



G5 Benchmark

THE BENCHMARK OF FIFTH GENERATION COLLABORATIVE REGULATION

Expert Report to the Review Board

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1. INTRODUCTION

The International Telecommunication Union (ITU) has been advocating in the past years the need to implement a new approach to ICT regulation, labelled fifth generation collaborative regulation. The underlying premise of such an approach is the need for countries to migrate to a regulatory and policy framework based on the collaboration among multiple sectors and cross-sector regulators within a scope that expands beyond the ICT space into that of the digital economy. In this context, as part of its Global ICT Regulatory Outlook, the ITU launched a pilot version of *The Benchmark of Fifth Generation Collaborative Regulation* (G5 Benchmark) in 2020, with the objective of tracking the evolution of regulatory frameworks and helping countries establish roadmaps towards the new paradigm. The pilot edition of the G5 Benchmark covered more than 80 countries and has proven, so far, to be a powerful and straightforward tool for policymakers and regulators that sets new goals for regulatory excellence. More importantly, the Benchmark has become a reference in topics such as collaboration amongst regulators, and a design tool of policy and legal instruments seeking to maximize digital transformation across all sectors of the economy.

As a result of the feedback received after publishing the pilot version, the ITU has conducted a reevaluation of the G5 Benchmark. While the objectives and scope remain the same, the refined G5 Benchmark is based on a different metric structure, a larger number of indicators, and a wider range of data sources. As part of the development process, the new Benchmark has been examined by a multi-stakeholder Review Board.¹

The following document presents the new version of the G5 Benchmark. Chapter 2 provides a review of the research literature on regulatory and policy metrics in the ICT and digital economy domains. Its purpose is to provide a basis upon which the refined Benchmark has been constructed. Chapter 3 details the three new dimensions that need to be addressed in the new Benchmark: an expanded scope moving from ICT into the digital economy, the consequent need for collaborative regulation across agencies, and the need for governments to develop a digital economy policy agenda. After formalizing the new requirements, Chapter 4 presents the structure of the Benchmark and its methodology of construction. It also includes several robustness tests that allow assessing the methodology. Chapter 5 presents the initial results of the G5 Benchmark with a discussion of initial forward-looking implications. The annexes present all supporting materials in terms of methodology followed for the development of the Benchmark.

The G5 Benchmark is based on self-reported information gathered via official ITU Surveys to Member States Administrations, datasets compiled by international organizations as well as desktop research based on official government sources and direct outreach to national telecom/ICT regulatory authorities. Official data received from Member States Administrations has been verified to the extent reasonably feasible. The research team endeavors to ensure the accuracy of data to the greatest extent possible; nevertheless, we do not warrant its completeness nor we exclude the possibility of irregular or odd values in rare cases.

¹ See members of the Review Board in Annex A.

2. RESEARCH ON REGULATORY AND POLICY INDICES IN ICT AND THE DIGITAL ECONOMY

The development of regulatory and policy metrics dealing with the telecommunications, information and digital economy sectors has been evolving since the year 2000, gradually encompassing wider areas of impact, and progressing in sequence across three bodies of work: (i) the assessment of trade barriers in telecommunications services, (ii) the development of telecommunications regulatory frameworks, and (iii) the expansion of scope of regulation to include the internet and digital sectors. Each body of research will be reviewed in turn.

2.1. Indices measuring trade barriers in telecommunications services

The first effort in the measurement of trade barriers in telecommunications services was conducted in 2000 by Tony Warren, a researcher at the Australian National University, who developed a Policy Index aimed at measuring the impediments to trade and investment in the sector. The author defined five pillars composing the policy index: (i) Trade, which captures policies that discriminate against all potential entrants seeking to supply cross-border telecommunications services, (ii) Investment (fixed), assessing policies that discriminate against all potential entrants seeking to supply fixed network services via investment in the country at issue; (iii) Investment (mobile) measuring policies that discriminate against all potential entrants seeking to supply cellular mobile services via investment in the country; (iv) Trade policies that discriminate against potential foreign entrants seeking to supply cross-border telecommunication services; and (v) Investment policies that discriminate exclusively against potential foreign entrants seeking to supply fixed or mobile telecommunication services through participating in the domestic industry.

Following on Warren's analysis, Lim et al. (2009) measured the height of barriers to trade and investment in the telecommunications industry in the Asia Pacific Economic Cooperation (APEC) countries. While the authors ranked the countries in the region using the methodology proposed by Warren (2000), they also developed a regulatory index using information from the WTO. This index was composed of five pillars: (i) competitive safeguards, which specified the prevention of anticompetitive activities such as cross subsidization, use of information obtained by competitors, and withholding of technical or commercial information; (ii) interconnection policy; (iii) universal service index; (iv) licensing; and (v) the existence of an independent regulator. After calculating each section score, the index was generated assuming equal weights and normalized to a 0-1 scale.

Within the same body of work of assessing trade in telecommunications services, Nordas et al. (2014) developed a Services Trade Restrictiveness Index focused on telecommunications services, including fixed, mobile, and broadband services. The index, in this case, was a calculation of sixty-four indicators taking values between zero and one, zero representing an open market and one a market completely closed to foreign services providers. The index was calculated for 40 countries, the 34 OECD members, Brazil, China, India, Indonesia, Russia, and South Africa in 2013. The scores ranged between 0.06 and 0.61, with a sample

average of 0.22. Barriers to competition, reflecting inadequate regulation of incumbents with significant market power, and state ownership in some countries made the largest contribution to the index value, followed by restrictions on foreign entry. As it can be seen, many indicators used in the calculation of the index were related to the assessment of a telecommunications regulatory framework, which is the subject of the second body of index work described in the section below.

