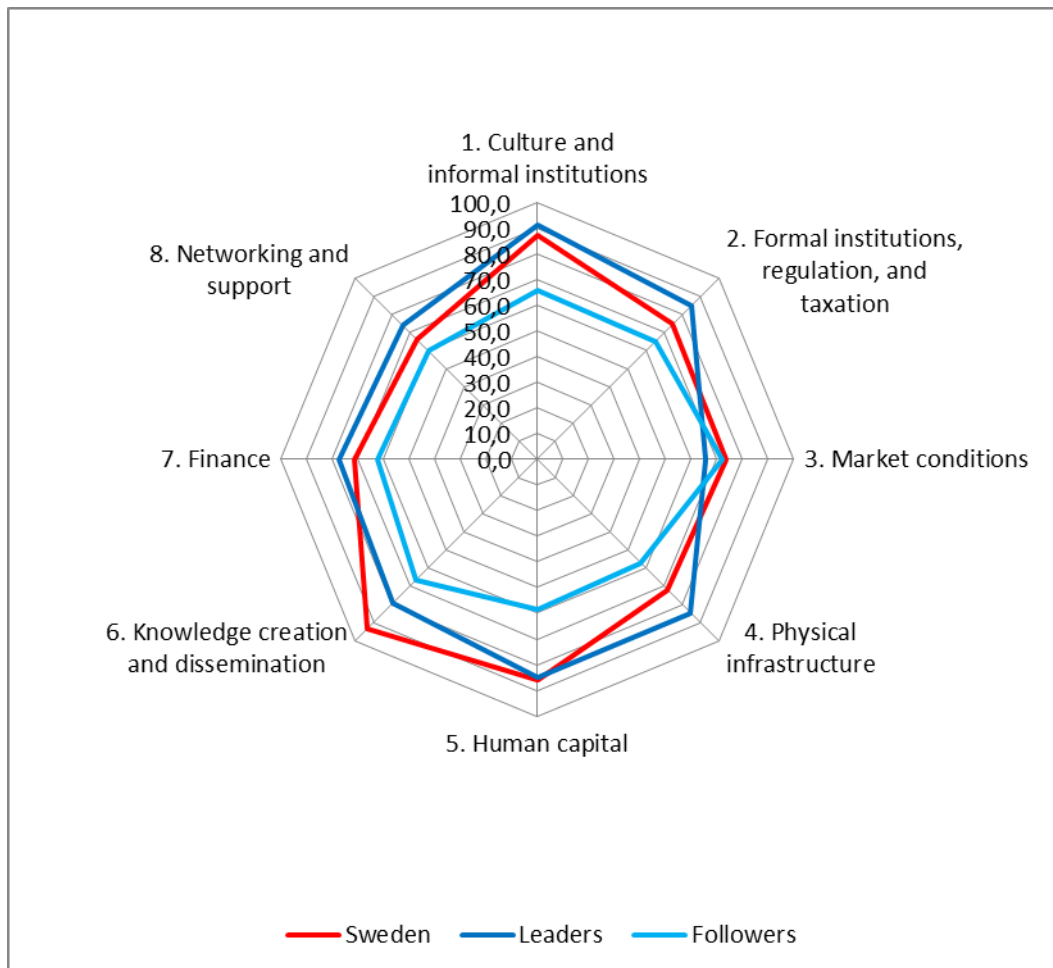
Sum of additional resources for 10% EIDES score increase (in unit per population)

51.0

### 6.2.27 Sweden

Size of population 2012-2016 (in Millions)	9.8
Per capita GDP in Euro 2014-2016 average (PPP)	41 667
Country group	Leaders
EIDES rank (score)	2 (75.6)
Digital Entrepreneurship Stand-up sub-index rank (score)	4 (73.4)
Digital Entrepreneurship Start-up sub-index rank (score)	2 (76.2)
Digital Entrepreneurship Scale-up sub-index rank (score)	2 (76.9)

**Figure 32. Sweden's position in the eight EIDES pillars**

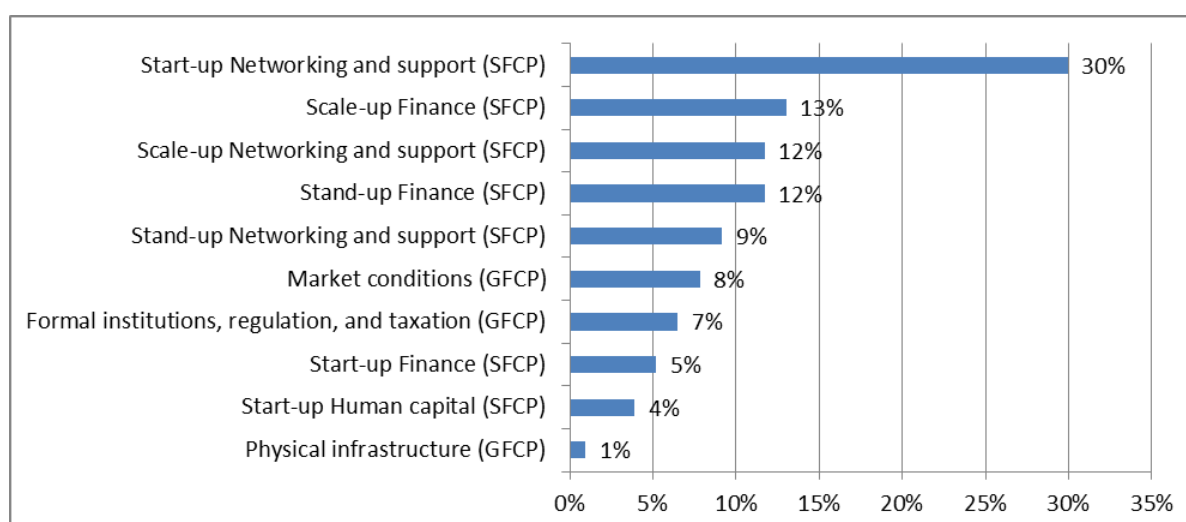


Weakest pillar: Networking and Support (66.3)  
 Strongest pillar: Knowledge Creation and Dissemination (93.4)

**Table 61. Sweden's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	87.4	94.8	93.3
	Formal Institutions, Regulation, and Taxation	74.6	86.2	86.0
	Market Conditions	73.8	83.7	80.9
	Physical Infrastructure	71.9	84.9	80.7
<b>Systemic Framework Conditions</b>	Human Capital	85.9	91.6	96.0
	Knowledge Creation and Dissemination	93.4	98.7	99.1
	Finance	71.4	92.1	79.7
	Networking and Support	66.3	90.3	74.2
<b>EIDES SCORE</b>		<b>75.6</b>	<b>90.3</b>	<b>86.2</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	73.4		
	Digital Entrepreneurship Start-up	76.4		
	Digital Entrepreneurship Scale-up	76.9		

**Table 62. Sweden's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



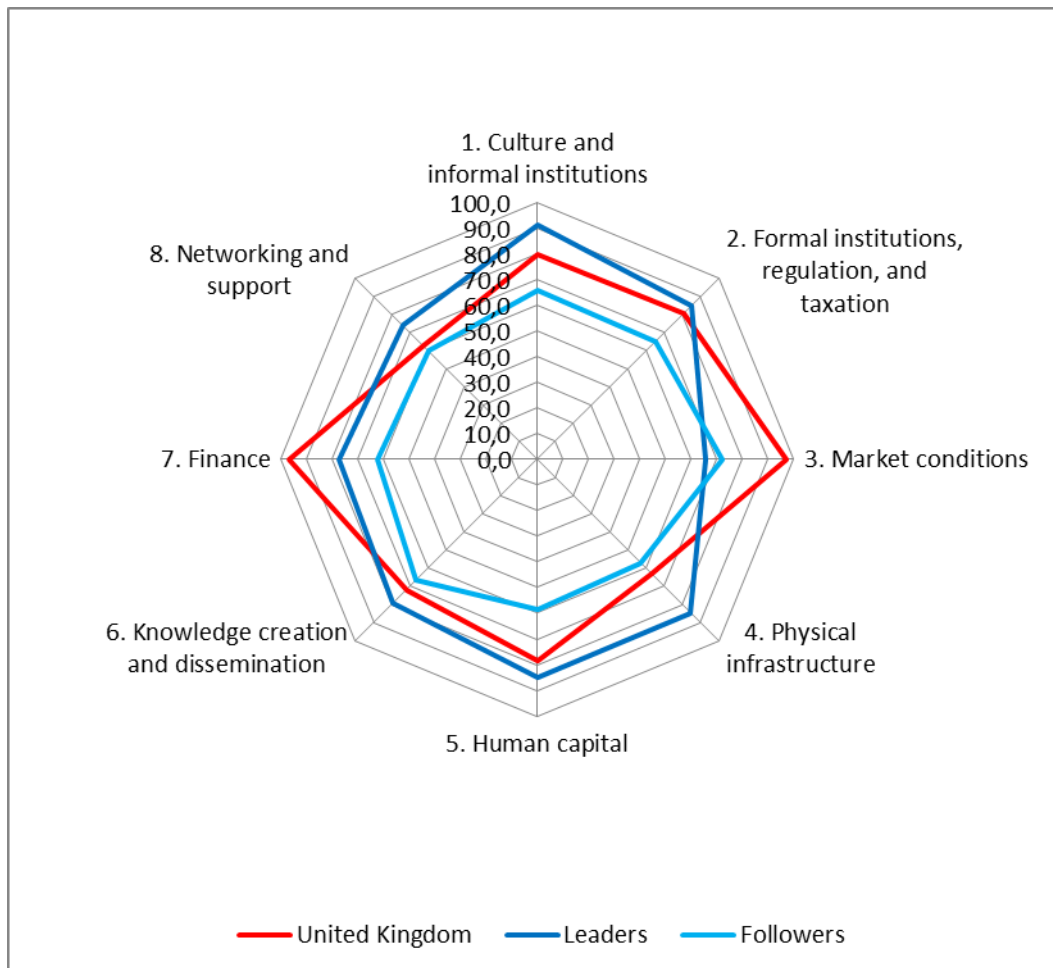
Sum of additional resources for 10% EIDES score increase (in unit per population)

76.7

### 6.2.28 United Kingdom

Size of population 2012-2016 (in Millions)	54.9
Per capita GDP in Euro 2014-2016 average (PPP)	31 300
Country group	Followers
EIDES rank (score)	6 (63.7)
Digital Entrepreneurship Stand-up sub-index rank (score)	5 (65.0)
Digital Entrepreneurship Start-up sub-index rank (score)	7 (60.6)
Digital Entrepreneurship Scale-up sub-index rank (score)	5 (65.6)

**Figure 33. United Kingdom's position in the eight EIDES pillars**



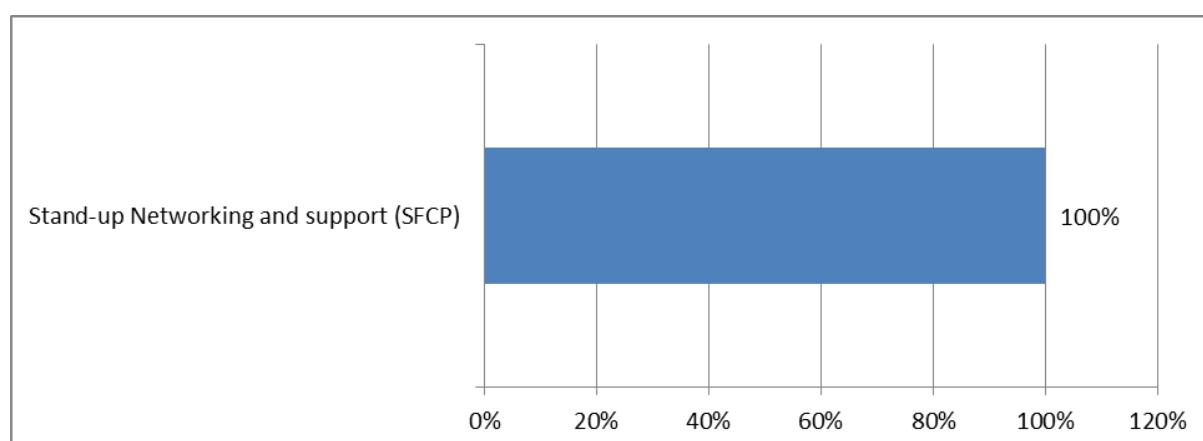
Weakest pillar: Networking and Support (62.5)  
 Strongest pillar: Market Conditions (97.4)



**Table 63. United Kingdom's EIDES component values**

	<b>PILLAR</b>	<b>PILLAR SCORE</b>	<b>NON DIGITAL SCORE</b>	<b>DIGITAL SCORE</b>
<b>General Framework Conditions</b>	Culture and Informal Institutions	80.0	92.3	87.6
	Formal Institutions, Regulation, and Taxation	80.6	93.6	81.6
	Market Conditions	97.4	78.2	94.1
	Physical Infrastructure	63.0	85.6	73.4
<b>Systemic Framework Conditions</b>	Human Capital	78.3	86.9	92.5
	Knowledge Creation and Dissemination	71.8	100.0	70.1
	Finance	96.4	100.0	100.0
	Networking and Support	62.5	69.6	95.8
<b>EIDES SCORE</b>		<b>63.7</b>	<b>88.3</b>	<b>86.9</b>
<b>SUB-INDEX</b>		<b>SUB-INDEX SCORE</b>		
<b>Sub-indices</b>	Digital Entrepreneurship Stand-up	65.0		
	Digital Entrepreneurship Start-up	60.6		
	Digital Entrepreneurship Scale-up	65.6		

**Table 64. United Kingdom's policy optimization simulation: The allocation of additional resources amongst the pillars to reach a 10% increase in EIDES score**



Sum of additional resources for 10% EIDES score increase (in unit per population) 15.0

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## Annexes

### Annex 1 Calculation of the EIDES scores

In constructing the index we followed eleven steps:

1. **Normalisation of indicators:** Altogether we have selected 116 indicators. Out of these there are 23 General Framework Condition, 39 Systemic Framework Condition, 26 Digital Framework Condition and 27 Systemic Digital Condition indicators. First, we normalized all the indicators using the distance methodology:

$$x_{i,k} = \frac{z_{i,j}}{\max z_{i,j}} \quad (1)$$

for all  $i = 1 \dots 28$ , the number of countries

$j = 1 \dots 121$ , the number of indicators

where  $x_{i,j}$  is the normalized indicator score value for country  $i$  and indicator  $j$

$z_{i,j}$  is the original indicator value for country  $i$  and indicator  $j$

2. **The construction of the variables:** We calculate all variables from the indicators by calculating the simple arithmetic averages. Altogether we have 24 variables, 4 general, 12 systemic, and 8 digital variables.