2.2. Indices measuring the development of telecommunications regulatory and policy frameworks

Within the second body of research, the ECTA Scorecard was launched in 2001, with the objective of comparing the regulatory environment in EU Member States, Norway and Turkey in the electronic communications sector and its effectiveness in promoting the objectives of the EU regulatory framework. The Scorecard was structured around five pillars: (i) overall institutional environment, (ii) key enablers for market entry and network roll out, (iii) the regulatory process followed by a National Regulatory Agency (NRA), (iv) the application of regulation by the NRA, and (v) regulatory and market outcomes. Each question was answered using a maximum, intermediate and minimum scale. To aggregate the pillars, a weighted addition sum was used. Most questions were weighted 'medium', equivalent to a maximum possible score for each question of 4.7, to signify that, in the absence of any evidence to the contrary, it is assumed that they have an equal contribution to the effectiveness of regulation. A 'high' (9.5 points) or 'low' (2.4 points) weight was applied to balance the weightings in a particular section, such that there is neutrality in the weightings amongst the type of questions asked.

Along the same body of research, Gutierrez (2003) developed an index measuring the development of the regulatory framework in telecommunications. This index in this case, was based on three pillars. The first one assessed whether there is a separation between the telecommunications service provider and regulatory activities, although not necessarily whether there is a specialized and separate regulatory body. The second pillar provided a value to four features of independent telecommunications regulatory agencies: (i) whether the regulatory body is autonomous (e.g., whether there is budgetary independence or limits on government's ability to freely replace regulators), (ii) its accountability, measured by existence of mechanism to resolve disputes between regulators and operators, (iii) the clarity of the regulators' roles in terms of ability to set tariffs and fine or penalize operators, and (iv) transparency and participation in the regulatory process. The last dimension assessed whether the creation of the regulatory body (or the separation of the operating and regulatory activities) was backed by law or some norm, such as a presidential decree. The pillars were weighted and summed by assigning equal value to every component. For example, the first and third pillars, with just one component, had a weight of about 16.6% each, as did each of the four components of the second dimension. The index reflected a continuous growth to the extent that countries adopted new regulatory legislation.

Zenhausern et al. (2007) developed a Regulatory Density Index with the objective of comparing the intensity of regulatory environments in 27 European countries. The regulatory index was based on four pillars: (i) price regulation, (ii) quantity regulation, (iii)

market-entry regulation, and (iv) miscellaneous regulations relevant to investment incentives. Each pillar was based on several indicators which were assigned a value on a scale ranging from weak to strong intervention and were weighted differently from the ECTA Scorecard. For example, quantitative standards received even greater weight and approval obligations were weighted the heaviest. To determine a weighting scheme for each indicator with enough robustness, additional scenarios were calculated: a basic one where all areas weighted equally (25%) and four more where the weight of one section was twice that of the other three. The five scenarios were compared among themselves, and the authors found the results (and therefore, the index) not being sensitive to the aggregation rule.

2.3. Indices measuring the development of regulatory and policy frameworks applied to the digital economy

The extension of metrics focused on telecommunications and/or ICT sectors to the digital economy is a relatively recent trend. Most of the work in this area has been generated in the context of the development of digital economy indices, with regulation and policy representing one of the index pillars or sub-pillars. Consequently, there is no index capturing exclusively the development of regulatory and policy frameworks applied to the digital sector.

The Network Readiness Index (Dutta et al., 2020), originally developed by the World Economic Forum and INSEAD, contains a regulation sub-pillar composed of five indicators: (i) regulatory quality, (ii) ICT regulatory environment, (iii) Legal framework's adaptability to emerging technologies, (iv) e-commerce legislation, and (v) privacy protection by law content. The regulatory quality indicator captures perceptions of the ability of governments to formulate and implement sound policies as reported by the World Bank Worldwide Governance Indicators. The ICT Regulatory Environment is based on the ITU Regulatory Tracker Index. The adaptability of the legal framework and privacy protection indicators are based on survey responses, while the e-commerce legislation indicator is reported by UNCTAD.

In a similar vein, the CAF Digital Ecosystem Development Index (2020) has a particular pillar labelled Public Policies and Regulation, which is composed of two sub-pillars: (i) Regulatory Framework and (ii) Concentration of digital industries. The regulatory framework sub-pillar is a composite index of the ITU Regulatory Tracker clusters and the cybersecurity index.

2.4. Conclusion

In reviewing the research on measurement metrics of regulatory and policy frameworks in the ICT and digital economy sectors, three conclusions can be drawn.

First, there is no comprehensive metric addressing the complete regulation and policy framework. Each of the six ICT indices reviewed above focus on specific areas. ECTA (2001) is more focused in assessing the regulatory and institutional framework, while Gutierrez (2003) measures institutional strength/ Similarly, Zenhausern et al. (2007) focuses on the regulatory and policy framework, while (Warren (2000), Lim at al. (2009) and Nordas et al.

(2014) address only trade restrictions in telecommunications services with an occasional spill-over on the regulatory framework (see table 1).

Table 1. Specificity of Regulatory Indices

	ECTA SCORECARD	Index of regulatory density (Zenhausern et al., 2007)	Gutierrez (2003)	Index of Telecommunications Trade Policy (Warren, 2000)	Index of telecommunications trade barriers (Lim et al. (2009)	Index of telecommunications trade restrictiveness (Nordas et al. (2014)
Institutional Framework	X		X			
Regulatory Framework	X	X		X	X	
Trade and FDI regulation				X	X	X

Source: Analysis by the authors

Second, contrary to indices measuring sector performance (such as adoption, pricing, capital investment, productivity), the development of metrics for policy and regulatory frameworks, entail the potential challenge of implicit measurement subjectivity. In fact, the assumptions of the metric developer could be guiding the measurement of a particular policy. As an example, if a country has enacted sub-loop unbundling (question 99 of the ECTA scorecard), the score received is 1 (and conversely, 0 if unbundling does not exist). This decision assumes that network unbundling is the more favored policy in the development of broadband competition. Recognizing the potential subjectivity bias, indices measuring the development of policy and regulation are particularly useful when addressing the progress of a country toward a certain state that favors the overall development of the sector. Along those lines, in the impact assessment of specific policies, it would be recommended to consider the policy or regulation individually within a specific country context rather than considering the effect of aggregate index results. A similar recommendation could be made against overly relying on a ranking system based on such indices.

Third, while the ICT sector is evolving toward an integration within a digital economy scope, there is still no metric focused specifically in addressing the measurement of the regulation and policy framework of this universe. Indices focused on the digital economy tackle the regulatory dimension as a pillar or sub-pillar within an overall assessment of sector development.

These three considerations have been considered in the development the new G5 benchmark.

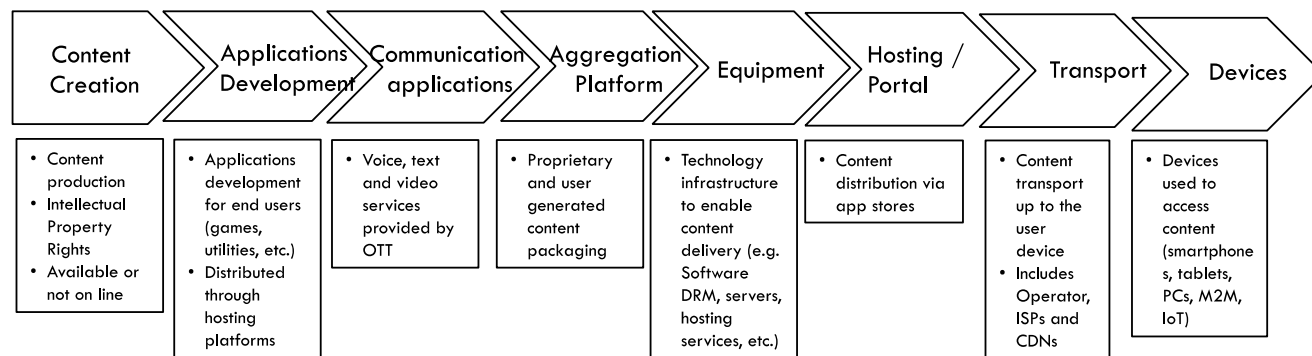
3. THE CURRENT INDUSTRY CONTEXT REQUIRES A NEW REGULATORY AND POLICY METRIC

3.1. The transition to a digital economy

The digital economy has been generally conceptualized and measured through two basic approaches. The more common approach has been to measure the output generated by industries that are part of the digital ecosystem, comprising the Information and Communications Technology sector (telecommunications, IT, and content industries), online platforms, electronic commerce, and collaborative/sharing platforms.² A more expansive approach includes all consumption of intermediate goods (telecommunications and information technology solutions) by the production sector of the economy. Following the second approach, the concept of digital economy encompasses two dimensions: (i) industries involved in the production of digital goods and services, (ii) the spillovers of digital technology on all economic sectors of a given country.

The first dimension is based on the output of industries that are part of the domestic digital ecosystem (telecommunications, IT, media, digital platforms, e-commerce, and collaborative/sharing platforms). In general terms, the concept involves all firms operating in the following production chain³ (see figure 1).

Figure 1. Production Chain of the Digital Economy



Source: Analysis by the authors

The digital economy production chain comprises firms operating within an ecosystem delivering content, applications and digital services to consumers, businesses, and

² Ahmad, Nadim, and Jennifer Ribarsky, 2017, *Issue Paper on a Proposed Framework for a Satellite Account for Measuring the Digital Economy*. and Abraham K., J. Haltiwanger, K. Sandusky K., and J. Spletzer, 2017, *Measuring the Gig Economy: Current Knowledge and Open Issues*.

³ We rely in this case on the concept of production chain originally developed by Stigler in his seminal article "The division of labor is limited by the extent of the market" *The Journal of Political Economy*, vol. 59, No. 3 (June 1951), pp. 185-193.

governments.⁴ The first three stages are focused in developing raw content, providing applications, and offering communications services. In the far left of the chain, content creation firms assume responsibility for developing and/or offering news, videos (e.g., YouTube), music (e.g., Spotify), etc. In the next step, several players develop applications and services, such as games (e.g., Zynga), electronic commerce (e.g., Amazon), and other utilities. In the next stage, the developers of communications applications operate private messaging (e.g., WhatsApp), VoIP (e.g., Skype) and video conferencing (e.g., Zoom) platforms. The aggregation platforms, located in the fourth stage, are either social and professional networks (e.g., Facebook, LinkedIn) or search platforms (e.g., Google, Bing, Baidu) that are a point of access to content, utilities and communications applications operating in the first three stages. The equipment stage comprises firms providing technology inputs to service providers, while the hosting stage of the production chain comprises a range of infrastructure companies supporting the ecosystem: data center operators, hosting services (e.g., IBM, Amazon Web Services), and companies that offer back-office services (such as authentication, billing, marketing, and analytics). The transport stage comprises traditional telecommunications operators providing connectivity, while the device suppliers are the manufacturers of smartphones, PCs, tablets, and associated software. While the weight of the digital sector of a country's GDP is a function of the size of the economy, it typically represents between 4 percent to 8 percent of a country's Gross Domestic Product (GDP).

Beyond the digital ecosystem output, digital spillovers reflect the multiplier effect that digital technology and business models have on the overall economy. This includes productivity gains across different business units, gains across players in the value chain, and faster growth among players in the digital sector. Spillovers also capture the multiplier effect from digital investments, leading to the development of new business models. For example, by matching demand with supply through mobile connectivity, business models based on the "gig" economy, in which people work flexibly, facilitate higher utilization and productivity. Spillovers increase with digital consumption of enterprises, from agriculture to logistics. The contribution of digital technologies to all sectors may reach up to 25% of the economy in some countries.⁵

The transition to digital economies is prompting governments to consider the need of an expansion of the conventional ICT regulatory and policy agenda. Given the fact that the economic and social impact of the digital economy production chain transcends that of ICT, the future regulatory interventions to be addressed within a policy metric must encompass other domains, ranging from content production to equipment manufacturing. In addition, based on externalities of the digital ecosystem, the assessment of policy and regulatory agendas needs to consider areas related to the promotion of innovation and digital transformation.