The four General Framework Condition (GFC) variables are calculated as follows:

$$\text{GFC\_P1}_i = \frac{\sum_1^6 x_{i,j}}{6} \quad (2a)$$

$$\text{GFC\_P2}_i = \frac{\sum_7^{13} x_{i,j}}{7} \quad (2b)$$

$$\text{GFC\_P3}_i = \frac{\sum_{14}^{20} x_{i,j}}{7} \quad (2c)$$

$$\text{GFC\_P4}_i = \frac{\sum_{21}^{23} x_{i,j}}{3} \quad (2d)$$

for all countries  $i$

GFC\_P1= Culture and Informal Institutions general

GFC\_P2= Formal Institutions, Regulation, and Taxation general

GFC\_P3= Market Conditions general

GFC\_P4= Physical Infrastructure general

The Systemic Framework Condition (SFC) variables are calculated independently for the three stages.

$$\text{S1\_SFC\_P1}_i = \frac{\sum_{24}^{25} x_{i,j}}{2} \quad (2e)$$

$$\text{S2\_SFC\_P1}_i = \frac{\sum_{26}^{29} x_{i,j}}{4} \quad (2f)$$

$$\text{S3\_SFC\_P1}_i = \frac{\sum_{30}^{33} x_{i,j}}{4} \quad (2g)$$

S1\_SFC\_P1= Human Capital systemic Stand-up

S2\_SFC\_P1= Human Capital systemic Start-up  
 S3\_SFC\_P1= Human Capital systemic Scale-up

$$S1\_SFC\_P2_i = \frac{\sum_{34}^{35} x_{i,j}}{2} \quad (2h)$$

$$S2\_SFC\_P2_i = \frac{\sum_{36}^{37} x_{i,j}}{2} \quad (2i)$$

$$S3\_SFC\_P2_i = \frac{\sum_{38}^{44} x_{i,j}}{7} \quad (2j)$$

S1\_SFC\_P2= Knowledge Creation and Dissemination systemic Stand-up  
 S2\_SFC\_P2= Knowledge Creation and Dissemination systemic Start-up  
 S3\_SFC\_P2= Knowledge Creation and Dissemination systemic Scale-up

$$S1\_SFC\_P3_i = \frac{\sum_{45}^{46} x_{i,j}}{2} \quad (2k)$$

$$S2\_SFC\_P3_i = \frac{\sum_{47}^{52} x_{i,j}}{6} \quad (2l)$$

$$S3\_SFC\_P3_i = \frac{\sum_{53}^{56} x_{i,j}}{4} \quad (2m)$$

S1\_SFC\_P3= Finance systemic Stand-up  
 S2\_SFC\_P3= Finance systemic Start-up  
 S3\_SFC\_P3= Finance systemic Scale-up

$$S1\_SFC\_P4_i = \frac{\sum_{57}^{57} x_{i,j}}{1} \quad (2n)$$

$$S2\_SFC\_P4_i = \frac{\sum_{58}^{59} x_{i,j}}{2} \quad (2o)$$

$$S3\_SFC\_P4_i = \frac{\sum_{60}^{62} x_{i,j}}{3} \quad (2p)$$

S1\_SFC\_P4= Networking and Support systemic Stand-up  
 S2\_SFC\_P4= Networking and Support systemic Start-up  
 S3\_SFC\_P4= Networking and Support systemic Scale-up

The calculation of the digital variables follows exactly the same logic.

The four Digital Framework Condition (DFC) variables are calculated as follows:

$$DFC\_P1_i = \frac{\sum_{63}^{66} x_{i,j}}{4} \quad (2a)$$

$$DFC\_P2_i = \frac{\sum_{67}^{72} x_{i,j}}{6} \quad (2b)$$

$$DFC\_P3_i = \frac{\sum_{73}^{79} x_{i,j}}{7} \quad (2c)$$

$$DFC\_P4_i = \frac{\sum_{80}^{88} x_{i,j}}{9} \quad (2d)$$

for all countries

DFC\_P1= Culture and Informal Institutions digital

DFC\_P2= Formal Institutions, Regulation, and Taxation digital

DFC\_P3= Market Conditions digital

DFC\_P4= Physical Infrastructure digital

The Systemic Digital Condition (SDC) variables are also calculated independently for the three stages.

$$S1\_SDC\_P1_i = \frac{\sum_{89}^{91} x_{i,j}}{3} \quad (2e)$$

$$S2\_SDC\_P1_i = \frac{\sum_{92}^{92} x_{i,j}}{1} \quad (2f)$$

$$S3\_SDC\_P1_i = \frac{\sum_{93}^{94} x_{i,j}}{2} \quad (2g)$$

S1\_SDC\_P1= Human Capital digital Stand-up

S2\_SDC\_P1= Human Capital digital Start-up

S3\_SDC\_P1= Human Capital digital Scale-up

$$S1\_SDC\_P2_i = \frac{\sum_{95}^{97} x_{i,j}}{3} \quad (2h)$$

$$S2\_SDC\_P2_i = \frac{\sum_{98}^{99} x_{i,j}}{2} \quad (2i)$$

$$S3\_SDC\_P2_i = \frac{\sum_{200}^{101} x_{i,j}}{2} \quad (2j)$$

S1\_SDC\_P2= Knowledge Creation and Dissemination digital Stand-up

S2\_SDC\_P2= Knowledge Creation and Dissemination digital Start-up

S3\_SDC\_P2= Knowledge Creation and Dissemination digital Scale-up

$$S1\_SDC\_P3_i = \frac{\sum_{102}^{104} x_{i,j}}{3} \quad (2k)$$

$$S2\_SDC\_P3_i = \frac{\sum_{105}^{105} x_{i,j}}{1} \quad (2l)$$

$$S3\_SDC\_P3_i = \frac{\sum_{106}^{106} x_{i,j}}{1} \quad (2m)$$

S1\_SDC\_P3= Finance digital Stand-up

S2\_SDC\_P3= Finance digital Start-up

S3\_SDC\_P3= Finance digital Scale-up

$$S1\_SDC\_P4_i = \frac{\sum_{107}^{108} x_{i,j}}{2} \quad (2n)$$

$$S2\_SDC\_P4_i = \frac{\sum_{109}^{112} x_{i,j}}{4} \quad (2o)$$

$$S3\_SDC\_P4_i = \frac{\sum_{113}^{116} x_{i,j}}{3} \quad (2p)$$

S1\_SDC\_P4= Networking and Support digital Stand-up

S2\_SDC\_P4= Networking and Support digital Start-up

S3\_SDC\_P4= Networking and Support digital Scale-up

3. **Normalisation of the variables:** variables are normalized again to a range from 0 to 1:

$$m(norm)_{i,l} = \frac{m_{i,l}}{\max m_{i,l}} \quad (3)$$

for all  $l = 1 \dots 24$ , the number of variables  
 where  $m(norm)_{i,j}$  is the normalized score value for country  $i$  and variable  $j$   
 $m_{i,l}$  is the original pillar value for country  $i$  and variable  $l$   
 $\max m_{i,l}$  is the maximum value for variable  $l$

4. **Systemic Digital Condition variables calculation:** Our original idea was to match the systemic and the digital variables one by one. Unfortunately some of the systemic digital variables contain on a few or in three cases only one indicator. Therefore their reliability is not as high as the systemic framework component values. So we decided to calculate only one digital component for all four systemic digital variables.

$$SDC\_P1_i = \frac{\sum_1^3 S(s)\_SDC\_P1_{i,s}}{3} \quad (4a)$$

$$SDC\_P2_i = \frac{\sum_1^3 S(s)\_SDC\_P1_{i,s}}{3} \quad (4a)$$

$$SDC\_P3_i = \frac{\sum_1^3 S(s)\_SDC\_P1_{i,s}}{3} \quad (4a)$$

$$SDC\_P4_i = \frac{\sum_1^3 S(s)\_SDC\_P1_{i,s}}{3} \quad (4a)$$

where SDC\_P1, SDC\_P2, SDC\_P3, SDC\_P4 are the Systemic Digital Condition variables for all country  $i$   
 and the  $S(s)\_SDC\_P1$ ;  $S(s)\_SDC\_P2$ ;  $S(s)\_SDC\_P2$ ;  $S(s)\_SDC\_P4$  are the Systemic Digital Condition variables for Stand-up, Start-up and Scale-up stages  $s=1,2,3$

5. **Normalisation of the Systemic Digital Condition variables:** Similar to the previous cases we calculate the normalized scores for the four Systemic Digital Condition variables

$$m(norm)_{i,l} = \frac{m_{i,l}}{\max m_{i,l}} \quad (5)$$

for all  $l = 20 \dots 24$ , the number of variables  
 where  $m(norm)_{i,l}$  is the normalized variable score value for country  $i$  and variable  $l$   
 $m_{i,l}$  is the original digital variable value for country  $i$  and variable  $l$   
 $\max m_{i,l}$  is the maximum value for variable  $l$

6. **Pillar calculation:** There are altogether 16 pillars in the EIDES. All 16 pillars are the result of the multiplication of the general / systemic variable and the associated digital variable.

For the General Framework Conditions the digital entrepreneurship pillars are the followings:

$$GDFC\_P1_i = GFC\_P1_i * DFC\_P1_i \quad (6a)$$

$$\text{GDFC\_P2}_i = \text{GFC\_P2}_i * \text{DFC\_P2}_i \quad (6b)$$

$$\text{GDFC\_P3}_i = \text{GFC\_P3}_i * \text{DFC\_P3}_i \quad (6c)$$

$$\text{GDFC\_P4}_i = \text{GFC\_P4}_i * \text{DFC\_P4}_i \quad (6d)$$

where:

GDFC\_P1= Culture and Informal Institutions digital entrepreneurship pillar  
 GDFC\_P2= Formal Institutions, Regulation, and Taxation digital entrepreneurship pillar  
 GDFC\_P3= Market Conditions digital entrepreneurship pillar  
 GDFC\_P4= Physical Infrastructure digital entrepreneurship pillar

For the Systemic Framework Conditions the digital entrepreneurship pillars are calculated separately for all three stages.

For the Stand-up stage:

$$\text{S1\_SDFC\_P1}_i = \text{S1\_SFC\_P1}_i * \text{SDC\_P1}_i \quad (6e)$$

$$\text{S1\_SDFC\_P2}_i = \text{S1\_SFC\_P2}_i * \text{SDC\_P2}_i \quad (6f)$$

$$\text{S1\_SDFC\_P3}_i = \text{S1\_SFC\_P3}_i * \text{SDC\_P3}_i \quad (6g)$$

$$\text{S1\_SDFC\_P4}_i = \text{S1\_SFC\_P4}_i * \text{SDC\_P4}_i \quad (6h)$$

where:

S1\_SDFC\_P1=Human Capital Stand-up digital entrepreneurship pillar  
 S1\_SDFC\_P2= Knowledge Creation and Dissemination Stand-up digital entrepreneurship pillar  
 S1\_SDFC\_P3= Finance Stand-up digital entrepreneurship pillar  
 S1\_SDFC\_P4= Networking and Support Stand-up digital entrepreneurship pillar

For the Start-up stage:

$$\text{S2\_SDFC\_P1}_i = \text{S2\_SFC\_P1}_i * \text{SDC\_P1}_i \quad (6i)$$

$$\text{S2\_SDFC\_P2}_i = \text{S2\_SFC\_P2}_i * \text{SDC\_P2}_i \quad (6j)$$

$$\text{S2\_SDFC\_P3}_i = \text{S2\_SFC\_P3}_i * \text{SDC\_P3}_i \quad (6k)$$

$$\text{S2\_SDFC\_P4}_i = \text{S2\_SFC\_P4}_i * \text{SDC\_P4}_i \quad (6l)$$

where:

S2\_SDFC\_P1= Human Capital Start-up digital entrepreneurship pillar  
 S2\_SDFC\_P2= Knowledge Creation and Dissemination Start-up digital entrepreneurship pillar  
 S2\_SDFC\_P3= Finance Start-up digital entrepreneurship pillar  
 S2\_SDFC\_P4= Networking and Support Start-up digital entrepreneurship pillar

For the Scale-up stage:

$$S3\_SDFC\_P1_i = S3\_SFC\_P1_i * SDC\_P1_i \quad (6m)$$

$$S3\_SDFC\_P2_i = S3\_SFC\_P2_i * SDC\_P2_i \quad (6n)$$

$$S3\_SDFC\_P3_i = S3\_SFC\_P3_i * SDC\_P3_i \quad (6o)$$

$$S3\_SDFC\_P4_i = S3\_SFC\_P4_i * SDC\_P4_i \quad (6p)$$

where:

S3\_SDFC\_P1= Human Capital Scale-up digital entrepreneurship pillar

S3\_SDFC\_P2= Knowledge Creation and Dissemination Scale-up digital entrepreneurship pillar

S3\_SDFC\_P3= Finance Scale-up digital entrepreneurship pillar

S3\_SDFC\_P4= Networking and Support Scale-up digital entrepreneurship pillar

7. **Normalisation of the pillars:** Similar to the previous cases we calculate the normalized scores for all the 16 pillars

$$p(norm)_{i,k} = \frac{p_{i,k}}{\max p_{i,k}} \quad (7)$$

for all  $k= 1 \dots 16$ , the number of pillars

where  $p(norm)_{i,k}$  is the normalized score value for country  $i$  and pillar  $k$

$p_{i,k}$  is the original digital pillar value for country  $i$  and pillar  $k$

$\max p_{i,k}$  is the maximum value for pillar  $k$

8. **Average pillar adjustment:** The different averages of the normalized values of the pillars imply that reaching the same indicator values requires different effort and resources. Since we want to apply the EIDES for public policy purposes, the additional resources for the same marginal improvement of the pillar values should be the same for all pillars. Therefore, we need a transformation to equalize the average values of the pillar components. Equation 8 shows the calculation of the average value of the  $k$  pillar:

$$\overline{p(norm)}_k = \frac{\sum_{i=1}^n p(norm)_{i,k}}{n} \quad \text{for all } k \quad (8a)$$

where  $\overline{p(norm)}_k$  is the average value of all  $k=16$  normalized pillars

We want to transform the  $p(norm)_{i,k}$  values such that the potential values to be in the  $[0, 1]$  range.

$$y_{i,k} = p(norm)_{i,k}^t \quad (8b)$$

where  $t$  is the "strength of adjustment", the  $t$ -th moment of  $p(norm)_k$  is exactly the needed average,  $\bar{y}_j$

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

$$\sum_{i=1}^n p(norm)_{i,k}^t - n\bar{y}_j = 0 \quad (8c)$$

It is easy to see based on previous conditions and derivatives that the function is decreasing and convex which means it can be quickly solved using the well-known

Newton-Raphson method with an initial guess of 0. After obtaining  $k$ , the computations are straightforward.

9. **Penalizing:** After these transformations, the Penalty for Bottleneck (PFB) methodology was used to create pillar-adjusted PFB values. We define our penalty function following as:

$$h_{(i),k} = \min y_{(i),k} + (1 - e^{-(y_{(i),k} - \min y_{(i),k})}) \quad (9)$$

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

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

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

$i = 1, 2, \dots, 28$  = the number of countries

$k = 1, 2, \dots, 16$  = the number of pillars

10. **Sub-index calculation:** The value of a sub-index for any country was then calculated as the arithmetic average of its PFB-adjusted pillars for that sub-index multiplied by 100 to get a 100 point scale. Note that the General Framework Conditions pillars are the same for all stages

$$DE\_Stand\_up_i = \frac{100}{8} \left( \sum_{k=1}^4 GDFC_{P_{i,k}} + \sum_{k=5}^8 S1\_SDFC_{P_{i,k}} \right) \quad (10a)$$

$$DE\_Start\_up_i = \frac{100}{8} \left( \sum_{k=1}^4 GDFC_{P_{i,k}} + \sum_{k=5}^8 S2\_SDFC_{P_{i,k}} \right) \quad (10b)$$

$$DE\_Scale\_up_i = \frac{100}{8} \left( \sum_{k=1}^4 GDFC_{P_{i,k}} + \sum_{k=5}^8 S3\_SDFC_{P_{i,k}} \right) \quad (10c)$$

where

DE\_Stand\_up= Digital Entrepreneurship Stand-up sub-index

DE\_Start\_up= Digital Entrepreneurship Start-up sub-index

DE\_Scale\_up= Digital Entrepreneurship Scale-up sub-index

11. **EIDES point calculation:** Finally, the scores are calculated as simple arithmetic averages of the three sub-indices.

$$EIDES_i = \frac{1}{3} (DE\_Stand\_up_i + DE\_Start\_up_i + DE\_Scale\_up_i) \quad (11)$$

## **Annex 2 Robustness analyses of the EIDES and its components**

In composite indicator analysis, the setting up of the final index is based upon a series of choices. The aim of the robustness (or uncertainty) analysis is to examine the extent to which the final ranking depends on the set of choices made during the selection and transformation of the variables (Van Roy & Nepelski 2016; Saisana, Saltelli, & Tarantola, 2005).

The indicators which populate the pillars in the framework are generally chosen by integrating experts' judgment, data availability and checks on statistical consistency.

Robustness analysis in our case involves the followings:

- compensability effect analysis;
  - the role of the pillars and the sub-indices in the development stages;
  - drop out effect of the pillars.
1. Compensability effect analysis

In connection with the analysis of the effect of excluding one pillar at a time the next question is the amount of compensability effects. Compensability is the "existence of trade-off, i.e. the possibility of offsetting a disadvantage on some criteria by a sufficiently large advantage on another criterion" (Munda, 2008, 71. p.). The EIDES will be the base for the comparison. More methods are applied. Ordered Weighted Averaging (OWA) approach is used for the pillars to present one aspect of compensability in case of EIDES. (Yager, 1996) This technique looks for different scenarios of weights to put together more variables into a single index. The variables are to be in descending order. From our point of view there are three special cases defined for the OWA operators (set of weights, where the sum of the weights is 1).

- Purely optimistic operator (o): the highest variable (in our case pillar) gets all of the weight (1). So the sub-index gets the highest pillar value. This concept expresses an "or" multiple criteria condition, where the satisfaction of at least one criterion is enough to have a good position.
- Purely pessimistic operator (p): the lowest pillar gets the weight 1. So the overall index will include only the value of the lowest pillar. It can be understood as an "and" condition. No compensation is allowed, all criteria must be satisfied at the same time.
- From our point of view an operator, which calculates a simple arithmetic mean of the pillars is interesting as well, to see, how far the penalty weighted results from the average situation are.

In each case, the final index value is calculated as a simple arithmetic mean from the sub-indices. So OWA operators are applied for the pillars.

Going further the best/worst/average possible outcomes two other well-known weighting schemes are also considered:

- Equal weights for the pillars (simple arithmetic mean) to get the sub-indices and geometric mean to receive the final index values (arithmetic+geometric).
- Geometric mean of the pillars to get the sub-indices and also geometric mean to receive the final index values (geometric+geometric).

Geometric mean, similarly to out penalized weighting scheme, supports the "and" condition as it gives the lower results if the distribution of the pillar values is uneven.

Monte Carlo experiments are often applied in case of robustness checks, where random weights within a given range are simulated. In our case the penalized weighting accounts for different weights by countries according to the consistency of the pillar values. Therefore this type of simulation is not sufficient in our case. That is why we apply the above mentioned "extreme" (optimistic, pessimistic) scenarios together with different

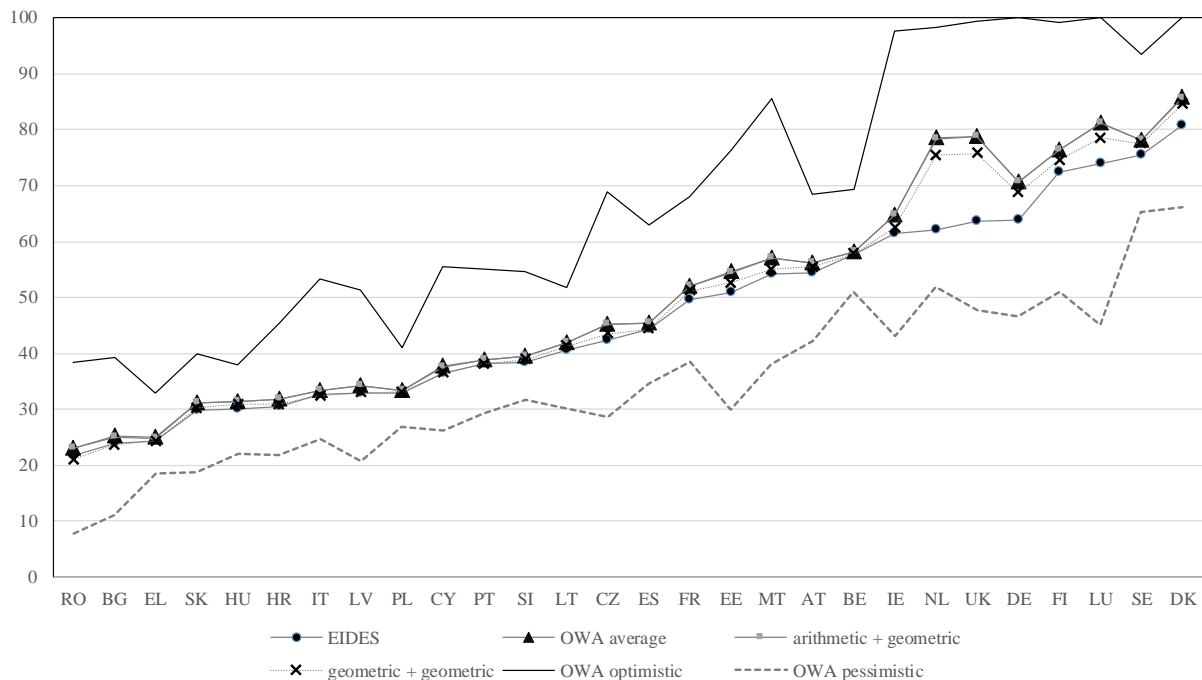


combination of the geometric mean, as its concept is closer to the idea behind the EIDES weighting.

Altogether we have five weighting scenarios, which will be compared to our (original) EIDES values. Besides comparing the final EIDES values, the ranks based on the different scenarios are also confronted. The results are presented in Figure A1 and A2.

As an obvious result, pessimistic and optimistic lines frame all the rest of the scenarios. It is also clear, that the aim of the penalty weighting was reached, as the EIDES are always below the average line. It means that compensability is restricted within the REDI indicator, and balanced performance is rewarded. Introducing the geometric mean in most of the cases results similar values with the EIDES and the simple arithmetic mean concepts. There are only two countries having higher differences between the penalized and the other three schemes. The Netherlands and the United Kingdom indicates the same patterns. Both have relatively high values in case of all pillars but one. This one is the Networking and Support pillar within the start-up group with 0.17 and 0.21 respectively. The rest of the pillar values have a minimum over 0.60, so this one pillar in both countries causes the relevant difference of the final score. The penalized weights decrease the overall value of these countries.

**Figure A1. EIDES values calculated with different weighting scenarios**

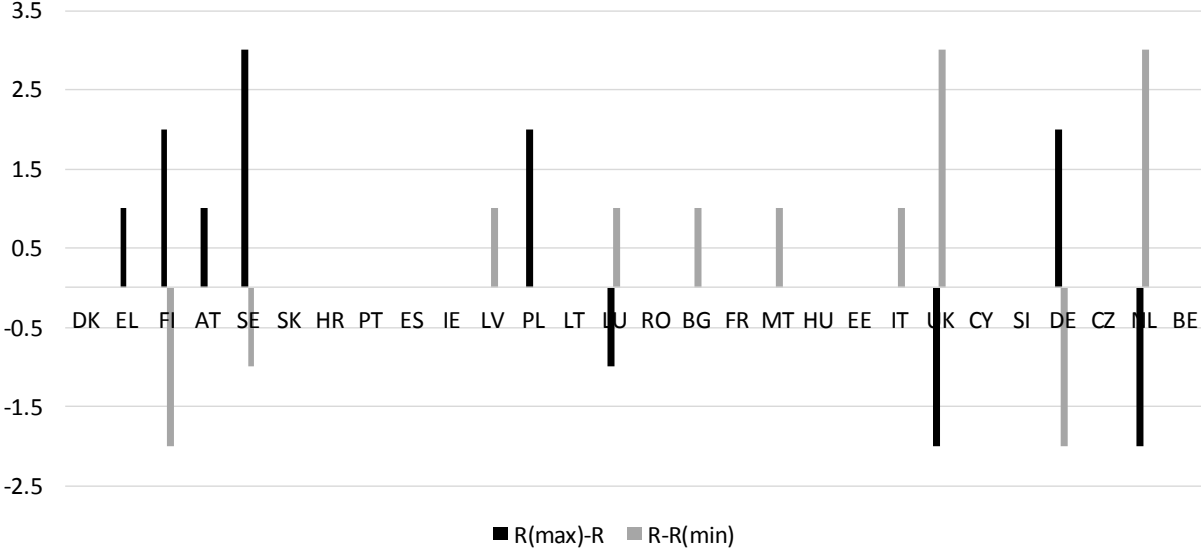


It is clear from Figure A1 that the penalized weighting scheme performs similarly as the non-extreme (extremes are the optimistic and pessimistic OWA solutions), but also reaches its objective of rewarding the balanced and unrewarding the unbalanced distribution of the pillar scores. Therefore in the followings, where the ranks are compared, we only focus on the non-extreme scenarios.