3.2. The need of a digital policy agenda

⁴ While less mentioned, digital services represent a critical approach to improving the delivery of public services and improve the efficiency of government administrative procedures.

⁵ Garcia Herrero, Alicia, and Jianwei Xu, 2017, *How big is China's Digital Economy?* Presented at the 5th IMF Statistical Forum.

Either through the output of digital industries or its spillovers, the digital economy has a significant contribution to a country's economy. An econometric model, developed to estimate of the contribution of the digital economy to economic growth, indicates that a 10 percent increase in the Digital Economy Development Index⁶ is associated with a 2.64% rise in GDP per capita. In other words, the model indicates that there is an economic return for a country that concentrates in not only developing its digital industries, but also promoting the digital transformation of the entire economy.

Moreover, by running the economic growth model for three groups of countries ranked by the development of their Digital Economy Development Index, the research indicated that the economic benefit of the digital economy is statistically significant and higher for the more advanced countries. In short, the higher the level of the digital economy, the more important is its contribution to economic growth. This "return to scale" effect supports the notion that countries should accelerate their development of the digital economy to maximize its impact.

A second econometric model, run to estimate the impact of the digital economy on job creation concluded that 10% increase in the Digital Development Index increases employment by 1.07%. Notwithstanding the potential social disruptions implied by the transition to a digitally intensive economy (such as job reskilling, and the disappearance of certain occupations), all in all employment appears to increase. However, when running the economic growth model by level of development of the Digital Economy Index, contrary to the "return to scale" found on the economic impact model described above, the contribution to employment in lesser developed countries is slightly higher than in more advanced ones. This is explained by the fact that, considering the lower cost of labor in less developed digital countries, digitization does not immediately result in a loss of jobs due to automation.

If the digital economy is critical to economic growth and job creation, its development is no longer a choice, but an imperative for any country. Beyond this natural growth, countries need to accelerate the development of their digital economy to achieve the goal of diversification, increase competitiveness in the global economy, meet burgeoning demand, and ensure economic resilience. In this context, policymakers need to act decisively, with particular emphasis in areas such as increasing capital spending in ICT infrastructure, deepening the talent pool, strengthening innovation, promoting the local development of digital industries, and fostering the digital transformation of enterprises in the rest of the economy. All these interventions point to the need of an active policy agenda that expands well beyond the ICT scope, through a collaboration with agencies and ministries involved in other sectors, such as logistics, industrialization, rural development, and the like. A metric capturing what countries are doing in this domain is necessary.

⁶ The Digital Economy Development Index (DDI) is structured around five pillars: digital foundation (that is to say, digital infrastructure), digital talent (which encompasses human capital), digital innovation (measuring innovative capacity and output), digital adoption among consumers and enterprises, and digital localization (economic weight of local digital industries). All five pillars are composite sub-indices of 86 indicators (El-Darwiche, et al., 2021).

3.3. The need for measuring cross-sector collaboration

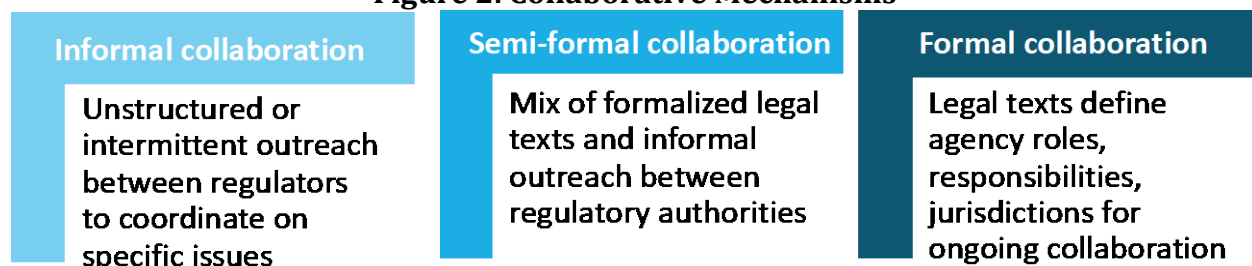
The gradual dominance of the digital economy within a nation's GDP and the consequent need to develop regulatory and policy approaches that go beyond the traditional scope of ICT is prompting the need to implement cross-sector collaboration. Countries need to recognize that they need to transition away from regulatory interventions and policies discussed and implemented in silos within one agency or ministry. Going forward, regulatory and policy development frameworks should be implemented cross-sectionally in a collaborative fashion. Regulation of the ICT sector should be consolidated across several adjacent sectors, such as media, and the Internet, while also coordinated with other infrastructures, to identify opportunities for cross-sectional proactive intervention.

Collaboration should be defined in terms of breadth and depth. Breadth of collaboration refers to whether the ICT regulator coordinates with authorities in charge of competition, consumer protection, finance, energy, broadcasting, spectrum, management, and Internet issues. Depth of collaboration considers whether regulators have engaged in informal, formal collaboration, or have put in place other hybrid mechanisms.

Collaboration within government involves various agencies working together on a common issue. This often entails the ICT regulator sharing responsibilities or creating strategies that overlap with other sectoral agencies' jurisdictions. As digitization impacts and becomes an integral component of other sectors (such as logistics and energy), inter-agency collaboration becomes crucial to ensuring regulatory certainty and continuity across all industries.

There is no single approach to collaboration mechanisms. They can range from informal to formal modes along three levels (see figure 2).

Figure 2. Collaborative Mechanisms



Source: ITU

Collaboration comes in many shapes and forms, in different countries and across various agencies. There is no uniform approach for collaboration to work and deliver a positive outcome. Sometimes, informal collaboration (such as ad-hoc coordination meetings) stands out with its flexibility but may also bring uncertainty regarding results. On the other hand, formal collaboration (such as developing cross-ministerial committees) brings a degree of stability but may prove rigid under certain circumstances. The relevance of inter-

agency collaboration is prompting the need to develop a metric that measures its intensity within the development of regulation and policy making in the digital economy.

4. THE G5 BENCHMARK

As explained above, the development of the G5 benchmark index was prompted by the need to measure how countries transition to a holistic digital collaborative regulation and policy making in the digital economy. The review of the research literature on metrics measuring ICT regulation and policy making showed how they have gradually evolved from a very circumscribed notion of telecommunications trade regulation to an ICT sector view, while still having limitations in terms of addressing the new digital economy dynamics. The development of ICT markets and the emergence of the digital economy as an all-encompassing sector that has taken place in the past ten years has put increased pressure to update the existing indices. Among the most important trends, we could mention:

- The state has often moved out of market operations to leave private sector initiative shape market dynamics.
- Separate regulators have been created to oversee sector markets (e.g., energy, financial services);
- Regulations have evolved from obligation-based to incentive-based;
- The decision-making processes have become more inclusive, incorporating perspectives from consumers, the private sector, and civil society;
- Consumer welfare and the impact of ICT on economic development, in addition to market concentration, have come into the center of regulators' attention;
- Data-driven evidence has become the basis of policy and decision-making; and
- The future impact of regulation has become a primary consideration in regulatory processes.

In this context, the International Telecommunication Union believes it is necessary to define a metric that allows countries to understand their position in the transition to the next frontier in the regulatory and policy-making environment. Following this requirement, the G5, which stands for Fifth Generation Regulation, was developed with the following objectives:

- Conceived as a tool for policymakers and regulators that captures the essence of collaborative regulation and sets new goals for regulatory excellence;
- Measuring collaboration amongst regulators and reference standards for policy and regulatory design to maximize digital transformation across all the economy; and
- Enhancing the ICT Regulatory Tracker, the G5 Benchmark by focusing on the digital economy, rather than only the telecom/ICT sector.

The Benchmark offers perspectives on the regulatory road already travelled as well as on the pathways into the future. From that perspective, it intends to reflect how digital transformation is shifting regulatory perspective and patterns and the need for new tools. In addition, it aims to reveal regulatory gaps, and help with building custom roadmaps for navigating the digital transformation. In doing so, it facilitates the high-value debate on the future of markets and regulation.

The tool makes possible benchmarking the performance of a country against trends in digital economy policy making and regulatory frameworks and identifies potential gaps, providing the bases for further reform. The Benchmark does not measure the performance of the regulatory and policy frameworks or the level of development of the digital economy. It only assesses the level of framework evolution against best practices, excluding any indicators related to level of development of the digital economy.

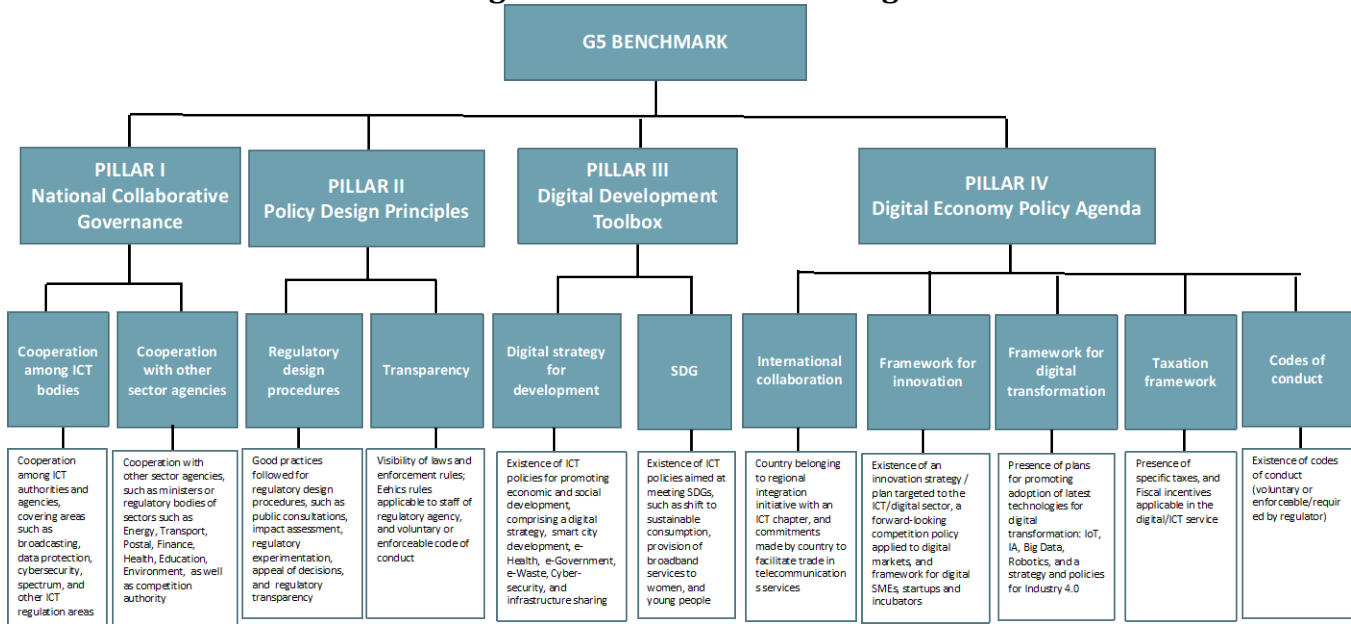
4.1. Benchmark design

The Benchmark overall score is calculated based on sixty-six indicators (in some cases, some indicators are consolidated into a composite one, meaning that ultimately, the number of indicators feeding into the Benchmark calculation is 52) grouped around four pillars: (i) National Collaborative Governance, (ii) Policy Design Principles, (iii) Digital Development, and (iv) Digital Economic Policy Agenda. Each pillar focuses in a specific institutional, process, and framework of regulation and policy making:

- Pillar I (National Collaborative Governance) measures the breadth and depth of cross-sector collaboration between the ICT regulator and its peers. The pillar factors in the institutional set-up (agencies and their mandate) as well as practices around regulatory collaboration, formal and informal.
- Pillar II (Policy Design Principles) focuses on the design of frameworks and what keeps them together. Today's effective regulators aim to rely on sound policy principles, tried-and-tested institutional wisdom and a vanguard spirit – from infrastructure investment to consumer protection to data privacy.
- Pillar III (Digital Development Toolbox) focuses on the tools needed by regulators to stimulate development of a sustainable digital economy. It considers the new consumer needs, business models and market dynamics.
- Finally, the focus of Pillar IV (Digital Economic Policy Agenda) is, as indicated in its name, the policies and interventions taken by a country to promote the development of the digital economy. They range from an innovation framework to digital transformation, to sector taxation, and international linkages.