Figure A2 represents the differences of the maximum and minimum ranks by the non-extreme weighting scenarios compared to the original EIDES rank. In most of the cases (15 countries) the ranks are perfectly stable, so the original EIDES rank is exactly the same as the ranks based on other weighting scenarios. Even the highest differences in the ranks are only three positions. The effected countries are again The Netherlands and the United Kingdom, together with Sweden. The case of Sweden is similar to the other two, however the relative difference between the worst pillar (again Networking and Support) is not so high. The remaining 10 countries show one or two position differences.

It can be concluded that the **weighting scheme of EIDES is free from distortion, while its penalizing aim is sufficiently gained.**

**Figure A2. Rank differences of non-extreme weighting scenarios compared to the original EIDES ranks (R)**



2. Analysis by development stages

Based on the final sub-index and the EIDES values the following stages were determined:

- Laggards (EIDES below 35)
- Catchers-up (35 <EIDES≤ 45)
- Followers (45 <EIDES≤ 70)
- Leaders (EIDES over 70)

First the contribution of the final pillar values and the sub-indices to this grouping idea by development stages is to be checked. Analysis of variance (ANOVA)<sup>17</sup> is applied to see if the means are equal in the four groups, or, putting it another way, if the final pillars and the sub-indices show significant stochastic relationship with the development stages. Table A1 includes the results by pillars and Table A2 includes the results by sub-indices.

<sup>17</sup> The assumption of homogeneity of variances is not violated in any case, however, as the size of the groups is very limited, the results were double checked by Kruskal-Wallis nonparametric procedure and it had led to the same conclusions.

**Table A1. ANOVA results for development stages and pillars**

Structure	Pillar	F	Deviation ratio	
Contextual influences	Culture and informal institutions	66.96 ***	0.95	
	Formal institutions, regulation and taxation	90.27 ***	0.96	
	Market conditions	12.48 ***	0.78	
	Physical infrastructure	40.91 ***	0.91	
Entrepreneurship sub-dynamics	Stand-up	Human capital	38.69 ***	0.91
		Knowledge creation and dissemination	43.02 ***	0.92
		Finance	26.99 ***	0.88
		Networking and support	13.07 ***	0.79
	Start-up	Human capital	30.48 ***	0.89
		Knowledge creation and dissemination	31.07 ***	0.89
		Finance	27.35 ***	0.88
		Networking and support	2.81 *	0.51
	Scale-up	Human capital	56.56 ***	0.94
		Knowledge creation and dissemination	24.80 ***	0.87
		Finance	34.98 ***	0.90
		Networking and support	19.08 ***	0.84

\* p<0.1; \*\*\*p<0.001

**Table A2. ANOVA results for development stages and sub-indices**

Sub-index	F	Deviation ratio
Stand-up	118.24 ***	0.97
Start-up	145.14 ***	0.97
Scale-up	97.66 ***	0.96

In both tables (A1 and A2) the empirical F values, p-value indications (\*p<0.100; \*\*p<0.05 \*\*\*p<0.001) and the deviation ratio are included. The p-values are below 0.100 in each case, which means that the sub-indices as well as the pillars do have different mean values across the development stages. The deviation ratio suggests how strong is the relationship between the grouping criterion (development stage) and the quantitative variables (sub-indices and pillars). Relationships above 0.70 are considered as strong, between 0.30 and 0.70 as moderate and below 0.30 as weak. All the sub-indices and pillars indicate strong relationship with the development stages, which clearly justifies the results of the development stages.

Second, a pairwise comparison of the development stages was performed. As the group sizes are relatively small, the pairwise comparisons of the Kruskal-Wallis procedure were applied (instead of the post hoc tests of ANOVA) (Table A3 and A4).

**Table A3. Kruskal-Wallis pairwise comparisons of development stages by pillars**

Structure	Pillar	1-2	1-3	1-4	2-3	2-4	3-4	
Contextual influences	Culture and informal institutions	0.181	**	***	**	***	0.209	
	Formal institutions, regulation and taxation	0.189	**	***	*	***	*	
	Market conditions	0.866	0.103	**	*	***	0.134	
	Physical infrastructure	0.141	**	***	0.151	***	*	
Entrepreneurship sub-dynamics	Stand-up	Human capital	*	**	***	0.457	**	**
		Knowledge creation and dissemination	0.357	**	***	*	***	0.121
		Finance	0.155	**	***	*	**	0.241
		Networking and support	0.320	**	**	**	**	0.564
	Start-up	Human capital	0.142	**	***	0.166	**	*
		Knowledge creation and dissemination	0.323	**	***	*	***	0.159
		Finance	0.278	**	***	*	***	0.115
		Networking and support	0.172	**	**	0.513	0.127	0.330
	Scale-up	Human capital	0.160	**	***	0.104	***	0.104
		Knowledge creation and dissemination	0.273	**	***	*	***	0.226
		Finance	0.229	**	***	**	***	0.293
		Networking and support	0.518	**	**	**	***	0.288

**Table A4. Kruskal-Wallis pairwise comparisons of development stages by sub-indices**

Sub-index	1-2	1-3	1-4	2-3	2-4	3-4
Stand-up	0.189	**	***	*	***	*
Start-up	0.188	**	***	*	***	*
Scale-up	0.188	**	***	*	***	*

Table A3 and A4 presents the p-values of the Kruskal-Wallis pairwise comparisons. The significant differences indicate mainly the same pattern. The differences can be captured in the same way on the level of the pillars. Both tables suggests that differences are not significant at the lowest and highest levels (1-2 and 3-4), however the in-between (1-3, 2-4) differences still indicate the necessity of the four digital entrepreneurship development levels.

The same comparison steps had been applied to the so called "raw" pillars. Those pillar values of the conceptual influences were utilized that had been formulated from the basic variables, before any transformation of these pillars. They might be considered as raw pillar values. The same idea of analysing the original entrepreneurship sub-dynamics pillars was applied by using the normalized and average adjusted pillar values, before the penalized weighting (as this was the first stage where the pillar values had been formulated). It is also important to discover the relationship of the "original" values, e.g. the values of the pillars before adjustments, transformations and normalisation or before the weighting. The same ANOVA procedure, as described above, is proceeded for the raw pillar values. Table A5 presents the results.

**Table A5. ANOVA results for development stages and raw pillars**

Structure	Raw Pillar	F	Deviation ratio	
Contextual influences	Culture and informal institutions	21.03 ***	0.85	
	Formal institutions, regulation and taxation	40.83 ***	0.91	
	Market conditions	12.06 ***	0.78	
	Physical infrastructure	16.17 ***	0.82	
Entrepreneurship sub-dynamics	Stand-up	Human capital	25.45 ***	0.87
		Knowledge creation and dissemination	27.18 ***	0.88
		Finance	15.97 ***	0.82
		Networking and support	10.53 ***	0.75
	Start-up	Human capital	20.20 ***	0.85
		Knowledge creation and dissemination	19.12 ***	0.84
		Finance	15.27 ***	0.81
		Networking and support	1.82 (p=0,171)	0.43
	Scale-up	Human capital	33.88 ***	0.90
		Knowledge creation and dissemination	17.56 ***	0.83
		Finance	19.68 ***	0.84
		Networking and support	12.13 ***	0.78

The stochastic relationship between the development stages – set by the final EIDES values – and the raw pillars is significant and strong in every case, except for one, which is the Networking and Support. If we look back to the results of compensability effect analysis, we can realize that this is the same pillar, which had relatively low values in The Netherlands and in the United Kingdom. Most probably these nonconformist values cause the low empirical F value here. Altogether the strong relationship of the raw pillar values highly supports the adequacy of the transformation methods, as the final values kept the main characteristics of the original indicators.

**Table A6. Kruskal-Wallis pairwise comparisons of development stages by raw pillars**

Structure		Pillar	1-2	1-3	1-4	2-3	2-4	3-4
Contextual influences		Culture and informal institutions	0.263	**	***	**	***	0.384
		Formal institutions, regulation and taxation	0.422	**	***	**	***	0.200
		Market conditions	0.848	**	***	0.132	**	0.148
		Physical infrastructure	*	**	***	0.209	**	0.343
Entrepreneurship sub-dynamics	Stand-up	Human capital	0.116	**	***	0.457	**	**
		Knowledge creation and dissemination	0.682	**	***	**	***	0.121
		Finance	0.283	**	***	*	***	0.270
		Networking and support	0.438	**	**	**	**	0.608
	Start-up	Human capital	0.187	**	***	0.151	**	*
		Knowledge creation and dissemination	0.431	**	***	*	***	0.134
		Finance	0.402	**	***	*	***	0.127
		Networking and support						
	Scale-up	Human capital	0.208	**	***	*	***	0.134
		Knowledge creation and dissemination	0.489	**	***	**	***	0.228
		Finance	0.357	**	***	**	***	0.363
		Networking and support	0.637	**	**	**	***	0.282

The pairwise comparisons results (Table A6) of the raw pillars are very similar to the results of the final pillars validating the transformation procedures.

It can be concluded that the comparisons by development stages represent similar results after and before transformations of the pillars and also for the sub-indices. **The level of the performance of the countries seems to be captured correctly by the weighted pillars and the sub-indices. These facts support the theoretical and methodological background of EIDES.**

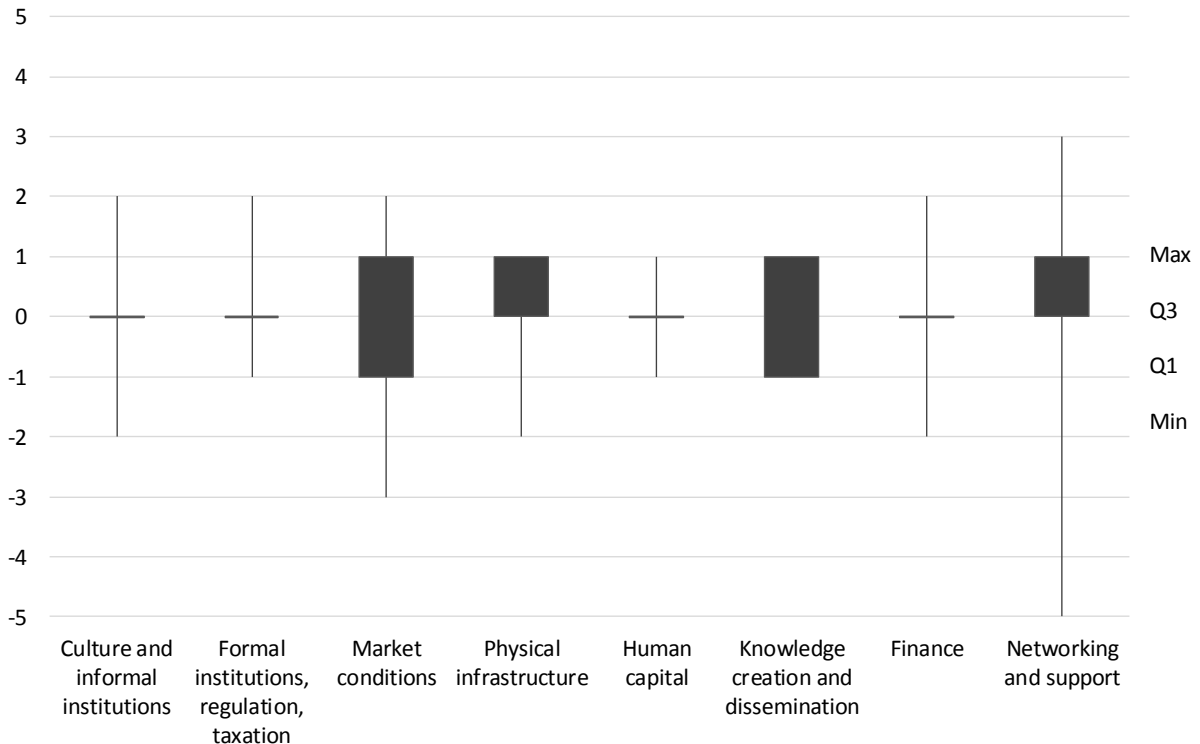
### 3. Drop out effect of the pillars

A typical test of the robustness of the result is to drop out one pillar at a time and view the changes in the rank of the regions (OECD 2008). It is an appropriate method to evaluate the balance among the pillars in EIDES. During this analysis EIDES values are calculated with the original methodology and the penalized weighting method, but we discarded one pillar at a time. So basically the weights just slightly changed (within a country the weight can be the lowest or the second lowest value during these simulations), however the effect of the missing pillar can be evaluated. The contextual influences pillars were dropped out individually. The entrepreneurship sub-dynamics pillars were removed from each phase (stand-up, start-up, scale-up) at the same time. Eight simulations were run to see the effect of excluding a pillar.

The box-plot figure (Figure A3) refers to the different simulations. It displays the minimum, maximum values together with the lower and upper quartile ( $Q_1$ ,  $Q_3$ ) values (range and interquartile range) of the distribution of the difference between the modified rank, obtained discarding one pillar, and the reference rank, computed on the basis of the original EIDES scores. The titles tells us, which pillar was excluded.

The interquartile range ( $Q_3-Q_1$ ) is between zero and two, which means that in each case the middle 50% of the rank changes is at most only two positions. It proves that the main characteristics and the order of the countries are captured correctly by the EIDES methodology. There are no pillars prevailing over the rest of the aspects and the overall result is a balanced outcome of the pillars. Looking at the full range (max-min) the lowest is two positions, while the highest is eight. As it could have been expected, discarding Networking and Support causes the highest diversity because of those three countries mentioned earlier.

**Figure A3. Distribution of the rank differences, discarding one pillar at a time**



Robustness analysis results in three different aspects supports the robustness of the REDI indicator. The results justify, that the index provides a synthetic picture of the European Index of Digital Entrepreneurship Systems for the EU countries, while representing a balanced diversity of the different aspects (pillars).

### References for Annex 2:

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### Annex 3. The structure and the description of the EIDES components

Table A7. General Framework Conditions (GFC)

GENERAL FRAMEWORK CONDITIONS (GFC)							
Indicators	Code	Dataset	Type of data	Unit of measurement	Description	Sources	Base period
CULTURE AND INFORMAL INSTITUTIONS (GFC_P1)							
<b>Ethics and Corruption</b>	GFC_P1_I1	World Economic Forum (WEF), Global Competitiveness Index	Aggregate	Likert scale (1-7)	Aggregate composite index of three indicators: <i>Diversion of public funds</i> In your country, how common is illegal diversion of public funds to companies, individuals, or groups? [1 = very commonly occurs; 7 = never occurs] <i>Public trust in politicians</i> In your country, how do you rate the ethical standards of politicians? [1 = extremely low; 7 = extremely high] <i>Irregular payments and bribes</i> Average score across the five components of the following Executive Opinion Survey question: In your country, how common is it for firms to make undocumented extra payments or bribes connected with (a) imports and exports; (b) public utilities; (c) annual tax payments; (d) awarding of public contracts and licenses; (e) obtaining favourable judicial decisions? In each case, the answer ranges from 1 [very common] to 7 [never occurs]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016-2017 weighted average
<b>Corruption Perception Index</b>	GFC_P1_I2	Transparency International	Aggregate	score	See "Source description" file, survey based database, detailed information about each country survey. CPI 2016 scores. <a href="https://www.transparency.org/news/feature/corruption_perceptions_index_2016#regional">https://www.transparency.org/news/feature/corruption_perceptions_index_2016#regional</a> (28/11/2017)	<a href="https://www.transparency.org/news/feature/corruption_perceptions_index_2016#regional">https://www.transparency.org/news/feature/corruption_perceptions_index_2016#regional</a> (28/11/2017)	2016 edition



<b>Ethical behaviour of firms</b>	GFC_P1_I3	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, how do you rate the corporate ethics of companies (ethical behaviour in interactions with public officials, politicians and other firms)? [1 = extremely poor—among the worst in the world; 7 = excellent—among the best in the world]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	Weighted average 2016–2017 (source date: 27/09/2017)
<b>Risk aversion</b>	GFC_P1_I4	Flash Eurobarometer Survey, 354 Entrepreneurship in the EU and beyond	Indicator	%	The percentage of people who disagreed with the statement: "One should not start a business if there is a risk it might fail" (Total disagrees, %)	<a href="http://ec.europa.eu/commfrontoffice/publicopinion/archives/flash_arch_360_345_en.htm#354">http://ec.europa.eu/commfrontoffice/publicopinion/archives/flash_arch_360_345_en.htm#354</a> (28/11/2017) T52 p.	2012
<b>Reliance on professional management</b>	GFC_P1_I5	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, who holds senior management positions in companies? [1 = usually relatives or friends without regard to merit; 7 = mostly professional managers chosen for merit and qualifications]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016–17 weighted average
<b>Willingness to delegate authority</b>	GFC_P1_I6	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, to what extent does senior management delegate authority to subordinates? (1 = Not at all; 7 = To a great extent)	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016–17 weighted average

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**FORMAL INSTITUTIONS, REGULATION, AND TAXATION (GFC\_P2)**


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<b>Rule of law (Property rights)</b>	GFC_P2_I1	Economic Freedom Index, Rule of Law pillar, Heritage Foundation	Aggregate	Score	The score for this component is derived by averaging scores for the following five sub-factors, all of which are weighted equally: Physical Intellectual property rights Strength of investor protection Risk of expropriation Quality of land administration <a href="http://www.heritage.org/index/exploration">http://www.heritage.org/index/exploration</a> (29/11/2017) <a href="http://www.heritage.org/index/book/methodology#rule-of-law">http://www.heritage.org/index/book/methodology#rule-of-law</a> (29/11/2017)	<a href="http://www.heritage.org/index/exploration">http://www.heritage.org/index/exploration</a> (29/11/2017)	2017 edition
<b>Rule of law (Judicial Effectiveness)</b>	GFC_P2_I2	Economic Freedom Index, Rule of Law pillar, Heritage Foundation	Aggregate	Score	The score for the judicial effectiveness component is derived by averaging scores for the following three sub-factors, all of which are weighted equally: Judicial independence Quality of the judicial process Likelihood of obtaining favourable judicial decisions <a href="http://www.heritage.org/index/book/methodology#rule-of-law">http://www.heritage.org/index/book/methodology#rule-of-law</a> (29/11/2017)	<a href="http://www.heritage.org/index/exploration">http://www.heritage.org/index/exploration</a> (29/11/2017)	2017 edition
<b>Effectiveness of anti-monopoly policy</b>	GFC_P2_I3	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, how effective are anti-monopoly policies at ensuring fair competition? [1 = not effective at all; 7 = extremely effective]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016-2017 weighted average
<b>Government effectiveness and accountability</b>	GFC_P2_I4	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, how efficient is the government in spending public revenue? [1 = extremely inefficient; 7 = extremely efficient]   2017	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016-17 weighted average

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<b>Effect of taxation incentives on invest</b>	GFC_P2_I5	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, to what extent do taxes reduce the incentive to invest? [1 = to a great extent; 7 = not at all]   2016-17 weighted average	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016-17 weighted average
<b>Total tax rate</b>	GFC_P2_I6	World Economic Forum Global Competitiveness Index, World Bank/International Finance Corporation, Doing Business 2017: Equal Opportunity for All	Indicator	%	This variable is a combination of profit tax (% of profits), labour tax and contribution (% of profits), and other taxes (% of profits)   2016	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016
<b>Burden of government regulation</b>	GFC_P2_I7	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, how burdensome is it for companies to comply with public administration's requirements (e.g., permits, regulations, reporting)? [1 = extremely burdensome; 7 = not burdensome at all]   2016-17 weighted average	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016-17 weighted average

## MARKET CONDITIONS (GFC\_P3)

<b>Domestic market size</b>	GFC_P3_I1	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	Sum of gross domestic product plus value of imports of goods and services, minus value of exports of goods and services, normalized on a 1-7 (best) scale. The size of the domestic market is calculated as the natural log of the sum of the gross domestic product valued at PPP plus the total value (PPP estimates) of imports of goods and services, minus the total value (PPP estimates) of exports of goods and services. Data are then normalized on a 1-7 scale. PPP estimates of imports and exports are obtained by taking the product of exports as a percentage of GDP and GDP valued at PPP.	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016 or most recent year available
<b>Urbanization</b>	GFC_P3_I2	World Population Prospects, United Nations, Department of Economic and Social Affairs	Indicator	%	Percentage of urban population	<a href="http://www.un.org/en/development/desa/population/theme/urbanization/index.shtml">http://www.un.org/en/development/desa/population/theme/urbanization/index.shtml</a> (29/11/2017)	2015
<b>Opportunity start-ups (Exploiting a business opportunity)</b>	GFC_P3_I3	Flash Eurobarometer Survey, 354 Entrepreneurship in the EU and beyond	Indicator	%	Why would you prefer to be self-employed rather than an employee? (Exploiting business opportunity) (% of people who answered the question)	<a href="http://ec.europa.eu/comfrontoffice/publicopinion/archives/flash_arch_360_345_en.htm#354">http://ec.europa.eu/comfrontoffice/publicopinion/archives/flash_arch_360_345_en.htm#354</a> (28/11/2017)	2012
<b>Opportunity start-ups (Better income prospects)</b>	GFC_P3_I4	Flash Eurobarometer Survey, 354 Entrepreneurship in the EU and beyond	Indicator	%	Why would you prefer to be self-employed rather than an employee? Better income prospects (% of people who answered the question)	<a href="http://ec.europa.eu/comfrontoffice/publicopinion/archives/flash_arch_360_345_en.htm#354">http://ec.europa.eu/comfrontoffice/publicopinion/archives/flash_arch_360_345_en.htm#354</a> (28/11/2017)	2012
<b>Extent of market dominance</b>	GFC_P3_I5	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, how do you characterize corporate activity? [1 = dominated by a few business groups; 7 = spread among many firms]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016-17 weighted average

<b>Foreign market size index</b>	GFC_P3_I6	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	Value of exports of goods and services, normalized on a 1-7 (best) scale. The size of the foreign market is estimated as the natural log of the total value (PPP estimates) of exports of goods and services, normalized on a 1-7 scale. PPP estimates of exports are obtained by taking the product of exports as a percentage of GDP and GDP valued at PPP.	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016 or most recent year available
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<b>Prevalence of trade barriers</b>	GFC_P3_I7	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, to what extent do non-tariff barriers (e.g., health and product standards, technical and labelling requirements, etc.) limit the ability of imported goods to compete in the domestic market? [1 = strongly limit; 7 = do not limit at all]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	Weighted average 2016-2017 (source date: 27/09/2017)
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## PHYSICAL INFRASTRUCTURE (GFC\_P4)

<b>Electricity and telephony infrastructure</b>	GFC_P4_I1	World Economic Forum (WEF), Global Competitiveness Index	Aggregate	Score	<i>Quality of electricity supply</i> In your country, how reliable is the electricity supply (lack of interruptions and lack of voltage fluctuations)? [1 = extremely unreliable; 7 = extremely reliable]   2016-17 weighted average <i>Mobile-cellular telephone subscriptions</i> Number of mobile-cellular telephone subscriptions per 100 population   2016 Source: International Telecommunication Union, ITU World Telecommunication/ICT Indicators (June 2017 edition) <i>Fixed-telephone lines</i> Number of fixed-telephone lines per 100 population   2016 Source: International Telecommunication Union, ITU World Telecommunication/ICT Indicators (June 2017 edition)	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016-17 weighted average
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**Transportation infrastructure**

GFC\_P4\_I2

World Economic Forum (WEF), Global Competitiveness Index

Aggregate

Likert scale (1-7)

*Quality of overall infrastructure* How do you assess the general state of infrastructure (e.g., transport, communications, and energy) in your country? [1 = extremely underdeveloped—among the worst in the world; 7 = extensive and efficient—among the best in the world] World Economic Forum, Executive Opinion Survey

*Quality of roads* In your country, what is the quality (extensiveness and condition) of road infrastructure? [1 = extremely poor—among the worst in the world; 7 = extremely good—among the best in the world] World Economic Forum, Executive Opinion Survey

*Quality of railroad infrastructure* In your country, what is the quality (extensiveness and condition) of the railroad system? [1 = extremely poor—among the worst in the world; 7 = extremely good—among the best in the world] World Economic Forum, Executive Opinion Survey.