Each Pillar is composed in turn of sub-components, all of them focused on policy and regulatory frameworks within the digital economy (see figure 3).

Figure 3. G5 Benchmark design



Source: ITU

Each component is composed of multiple indicators. In total, the Benchmark comprises 66 indicators, although some are aggregated within an interim subcomponent, becoming 52 indicators after grouping (see table 2).

Table 2. G5 Index Component Structure

Pillars	Components	Indicators
Pillar I: National Collaborative Governance	Cooperation among ICT bodies	Collaboration with (Independent) Spectrum Authority/
		Collaboration with (Independent) Broadcasting (content) Authority
		Collaboration with Cybersecurity agency
		Collaboration with CERT (Computer Emergency Response Team)
		Collaboration with (Independent)
		Collaboration with ICT ministry OR ICT regulator AND Information Society Agency
	Cooperation with other sector agencies	Collaboration with (Independent) Finance Regulator
		Collaboration with Energy regulatory Authority
		Collaboration with Transport regulatory Authority
		Collaboration with (Independent) Competition Authorities
		Collaboration with Postal regulation Authority
		Collaboration with (Independent) Consumer Protection Authority, Data Protection Authority
		Collaboration with Ministry of Health (e-health)
		Collaboration with Ministry of Education (e-education)
Collaboration with Ministry of Environment (e-waste)		
Collaboration with Ministry of Economic development OR similar focusing on a single or a subset of economic sector/s, e.g., Industry, Agriculture, Fishery)		
Pillar II: Policy Design Principles	Regulatory design procedures	Are public consultations designed as a tool to gather feedback from national stakeholders and guide regulatory decision-making?
		Is there a formal requirement for Regulatory Impact Assessment (RIA) before regulatory decisions are made AND/OR ex-post or rolling reviews?

		Are the decisions of the regulatory authority (entity in charge of regulation) subject to a general administrative procedures law?		
		Can affected parties request reconsideration or appeal adopted regulations to the relevant administrative agency (all sectors)?		
		Are national policy and regulatory frameworks technology and service-neutral?		
		Regulatory experimentation	Are there mechanisms for regulatory experimentation?	
			Are there regulatory sandboxes for digital financial inclusion?	
		Policy reviews	Do ministries/regulatory agencies conduct ex-post policy reviews?	
	Do ministries/regulatory agencies conduct policy rolling reviews?			
	Transparency	Are the laws (all sectors) that are currently in effect available on a single website managed by the government?		
		Is public access to information ensured and fundamental freedoms protected, in accordance with national legislation and international agreements?		
		Are there ethics rules in place that apply to the regulator's staff, including Head/Chairperson and Members/Commissioners (e.g., improper acceptance of gifts, personal and financial conflicts of interest, post-employment obligations, etc.)?		
Pillar III: Digital Development Toolbox	Digital strategy for development	Strategy design and implementation	Is there an overarching digital strategy in place?	
			The digital strategy has mechanisms for implementation/ operational objectives?	
		Is broadband considered as part of UAS definition?		
		Is there a digital identity framework in place?		
		Is there an e-gov/ Digital first for government / National e- government strategy or equivalent?		
		Has your country adopted e-waste regulations or e-waste management standards?		
		Does a regulatory framework exist for ICT accessibility for persons with disabilities?		
		Public Services	Has your country adopted any policy/legislation/regulation related to Smart Cities?	
			Has your country adopted any policy/legislation/regulation related to e-Health or Smart Health?	
			Has your country adopted any policy/legislation/regulation related to e-applications and/or m-applications on Education and Learning?	
		Cybersecurity	Is there cybersecurity legislation or regulation?	
			Has your country signed or ratified the Budapest convention on cybersecurity?	
		Data Protection	Are there formal data protection rules (e.g., law, regulations)?	
			Has your country signed on international agreements determining jurisdiction and/or managing cross border flows on data privacy?	
		Emergency Situations	Has your country signed or ratified the Tampere convention for communications in emergency situations?	
			Does a National Emergency (Telecommunications) Plan exist?	
		Infrastructure Sharing	Does an official register or a mapping exist in your country of all telecommunication/ICT infrastructure?	
			Is there any cross-sector (ICT and other) infrastructure sharing or fiber co-deployment regulations/ agreements/promotion initiatives in your country?	
		SDG	Is the digital strategy SDG-oriented OR has a specific mention of or reference to SDGs or other international development goals (e.g., MDGs, WSIS goals, EU Strategic objectives)?	
			Are there policy instruments aimed at supporting the shift to sustainable consumption and production, or coordination mechanism for sustainable consumption and production?	
			Is there a developed and operationalized global strategy for youth employment and to implement the Global Jobs Pact of the ILO?	
			Strategies for targeted groups	Broadband plan / initiative includes to promote the provision of broadband services to women and girls

			Broadband plan / initiative includes to promote the provision of broadband services to persons with disabilities?	
			Broadband plan / initiative includes to promote the provision of broadband services to youth people	
Pillar IV: Digital Economy Policy Agenda	International collaboration	Does your country belong to regional integration initiatives with ICT chapters?		
		Has your country have made commitment to facilitate trade in telecommunications services?		
	Framework for innovation	Is there a holistic innovation policy or one tailored to the ICT/digital sector?		
		Is there a forward-looking competition policy, law or regulation applied to digital markets?		
	Framework for digital transformation	Has your country adopted a forward-looking or innovative national strategy, policy or initiative focusing on spectrum (e.g., IMT-2000, 5G, FWA, satellite, HAPS, 6 GHz)?		
		Are there policies and regulations for e-commerce/e-transactions?		
		Policies for specific sectors	Does the digital strategy include multiple sectors of the economy?	
			Has your country adopted any policy/legislation/regulation related to e-apps and/or m-apps linked to Agriculture/Science/Financial Services?	
		Industry 4.0	Does it include a strategy, policy or initiative focusing on IoT? Or applied any measure regarding spectrum management and availability for IoT?	
			Has your country adopted any policy/legislation/regulation related to cloud computing?	
	Has your country adopted a national strategy, policy or initiative focusing on AI?			
	Taxation framework	Are there specific taxes on the telecom/digital sector OR on Internet services?		
Are there regulatory incentives targeted at network operators or other digital market players?				