*Quality of port infrastructure* In your country, what is the quality (extensiveness and condition) of seaports (for landlocked countries, assess access to seaports)? [1 = extremely poor—among the worst in the world; 7 = extremely good—among the best in the world] World Economic Forum, Executive Opinion Survey

*Quality of air transport infrastructure* In your country, what is the quality (extensiveness and condition) of airports? [1 = extremely poor—among the worst in the world; 7 = extremely good—among the best in the world] World Economic Forum, Executive Opinion Survey

*Available airline seat kilometres* Airline seat kilometres (in millions) available on all flights (domestic and international service) originating in country per week (year average) | Monthly average for 2017, International Air Transport Association, SRS Analyser

World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf> (27/11/2017) <http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/> (27/11/2017)

2016-2017 weighted average

<b>Quality of overall infrastructure</b>	GFC_P4_I3	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	How do you assess the general state of infrastructure (e.g., transport, communications, and energy) in your country? [1 = extremely underdeveloped—among the worst in the world; 7 = extensive and efficient—among the best in the world]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016–17 weighted average
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**Table A8. Systemic Framework Conditions (SFC)**

**SYSTEMIC FRAMEWORK CONDITIONS (SFC)**

**STAND-UP(S1)**

Indicators	Code	Dataset	Type of data	Unit of measurement	Description	Sources	Base period
<b>HUMAN CAPITAL (S1_SFC_P1)</b>							
<i>Quality of education</i>	S1_SFC_P1_I1	World Economic Forum (WEF), Global Competitiveness Index	Aggregate	score	Composite index of the following indicators: (1) Quality of math and science education, (2) Quality of math and science education, (3) Quality of management schools (4) Internet access in schools	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016-2017 weighted average
<i>Entrepreneurial attitude at schools</i>	S1_SFC_P1_I2	Flash Eurobarometer Survey, 354 Entrepreneurship in the EU and beyond	Indicator	%	My school education is helping/has helped me to develop my sense of initiative and a sort of entrepreneurial attitude (survey, % of those who answered the question)	<a href="http://ec.europa.eu/commfrontoffice/publicopinion/archives/flash_arch_360_345_en.htm#354">http://ec.europa.eu/commfrontoffice/publicopinion/archives/flash_arch_360_345_en.htm#354</a> (28/11/2017)	2012
<b>KNOWLEDGE CREATION AND DISSEMINATION (S1_SFC_P2)</b>							
<i>Country capacity to retain talent</i>	S1_SFC_P2_I1	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	To what extent does your country retain talented people? [1 = not at all—the best and brightest leave to pursue opportunities abroad; 7 = to a great extent—the best and brightest stay and pursue opportunities in the country]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016-2017 weighted average
<i>Country capacity to attract talent</i>	S1_SFC_P2_I2	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	To what extent does your country attract talented people from abroad? [1 = not at all; 7 = to a great extent—the country attracts the best and brightest from around the world]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016-2017 weighted average



## FINANCE (S1\_SFC\_P3)

<b>Domestic credit to private sector</b>	S1_SFC_P3_I1	International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates.	Indicator	% of GDP	Domestic credit to private sector refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment.	<a href="https://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS">https://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS</a> (30/11/2017)	2016
<b>Ease of access to loans</b>	S1_SFC_P3_I2	World Economic Forum; Global Competitiveness Report 2017-2018; <a href="http://www.weforum.org/gcr">www.weforum.org/gcr</a>	Indicator	Likert scale (1-7)	In your country, how easy is it for businesses to obtain a bank loan? [1 = extremely difficult; 7 = extremely easy]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	Weighted average 2016-2017 (source date: 27/09/2017)

## NETWORKING AND SUPPORT (S1\_SFC\_P4)

<b>Opinion about entrepreneurs</b>	S1_SFC_P4_I1	Flash Eurobarometer Survey, 354 Entrepreneurship in the EU and beyond	Indicator	%	What is your overall opinion about the following groups of people? Entrepreneurs (self-employed, business owners) (Broadly favourable, %) (survey)	<a href="http://ec.europa.eu/commfrontoffice/publicopinion/archives/flash_arch_360_345_en.htm#354">http://ec.europa.eu/commfrontoffice/publicopinion/archives/flash_arch_360_345_en.htm#354</a> (28/11/2017)	2012
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**START-UP (S2)**


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Indicator s	Cod e	Dataset	Type of data	Unit of measur ent	Description	Sources	Base perio d
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**HUMAN CAPITAL (S2\_SFC\_P1)**


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<b>Tertiary educatio n enrolmen t</b>	S2_SFC_P1_I1	World Economic Forum; Global Competitiveness Report 2017-2018; www.weforum.org/gcr, UNESCO Institute for Statistics, [i]Data Centre[i] (accessed July 12, 2016); national sources	Indicato r	%	The reported value corresponds to the ratio of total tertiary enrolment, regardless of age, to the population of the age group that officially corresponds to the tertiary education level. Tertiary education (ISCED levels 5 and 6), whether or not leading to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level.	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2015 or most recent year available
<b>Percenta ge of universiti es in top ranking</b>	S2_SFC_P1_I2	Webometrics Ranking of World Universities, CSIC	Indicato r	number of universities in TOP1000 / total number of universities	Countries arranged by Number of Universities in Top Ranks, Number of universities in TOP1000 ranking divided by the total number of universities, by country	<a href="http://www.webometrics.info/en/node/54">http://www.webometrics.info/en/node/54</a> (30/11/2017)	2017
<b>STEM educatio n</b>	S2_SFC_P1_I3	Eurostat	Indicato r	number of graduates / 1000 of population aged 20-29	Graduates in tertiary education, in science, math., computing, engineering, manufacturing, construction, by sex - per 1000 of population aged 20-29 [educ_uoe_grad04]	<a href="http://appsso.eurostat.ec.europa.eu/nui/show.do">http://appsso.eurostat.ec.europa.eu/nui/show.do</a> (30/11/2017)	2015

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<b>Human resources in science and technology</b>	S2_SFC_P1_I4	Eurostat	Indicator	number of population in the age group 25-64 / total active population aged 25-64, %	Human resources in science and technology (HRST) as a share of the active population in the age group 25-64. The data shows the active population in the age group 25-64 that is classified as HRST (i.e. having successfully completed an education at the third level or being employed in science and technology) as a percentage of total active population aged 25-64. HRST are measured mainly using the concepts and definitions laid down in the Canberra Manual, OECD, Paris, 1995.	<a href="http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcode=ts00025&amp;plugin=1">http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcode=ts00025&amp;plugin=1</a> (30/11/2017)	2016
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## KNOWLEDGE CREATION AND DISSEMINATION (S2\_SFC\_P2)

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<b>Quality of scientific research institutions</b>	S2_SFC_P2_I1	World Economic Forum; Global Competitiveness Report 2017-2018; <a href="http://www.weforum.org/gcr">www.weforum.org/gcr</a> , UNESCO Institute for Statistics, [i]Data Centre[i] (accessed July 12, 2016); national sources	Indicator	Likert scale (1-7) 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, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016–17 weighted average
<b>Technology adoption</b>	S2_SFC_P2_I2	World Economic Forum; Global Competitiveness Report 2017-2018; <a href="http://www.weforum.org/gcr">www.weforum.org/gcr</a> , UNESCO Institute for Statistics, [i]Data Centre[i] (accessed July 12, 2016); national sources	Aggregate	Score Composite index of the following three indicators: (1) Availability of latest technology, (2) Firm-level technology absorption, (3) FDI & technology transfer	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016–17 weighted average

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## FINANCE (S2\_SFC\_P3)

<b>Venture capital availability</b>	S2_SFC_P3_I1	World Economic Forum (WEF), Global Competitiveness Report	Indicator	Likert scale (1-7)	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, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016–17 weighted average
<b>Venture Capital funding</b>	S2_SFC_P3_I2	Dealroom.co	Indicator	million € per capita	Venture Capital funding, million €, per capita (2016-2017 average population)	<a href="https://app.dealroom.co/markets/countries/overview">https://app.dealroom.co/markets/countries/overview</a>	2016
<b>Number of VC investors</b>	S2_SFC_P3_I3	Dealroom.co	Indicator	investors per capita	Number of VC investors, per capita (2016-2017 average population)	<a href="https://app.dealroom.co/markets/countries/overview">https://app.dealroom.co/markets/countries/overview</a>	2016
<b>Number of VC invested firms</b>	S2_SFC_P3_I4	Dealroom.co	Indicator	invested firms GDP per capita	Number of VC invested firms, GDP per capita, PPP (current international \$, 2016)	<a href="https://app.dealroom.co/markets/countries/overview">https://app.dealroom.co/markets/countries/overview</a>	2016
<b>Business angel investment</b>	S2_SFC_P3_I5	EBAN Statistics Compendium European Early Stage Market Statistics	Indicator	investment million € per GDP per capita	Total business angel investment average of 2015-2016, €M per GCP per capita (PPP, current international \$, 2016)	<a href="http://www.eban.org/wp-content/uploads/2017/11/Statistics-Compendium-2016-Final-Version.pdf">http://www.eban.org/wp-content/uploads/2017/11/Statistics-Compendium-2016-Final-Version.pdf</a> (30/11/2017)	2015-2016 average
<b>Early phase VC</b>	S2_SFC_P3_I6	Venture Source, Dow Jones	indicator	VC funding per million GDP	VC funding (calculated as 3-year moving averages) per GDP (Current prices, million euro)	<a href="https://www.dowjones.com/products/pevc/#tab-1">https://www.dowjones.com/products/pevc/#tab-1</a> (02/12/2017)	2014-2016 average

## NETWORKING AND SUPPORT (S2\_SFC\_P4)

<b>EU Network places</b>	S2_SFC_PI_I1	EU Enterprise Network homepage	Indicator	number of places per million population	Enterprise Europe Network number of places , per 1 000 000 population	<a href="http://een.ec.europa.eu/content/international-partnerships-0">http://een.ec.europa.eu/content/international-partnerships-0</a>	2017.11.27
<b>EU Network members</b>	S2_SFC_PI_I2	EU Enterprise Network homepage	Indicator	number of members per million population	Enterprise Europe Network members , per 1 000 000 population	<a href="http://een.ec.europa.eu/content/international-partnerships-0">http://een.ec.europa.eu/content/international-partnerships-0</a>	2017.11.27

### SCALE-UP (S3)

Indicators	Code	Dataset	Type of data	Unit of measurement	Description	Sources	Base period
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### HUMAN CAPITAL (S3\_SFC\_P1)

<b>Lifelong learning</b>	S3_SFC_P1_I1	Eurostat	Indicator	%	Adult participation in learning (previously named 'lifelong learning') refers to persons aged 25 to 64 who stated that they received education or training in the four weeks preceding the survey (numerator). The denominator consists of the total population of the same age group, excluding those who did not answer to the question 'participation in education and training'. Both the numerator and the denominator come from the EU Labour Force Survey. The information collected relates to all education or training whether or not relevant to the respondent's current or possible future job.	<a href="http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcode=tsdsc440&amp;plugin=1">http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcode=tsdsc440&amp;plugin=1</a> (30/11/2017)	2016
<b>Extent of staff training</b>	S3_SFC_P1_I2	World Economic Forum Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, to what extent do companies invest in training and employee development? [1 = not at all; 7 = to a great extent]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016 or most recent year available

<b>Quality of management schools</b>	S3_SFC_P1_I3	World Economic Forum Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, how do you assess the quality of business schools? [1 = extremely poor—among the worst in the world; 7 = excellent—among the best in the world]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2016 or most recent year available
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<b>Labour freedom</b>	S3_SFC_P1_I4	Heritage Foundation	Aggregate	Score	How free is a country from legal regulation on the labour market, including those relating to minimum wages, hiring and firing, hours of work and severance requirements. Ratio of minimum wage to the average value added per worker, Hindrance to hiring additional workers, Rigidity of hours, Difficulty of firing redundant employees, Legally mandated notice period, and Mandatory severance pay.	<a href="http://www.heritage.org/index/labor-freedom">http://www.heritage.org/index/labor-freedom</a>	2017 edition
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## KNOWLEDGE CREATION AND DISSEMINATION (S3\_SFC\_P2)

<b>Gross domestic expenditure on R&amp;D (GERD)</b>	S3_SFC_P2_I1	Eurostat	Indicator	% of GDP	The indicator provided is GERD (Gross domestic expenditure on R&D) as a percentage of GDP. "Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications" (Frascati Manual, 2002 edition, § 63).	<a href="http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcod=e=t2020_20&amp;plugin=1">http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcod=e=t2020_20&amp;plugin=1</a> (30/11/2017)	average 2015-2016
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<b>Availability of scientists and engineers</b>	S3_SFC_P2_I2	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, to what extent are scientists and engineers available? [1 = not available at all; 7 = widely available]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	Weighted average 2016-2017 (source date: 27/09/2017)
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<b>PCT patent applications</b>	S3_SFC_P2_I3	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Number of patent / million population	Number of applications filed under the Patent Cooperation Treaty (PCT) per million population	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2013-2014 weighted average
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<b>Firm-level technology absorption</b>	S3_SFC_P2_I4	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, to what extent do businesses adopt the latest technologies? [1 = not at all; 7 = to a great extent]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	Weighted average 2016-2017 (source date: 27/09/2017)
<b>Capacity for innovation</b>	S3_SFC_P2_I5	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, to what extent do companies have the capacity to innovate? [1 = not at all; 7 = to a great extent]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	Weighted average 2016-2017 (source date: 27/09/2017)
<b>University-industry collaboration in R&amp;D</b>	S3_SFC_P2_I6	World Economic Forum (WEF), Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, to what extent do business and universities collaborate on research and development (R&D)? [1 = do not collaborate at all; 7 = collaborate extensively]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	Weighted average 2016-2017 (source date: 27/09/2017)
<b>Economic complexity</b>	S3_SFC_P2_I7	Observatory of Economic Complexity	Aggregate	Score	“The complexity of an economy is related to the multiplicity of useful knowledge embedded in it. Because individuals are limited in what they know, the only way societies can expand their knowledge base is by facilitating the interaction of individuals in increasingly complex networks in order to make products. We can measure economic complexity by the mix of these products that countries are able to make.” ( <a href="http://atlas.media.mit.edu/en/resources/economic_complexity/">http://atlas.media.mit.edu/en/resources/economic_complexity/</a> )	<a href="http://atlas.media.mit.edu/en/rankings/country/eci/">http://atlas.media.mit.edu/en/rankings/country/eci/</a>	2015-2016 average