Source: ITU

4.2. Benchmark construction methodology

As is the case in the development of any composite metric, the construction of the G5 benchmark entailed addressing three main technical issues: scoring, weighting, and aggregation:

- Scoring relates to how regulatory and policy measures are transformed from qualitative to quantitative information.
- Weighting captures the relative importance of each indicator.
- The aggregation method determines how weights are applied to scores for calculating the index number.

In the case of scoring, each indicator was assigned a code between 0 and 2, where 2 is the best possible scenario based on internationally recognized best practices. Those were laid out in the 2019 Global Symposium of Regulators Best Practices Guidelines “Fast forward digital connectivity for all”, as well as the series of GSR Best Practice Guidelines adopted by the global community of ICT regulators since 2003.

The source of qualitative data used for scoring was self-reported information compiled from the answers to the ITU World Telecommunications Regulatory Survey⁷, desktop research, World Bank sources, the United Nations sources (UNCTAD, UNCTC), World Trade Organization (WTO), the Consultative Group to Assist the Poor (CGAP) and the Council of Europe, complemented with direct outreach to ICT regulatory authorities. The score for each indicator was determined according to the detailed methodology included in annex B. In the case data is not available for a particular indicator in each country, the score is treated as zero. While this penalizes countries with omitted values, it also assumes that non-available data and no answer to a survey question indicates that the country has not adopted the given policy instrument.

The aggregation of the final score is calculated by summing up the scores of each pillar. Given that each pillar has a different composition in terms of indicators, implicitly their relative importance over the overall score is determined by the number of indicators within. The score is normalized to reach values between zero and 100, according to the following formula:

$$Overall\ Score = \left(\frac{\sum_{i=1}^4 Score\ Pillar_i}{Max\ possible\ score} \right) * 100$$

Based on the scoring methodology, the maximum score attainable by a country is 100 and would be composed of the following Pillar scores (see table 3).

Table 3. Maximum Pillar Score

Pillars	Component	Maximum Component Score	Maximum Pillar Score	Maximum Index Score	Maximum Index Score (normalized)
Pillar I: National Collaborative Governance	Cooperation among ICT bodies	12	32	104	100
	Cooperation with other sector agencies	20			
Pillar II: Policy Design Principles	Regulatory design procedures	14	20		
	Transparency	6			
Pillar III: Digital Development Toolbox	Digital strategy for development	22	30		
	SDGs	8			
Pillar IV: Digital Economy Policy Agenda	International collaboration	4	22		
	Framework for innovation	4			
	Framework for digital transformation	8			
	Taxation framework	4			
	Code of conduct	2			

Source: ITU

⁷ The G5 Benchmark is based on self-reported information gathered via official ITU Surveys to Member States Administrations, datasets compiled by international organizations as well as desktop research based on official government sources and direct outreach to national telecom/ICT regulatory authorities. Official data received from Member States Administrations has been verified to the extent reasonably feasible.

The index was calculated for 158 countries for 2020. Once calculated, the final G5 Benchmark score was split into three stages of collaborative regulation (see table 4 for an indicative summary of the characteristics of each of the stages).

Table 4. Benchmark score thresholds

Fulfillment of G5 Benchmark	National Collaborative Governance	Policy Design Principles	Digital Development Toolbox	Digital Economy Policy Agenda	Maximum Score	Minimum Score
Limited	<ul style="list-style-type: none"> • No collaboration • No entity in charge 	<ul style="list-style-type: none"> • Public consultations are not undertaken or required by law • No formal requirement for Regulatory Impact Assessment • The decisions of the regulatory authority are not subject to a general administrative procedures law • Affected parties may not request reconsideration or appeal of regulations adopted by the administrative agency • Authorization/operating licences or spectrum, are not technology and service neutral • No mechanisms for regulatory experimentation or sandboxes exist • No ex-post regulatory policy reviews 	<ul style="list-style-type: none"> • No overarching digital strategy in place • No digital identity framework • No e-government strategy in place • No existence of policy/legislation/regulation for Smart Cities, e-Health, and applications for education and learning • No cybersecurity/cybercrime legislation and/or regulation in existence • There is neither a data protection law nor a data protection agency • No National Emergency Telecommunications Plan 	<ul style="list-style-type: none"> • No holistic innovation strategy tailored to the ICT sector • No forward-looking competition policy, law or regulation applied to digital markets • No policies and regulations for e-commerce transactions in place • No strategy, policy or initiative focusing on IoT • Taxes on the telecommunications and digital sector exist 	30	0
Transitioning	<ul style="list-style-type: none"> • Activities carried under the same ministry • Informal collaboration 	<ul style="list-style-type: none"> • Public consultations exist but there is no requirement/it is unclear what the timeline and process is and whether the regulator incorporates results in their decision-making/ there is no obligation to consider/respond to all comments • Regulatory Impact Assessment is required but it is not consistently applied to all decisions • There is an administrative review by the regulatory body • Authorization/operating licences or spectrum, are either technology or service neutral (with exceptions) 	<ul style="list-style-type: none"> • Overarching digital strategy expired, or being planned, is part of a broader development strategy, only covering specific plans or not clearly implemented • Partial measures regarding cybersecurity and cybercrime regulation • Data protection law exists but a data protection agency has not been established 	<ul style="list-style-type: none"> • Forward looking competition policy, law or regulation applied to digital markets, or spectrum management processes in the process of definition • Rules at regional level exist but country has not yet formulated national rules to match them, or no monitoring and enforcement of rules exist or, if they do, they have limited provisions 	60	30