## FINANCE (S3\_SFC\_P3)

<b>Later phase VC</b>	S3_SFC_P3_I1	Venture Source, Dow Jones	Indicator	VC funding per million GDP	VC funding (calculated as 3-year moving averages) per GDP (Current prices, million euro)	<a href="https://www.dowjones.com/products/pevc/#tab-1">https://www.dowjones.com/products/pevc/#tab-1</a> (02/12/2017)	2014-2016 average
<b>Depth of capital market</b>	S3_SFC_P3_I2	The Venture Capital & Private Equity Country Attractiveness Index Alexander Groh, Heinrich Liechtenstein, Karsten Lieser and Markus Biesinger	Aggregate	Score	<a href="http://blog.iese.edu/vcpeindex/about/">http://blog.iese.edu/vcpeindex/about/</a>	<a href="http://blog.iese.edu/vcpeindex/heat-map/">http://blog.iese.edu/vcpeindex/heat-map/</a> (30/11/2017)	2016
<b>Local equity market</b>	S3_SFC_P3_I3	World Economic Forum; Global Competitiveness Report 2017-2018; <a href="http://www.weforum.org/gcr">www.weforum.org/gcr</a>	Indicator	Likert scale (1-7)	In your country, to what extent can companies raise money by issuing shares and/or bonds on the capital market? [1 = not at all; 7 = to a great extent]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	Weighted average 2016-2017 (source date: 27/09/2017)
<b>Private Equity</b>	S3_SFC_P3_I4	European Private Equity Activity, Invest Europe	Indicator	% of GDP	2016 European Private Equity Activity - is the most comprehensive source for European private equity fundraising, investment and divestment data.	<a href="https://www.investeurope.eu/research/activity-data/annual-activity-statistics/?loc=2211">https://www.investeurope.eu/research/activity-data/annual-activity-statistics/?loc=2211</a> (30/11/2017)	2015-2016 average

## NETWORKING AND SUPPORT (S3\_SFC\_P4)

<b>State of cluster development</b>	S3_SFC_P4_I1	World Economic Forum Global Competitiveness Index	Indicator	Likert scale (1-7)	In your country, how widespread are well-developed and deep clusters (geographic concentrations of firms, suppliers, producers of related products and services, and specialized institutions in a particular field)? [1 = non-existent; 7 = widespread in many fields]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	Weighted average 2016-2017 (source date: 27/09/2017)
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<b>Business sophistication</b>	S3_SFC_P4_I2	World Economic Forum Global Competitiveness Index	Aggregate	Score	Composite index of the following indicators: Local supplier quantity, Local supplier quality, State of cluster development, Nature of competitive advantage, Value chain breadth, Control of international distribution, Production process sophistication, Extent of marketing, Willingness to delegate authority, Reliance on professional management	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017–2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	Weighted average 2016-2017 (source date: 27/09/2017)
<b>Logistic index</b>	S3_SFC_P4_I3	World bank	Aggregate	Likert scale (1-5)	Logistics performance index: Overall (1=low to 5=high)	<a href="https://lpi.worldbank.org/international/global">https://lpi.worldbank.org/international/global</a>	2016

**Table A9. Digital Framework Conditions (DFC)**

<b>DIGITAL FRAMEWORK CONDITIONS (DFC)</b>							
<b>Indicator</b>	<b>Code</b>	<b>Dataset</b>	<b>Type of data</b>	<b>Unit of measurement</b>	<b>Description</b>	<b>Sources</b>	<b>Base period</b>
<b>CULTURE AND INFORMAL INSTITUTIONS (DFC_P1)</b>							
<b>Households with personal computer</b>	DFC_P1_I1	World Economic Forum (WEF), Networked Readiness Index	Indicator	% of household	Percentage of households equipped with a personal computer	International Telecommunication Union (ITU), [i]ITU World Telecommunication/ICT Indicators Database 2015[i] (December 2015 edition), <a href="http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx">http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx</a>	2014 (2016 edition)
<b>Households with Internet access</b>	DFC_P1_I2	World Economic Forum (WEF), Networked Readiness Index	Indicator	% of household	Percentage of households with Internet access at home	International Telecommunication Union (ITU), [i]ITU World Telecommunication/ICT Indicators Database 2015[i] (December 2015 edition), <a href="http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx">http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx</a>	2014 (2016 edition)
<b>Individuals using Internet</b>	DFC_P1_I3	World Economic Forum (WEF), Networked Readiness Index	Indicator	% of individuals	Percentage of individuals using the Internet	International Telecommunication Union (ITU), [i]ITU World Telecommunication/ICT Indicators Database 2015[i] (December 2015 edition), <a href="http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx">http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx</a>	2014 (2016 edition)
<b>Enterprises having a website</b>	DFC_P1_I4	Eurostat	Indicator	% of enterprises	Percentage of enterprises having a website (% of enterprises)	<a href="http://appsso.eurostat.ec.europa.eu/nui/show.do">http://appsso.eurostat.ec.europa.eu/nui/show.do</a> (30/11/2017)	2016

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**FORMAL INSTITUTIONS, REGULATION, AND TAXATION (DFC\_P1)**


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<b>Law relating to ICTs</b>	DFC_P2_I1	World Economic Forum (WEF), Networked Readiness Index	Indicator	Likert scale (1-7)	How developed are your country's laws relating to the use of ICTs (e.g., e-commerce, digital signatures, consumer protection)? [1 = not developed at all; 7 = extremely well developed]	World Economic Forum, Executive Opinion Survey, The Global Competitiveness Report 2017-2018 <a href="http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf">http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf</a> (27/11/2017) <a href="http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/">http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/</a> (27/11/2017)	2014-15 weighted average
<b>Percentage of network attacks by Kaspersky</b>	DFC_P2_I2	Securelist	Indicator	% of users	It shows the percentages of users on whose devices Kaspersky Lab products intercepted Network attacks in the Last month. KL products' users are always protected from all – even the very latest – threats.	<a href="https://securelist.com/statistics/">https://securelist.com/statistics/</a>	2017
<b>Percentage of WEB treats</b>	DFC_P2_I3	Securelist	Indicator	% of users	It shows the percentages of users on whose devices Kaspersky Lab products intercepted Web threats in the Last month. KL products' users are always protected from all – even the very latest – threats.	<a href="https://securelist.com/statistics/">https://securelist.com/statistics/</a>	2017
<b>Software piracy rate</b>	DFC_P2_I4	World Economic Forum (WEF), Networked Readiness Index	Indicator	%	Unlicensed software units as a percentage of total software units installed	<a href="http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/">http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/</a>	2013
<b>Internet &amp; telephony competition</b>	DFC_P2_I5	World Economic Forum (WEF), Networked Readiness Index	Indicator	Likert scale (0-2)	Level of competition index for Internet services, international long distance services, and mobile telephone services on a 0-to-2 (best) scale	<a href="http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/">http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/</a>	2014

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<b>E-governme nt</b>	DFC_P2_I6	United Nations Department of Economic and Social Affairs Division for Public Administration and Development Management	Aggreg ate	Score	E-Government Development index incorporates the access characteristics, such as the infrastructure and educational levels, to reflect how a country is using information technologies to promote access and inclusion of its people. The EGDI is a composite measure of three important dimensions of e-government, namely: provision of online services, telecommunication connectivity and human capacity.	<a href="https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government">https://publicadministration.un.org/egovkb/en-us/About/Overview/-E-Government</a> (30/11/2017)	2016
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### MARKET CONDITIONS (DFC\_P3)

<b>Individual s using the internet for ordering goods or services</b>	DFC_P3_I1	Eurostat	Indicat or	% of individuals aged 16 to 74	Buy or order for private use. Within the last 12 months before the survey. Manually typed e-mails are excluded. % of individuals aged 16 to 74, Last online purchase: in the 12 months.	<a href="http://appsso.eurostat.ec.europa.eu/nui/show.do">http://appsso.eurostat.ec.europa.eu/nui/show.do</a> (02/12/2017)	2016
<b>Enterprise s having received orders via computer mediated networks, % of enterprise s</b>	DFC_P3_I2	Eurostat	Indicat or	% of enterprises	Enterprises having received orders online (at least 1%) - % of enterprises with at least 10 persons employed in the given NACE sectors, by size class. NACE Rev 2 since 2009 (break in series in 2009)	<a href="http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcode=tin00111&amp;plugin=1">http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcode=tin00111&amp;plugin=1</a> (02/12/2017)	2017
<b>Enterprise s' total turnover from e- commerce</b>	DFC_P3_I3	Eurostat	Indicat or	% from total turnover	Enterprises' receipts from sales through electronic networks as percentage from total turnover. Enterprises with at least 10 persons employed in the given NACE sectors, by size class. NACE Rev 2 since 2009 (break in series in 2009). Within the last calendar year before the survey.	<a href="http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcode=tin00110&amp;plugin=1">http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcode=tin00110&amp;plugin=1</a> (02/12/2017)	2016
<b>Enterprise s having done electronic sales to other countries</b>	DFC_P3_I4	Eurostat	Indicat or	% of enterprises	Enterprises having done electronic sales to other EU countries and the rest of the world, % of enterprises	<a href="http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_ec_eseln2&amp;lang=en">http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_ec_eseln2&amp;lang=en</a> (02/12/2017)	2015

<b>Enterprises having done electronic sales or purchases in the rest of the world</b>	DFC_P3_I5	Eurostat	Indicator	% of enterprises	Enterprises having done electronic sales or purchases in the rest of the world, % of enterprises	<a href="http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_ec_eseln2&amp;lang=en">http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_ec_eseln2&amp;lang=en</a> (02/12/2017)	2011
<b>T-index</b>	DFC_P3_I6	Translate.net	Indicator	Score	The T-Index is a percentage value that estimates the market share of each country in relation to global e-commerce. The higher the T-Index, the higher the online sales potential of a given country.	<a href="https://www.translated.net/en/languages-that-matter">https://www.translated.net/en/languages-that-matter</a> (02/12/2017)	2017
<b>Pay to advertise on the internet</b>	DFC_P3_I7	Eurostat	Indicator	% of enterprises	Percentage of enterprises paying to advertise on the internet (% of enterprises)	<a href="http://appsso.eurostat.ec.europa.eu/nui/show.do">http://appsso.eurostat.ec.europa.eu/nui/show.do</a> (30/11/2017)	2016
<b>PHYSICAL INFRASTRUCTURE (DFC_P4)</b>							
<b>Prepaid mobile cellular tariffs</b>	DFC_P4_I1	World Economic Forum (WEF), Networked Readiness Index	Indicator	PPP \$/Min	Average per-minute cost of different types of mobile cellular calls (PPP \$)	International Telecommunication Union (ITU), [i]ITU World Telecommunication/ICT Indicators Database 2015[i] (December 2015 edition), <a href="http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx">http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx</a>	2014 (2016 edition)
<b>Fixed broadband Internet tariffs</b>	DFC_P4_I2	World Economic Forum (WEF), Networked Readiness Index	Indicator	PPP \$/Min	Monthly subscription charge for fixed (wired) broadband Internet service (PPP \$)	International Telecommunication Union (ITU), [i]ITU World Telecommunication/ICT Indicators Database 2015[i] (December 2015 edition), <a href="http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx">http://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx</a>	2014 (2016 edition)
<b>Affordability</b>	DFC_P4_I3	World Economic Forum, [i]The Global Information Technology Report 2016[i]	Aggregate	Score	The affordability pillar (three variables) assesses the cost of accessing ICTs, either via mobile telephony or fixed broadband Internet, as well as the level of competition in the Internet and telephony sectors that determine this cost.	<a href="http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/">http://reports.weforum.org/global-information-technology-report-2016/networked-readiness-index/</a> (30/11/2017)	2014 (2016 edition)

<b>Average Download speed</b>	DFC_P4_I4	TestMy.net	Indicator	Mbit/s	Average Download speed Mbit/s	<a href="http://testmy.net/country">http://testmy.net/country</a>	2017 (07/12/2017)
<b>Average Upload speed</b>	DFC_P4_I5	TestMy.net	Indicator	Mbit/s	Average Upload speed Mbit/s	<a href="http://testmy.net/country">http://testmy.net/country</a>	2017 (07/12/2017)
<b>International Internet bandwidth (kb/s) per Internet user</b>	DFC_P4_I6	World Economic Forum (WEF), Networked Readiness Index	Indicator	kb/s	International Internet bandwidth refers to the total used capacity of international Internet bandwidth, in megabits per second (Mbit/s). It is measured as the sum of used capacity of all Internet exchanges offering international bandwidth. If capacity is asymmetric, then the incoming capacity is used. International Internet bandwidth (kbit/s) per Internet user is calculated by converting the speed from megabits to kilobits per second and dividing by the total number of Internet users.	<a href="http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf">http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf</a> (02/12/2017)	2015
<b>Speed</b>	DFC_P4_I7	Digital Economy and Society Index (DESI)	Indicator	Score	DESI Speed sub-dimension calculated as the weighted average of the normalized indicators: 1c1 NGA Coverage (50%), 1c2 Subscriptions to Fast BB (50%)	<a href="http://digital-agenda-data.eu/datasets/desi/indicators">http://digital-agenda-data.eu/datasets/desi/indicators</a> (02/12/2017)	2016
<b>Mobile network coverage</b>	DFC_P4_I8	World Economic Forum (WEF), Networked Readiness Index	Indicator	% of population	Mobile network coverage, % pop.	<a href="http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf">http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf</a> (02/12/2017)	2014
<b>Secure Internet servers</b>	DFC_P4_I9	World Economic Forum (WEF), Networked Readiness Index	Indicator	servers per million population	Secure Internet servers per million population	<a href="http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf">http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf</a> (02/12/2017)	2014

**Table A10. Systemic Digital Conditions (SDC)**

<b>SYSTEMIC DIGITAL CONDITIONS (SDC)</b>							
<b>STAND-UP (S1)</b>							
<b>Indicators</b>	<b>Code</b>	<b>Dataset</b>	<b>Type of data</b>	<b>Unit of measurement</b>	<b>Description</b>	<b>Sources</b>	<b>Base period</b>
<b>HUMAN CAPITAL (S1_SDC_P1)</b>							
<b>Internet access at place of education</b>	S1_SDC_P1_I1	Eurostat	Indicator	% of individuals	This indicator relates to all individuals aged 16 to 74 who accessed the internet within the last three months before the survey.	<a href="http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do">http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do</a> (02/12/2017)	2013
<b>Internet access in schools</b>	S1_SDC_P1_I2	World Economic Forum (WEF), Networked Readiness Index	Indicator	Likert scale (1-7)	In your country, to what extent is the Internet used in schools for learning purposes? [1 = not at all; 7 = to a great extent	<a href="http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf">http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf</a> (02/12/2017)	2014-2015 weighted average
<b>Individuals above basic digital skills</b>	S1_SDC_P1_I3	Eurostat	Indicator	% of individuals	Individuals who have above basic overall digital skills;% of individuals. The basic or above basic overall digital skills represent the two highest levels of the overall digital skills indicator, which is a composite indicator based on selected activities performed by individuals aged 16-74 on the internet in the four specific areas (information, communication, problem solving, content creation). It is assumed that individuals having performed certain activities have the corresponding skills; therefore the indicator can be considered as a proxy of the digital competences and skills of individuals. The indicator is based on the EU survey on the ICT usage in households and by individuals and is available for the years 2015 and 2016 (it will be compiled in 2017 as well).	<a href="http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_sk_dskl_i&amp;lang=en">http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_sk_dskl_i&amp;lang=en</a> (02/12/2017)	2015

## KNOWLEDGE CREATION AND DISSEMINATION (S1\_SDC\_P2)

<b>Open access of scientific documents</b>	S1_SDC_P1_I1	OECD Science, Technology and Industry Scoreboard 2017	Indicator	%	Open access of scientific documents, 2017 As a percentage of a random sample of 100 000 documents, OECD calculations based on Scopus Custom Data, Elsevier, Version 4.2017; and roadoi wrapper for the oaDOI API, <a href="https://oaDOI.org">https://oaDOI.org</a> , July 2017.	OECD Science, Technology and Industry Scoreboard 2017	2017
<b>Wikipedia yearly edits</b>	S1_SDC_P1_I2	Global Innovation Index 2017	Indicator	per million population 15-69 years old	Wikipedia yearly page edits (per million population 15-69 years old)	<a href="https://www.globalinnovationindex.org/gii-2017-report">https://www.globalinnovationindex.org/gii-2017-report</a>	2016
<b>YouTube video uploads</b>	S1_SDC_P1_I3	Global Innovation Index 2017	Indicator	scaled by population 15-69 years old	Number of video uploads on YouTube (scaled by population 15-69 years old)	<a href="https://www.globalinnovationindex.org/gii-2017-report">https://www.globalinnovationindex.org/gii-2017-report</a>	2016

## FINANCE (S1\_SDC\_P3)

<b>Digital payment transactions</b>	S1_SDC_P1	Statista	Indicator	transactions by million USD 2017 / GDP (current \$, 2015-2016 average)	Digital payment transactions by million USD 2017 / GDP (current \$, 2015-2016 average)	<a href="https://www.statista.com/statistics/276233/eu-member-states-with-the-most-cashless-payment-transactions/">https://www.statista.com/statistics/276233/eu-member-states-with-the-most-cashless-payment-transactions/</a> (24/11/2017)	2017
<b>Number of cashless payment transactions</b>	S1_SDC_P2	Statista	Indicator	transactions, million / GDP (current \$, 2015-2016 average)	Number of cashless payment transactions, million / GDP (current \$, 2015-2016 average)	<a href="https://www.statista.com/statistics/276233/eu-member-states-with-the-most-cashless-payment-transactions/">https://www.statista.com/statistics/276233/eu-member-states-with-the-most-cashless-payment-transactions/</a> (24/11/2017)	2017
<b>Internet banking</b>	S1_SDC_P3	Eurostat	Indicator	% of individuals	Percentage of individuals using internet banking (average of 2016-2017 data), internet banking includes electronic transactions with a bank for payment etc. or for looking up account information.	<a href="http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;plugin=1&amp;language=en&amp;pcode=tin0009">http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;plugin=1&amp;language=en&amp;pcode=tin0009</a>	2016-2017



## NETWORKING AND SUPPORT (S1\_SDC\_P4)

<b>Use of virtual social networks</b>	S1_SDC_P4_11	World Economic Forum (WEF), Networked Readiness Index	Indicator	Likert scale (1-7)	In your country, how widely are virtual social networks used (e.g., Facebook, Twitter, LinkedIn)? [1 = not at all used; 7 = used extensively]	<a href="http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf">http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf</a> (02/12/2017)	2014-2015 weighted average
<b>Participating in social networks</b>	S1_SDC_P4_12	Eurostat	Indicator	% of individuals	Internet use: participating in social networks (creating user profile, posting messages or other contributions to Facebook, twitter, etc.). % of individuals	<a href="http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database">http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database</a> (02/12/2017)	2016

## START-UP (S2)

Indicators	Code	Dataset	Type of data	Unit of measurement	Description	Sources	Base period
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## HUMAN CAPITAL (S2\_SDC\_P1)

<b>Employed ICT specialists</b>	S2_SDC_P1_11	Eurostat	Indicator	Employed ICT specialists per population	Employed ICT specialists per population	<a href="http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_sks_itspt&amp;lang=en">http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_sks_itspt&amp;lang=en</a> (02/12/2017)	2016
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## KNOWLEDGE CREATION AND DISSEMINATION (S2\_SDC\_P2)

<b>Employment in high tech and KIBs</b>	S2_SDC_P2_11	Eurostat	Indicator	% of total employment	Employment in high- and medium-high technology manufacturing sectors and knowledge-intensive service sectors as a percentage of total workforce	<a href="http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcode=tsc00011&amp;plugin=1">http://ec.europa.eu/eurostat/tgm/table.do?tab=table&amp;init=1&amp;language=en&amp;pcode=tsc00011&amp;plugin=1</a>	2010-2012
<b>Software developers</b>	S2_SDC_P2_12	Developer survey	Indicator	number per 1000 capita	Number of software developers per 1000 capita	<a href="https://insights.stackoverflow.com/survey/2016">https://insights.stackoverflow.com/survey/2016</a>	2016

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**FINANCE (S2\_SDC\_P3)**


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<b>Alternative finance</b>	S2_SDC_P3_4_I1	Cambridge Centre for Alternative Finance	Indicator	Euro per capita	Alternative Market Volume Per Capita by Country, red: Estimated data based on map, gathered data from 367 crowdfunding, peer-to-peer lending and other online alternative finance intermediaries	<a href="https://www.jbs.cam.ac.uk/fileadmin/user_upload/research/centres/alternative-finance/downloads/2016-european-alternative-finance-report-sustaining-momentum.pdf">https://www.jbs.cam.ac.uk/fileadmin/user_upload/research/centres/alternative-finance/downloads/2016-european-alternative-finance-report-sustaining-momentum.pdf</a>	2016
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**NETWORKING AND SUPPORT (S2\_SDC\_P4)**


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<b>Accelerator number</b>	S2_SDC_P4_I1	European Accelerator Report, gust	Indicator	per GDP per capita	EU MSs Accelerator Counts (EUR) / GDP per Capita (current prices, euro per capita)	<a href="http://gust.com/accelerator_reports/2016/europe/">http://gust.com/accelerator_reports/2016/europe/</a>	2016
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<b>Accelerator Amounts</b>	S2_SDC_P4_I2	European Accelerator Report, gust	Indicator	per GDP per capita	EU MSs Accelerator Amounts (EUR) / GDP per Capita (current prices, euro per capita)	<a href="http://gust.com/accelerator_reports/2016/europe/">http://gust.com/accelerator_reports/2016/europe/</a>	2016
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<b>Meetup Events</b>	S2_SDC_P4_I3	meetup.com	Indicator	per capita	Number of tech-related Meetup events per year and per day in Europe	<a href="https://www.meetup.com/">https://www.meetup.com/</a> (own calculation)	
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<b>Meetup Members</b>	S2_SDC_P4_I4	meetup.com	Indicator	per capita	Number of active members of tech-related Meetup groups by country	<a href="https://www.meetup.com/">https://www.meetup.com/</a> (own calculation)	
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**SCALE-UP (S3)**

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<b>Indicator s</b>	<b>Code</b>	<b>Dataset</b>	<b>Type of data</b>	<b>Unit of measureme nt</b>	<b>Description</b>	<b>Sources</b>	<b>Base period</b>
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**HUMAN CAPITAL (S3\_SDC\_P1)**

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<b>Internet use: looking for information</b>	S3_SDC_P 1_I1	Eurostat	Indicato r	% of individual	Internet use: looking for information about education, training or course offers,% of individuals	<a href="http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database">http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database</a> (02/12/2017)	2015
<b>Internet use: doing an online course</b>	S3_SDC_P 1_I2	Eurostat	Indicato r	% of individual	Internet use: doing an online course (of any subject)	<a href="http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database">http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database</a> (02/12/2017)	2016

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**KNOWLEDGE CREATION AND DISSEMINATION (S3\_SDC\_P2)**

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<b>Enterprises who have ERP software</b>	S3_SDC_P 2_I1	Eurostat	Indicato r	% of enterprises	Enterprises who have ERP software package to share information between different functional areas, % of enterprises	<a href="http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_eb_iip&amp;lang=en">http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_eb_iip&amp;lang=en</a> (03/12/2017)	2015
<b>Website has online ordering, reservation or booking</b>	S3_SDC_P 2_I2	Eurostat	Indicato r	% of enterprises	Website has online ordering, reservation or booking and at least one of: webacc, webctm, webot or webper	<a href="http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database">http://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database</a> (03/12/2017)	2016

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**FINANCE (S3\_SDC\_P3)**

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<b>Fintech</b>	S3_SDC_P 3_I1	dealroom.co	Indicato r	businesses per million capital	Number of financial technology businesses per 1 000 000 capita	<a href="https://app.dealroom.co/companies/f/industries/fintech/locations/Europe">https://app.dealroom.co/companies/f/industries/fintech/locations/Europe</a> (20/10/2017)	2017
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## NETWORKING AND SUPPORT (S3\_SDC\_P4)

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<b>ICT use for business-to-business transactions</b>	S3_SDC_P4_I1	WEF, Networked Readiness Index,	Indicator	Likert scale (1-7)	In your country, to what extent do businesses use ICTs for transactions with other businesses? [1 = not at all; 7 = to a great extent]	<a href="http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf">http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf</a> (02/12/2017)	2014-2015 weighted average
<b>Business-to-consumer Internet use</b>	S3_SDC_P4_I2	WEF, Networked Readiness Index,	Indicator	Likert scale (1-7)	In your country, to what extent do businesses use the Internet for selling their goods and services to consumers? [1 = not at all; 7 = to a great extent]	<a href="http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf">http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf</a> (02/12/2017)	2014-2015 weighted average
<b>Investment of telecommunications sector in networks</b>	S3_SDC_P4_I3	Eurostat	Indicator	Euro per capita	Investments of telecommunications sector in networks eur/capita	<a href="http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do">http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do</a>	2010-2012

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