Advanced	Formal collaboration (Joint Program of Committee)	<ul style="list-style-type: none"> Public consultations designed as a tool to gather feedback from national stakeholders and guide regulatory decision-making Regulatory Impact Assessment is required for all decisions The decisions of the regulatory authority are subject to a general administrative procedures law Affected parties may request reconsideration or appeal to an independent body or the judiciary of regulations adopted by the administrative agency Authorization, operating licenses, and spectrum are technology and service neutral Mechanisms for regulatory experimentation or sandboxes exist Systematic ex-post policy reviews Laws that are currently in effect available on a single website managed by the government 	<ul style="list-style-type: none"> Existing of current and updated digital strategy in place Digital identity framework in place Existence of a national e-government strategy or equivalent Existence of policy/legislation/regulation for Smart Cities, e-Health, and applications for education and learning Full cybersecurity and cybercrime legislation and regulatory framework Existence of a law and data protection agency Existence of a National Emergency Telecommunications Plan Mention of SDG or other international development goals mentioned in the digital strategy 	<ul style="list-style-type: none"> Existence of a holistic innovation strategy tailored to the ICT sector Forward looking competition policy, law or regulation applied to digital markets or spectrum management processes Policies and regulations for e-commerce transactions in place Strategy, policy, or initiative focusing on IoT Tax exemptions for the telecommunications and digital sectors 	100	60

Source: ITU

4.3. Test of benchmark robustness

In this section the G5 benchmark is analyzed from a statistical viewpoint to assess the theoretical coherence of the conceptual framework and the impact of its key assumptions on the final country scores and rankings. The procedures to be followed in this section are based on the analysis carried out by ITU (2020) for the ICT Regulatory Tracker and in Nordas et al. (2014) for the OECD. The results presented herein suggest that the Benchmark is sound, coherent, and robust, from a conceptual and statistical position.

4.3.1. Benchmark framework

The G5 Benchmark is composed of 52 indicators (some of them being an aggregation of multiple indicators in a composite one), grouped into four pillars: i) National Collaborative Governance, ii) Policy Design Principles, iii) Digital Development, and iv) Digital Economy Policy Agenda. The distribution of indicators and maximum scores by pillars is presented in Table 5. The overall score is the sum of the four pillar scores. Every pillar contributes to the score proportionally to the number of indicators it contains. The sum of the maximum pillar scores equals 100 (after normalization), which is the maximum theoretical score any country can achieve.

Table 5. Distribution of indicators by Pillar and maximum scores

Pillar	Name	Number of indicators	Max score	Max score (over 100)
I	National Collaborative Governance	16	32	30.77
II	Policy Design Principles	10	20	19.23
III	Digital Development	15	30	28.85
IV	Digital Economy Policy Agenda	11	22	21.15
	G5 Benchmark	52	104	100

Source: ITU

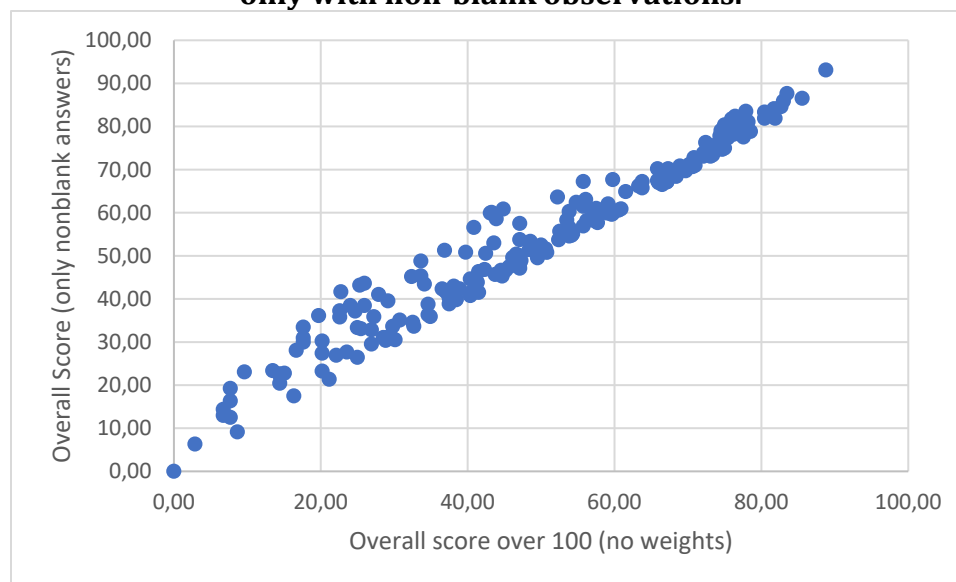
4.3.2. Data availability and missing values

To deal with missing values, the criteria followed was to implicitly treat cells with missing values as if a zero value had been imputed. Given that most information comes from country surveys and desktop research, the control procedure is two-fold:

- On the one hand, a no answer from a country questionnaire can be reasonably interpreted as a no. As pointed out in ITU (2020) for the case of the Regulatory Tracker, it is probably correct to assume that missing values are equal to zero, since for example some survey respondents may prefer leaving blanks rather than stating that their country has not adopted a given policy instrument and implicitly, does not comply with international best practices.
- On the other hand, if no further evidence can be found in the additional desktop research, then seems appropriate to consider that the respective condition stipulated in the indicator is not verified for the certain country.

To check an alternative procedure, we calculated the Benchmark score by relying only in the available information. We computed the score assuming that the maximum value (100) can be attributed to a certain country if it reaches the maximum score on each of the non-blank responses (normalization by the number of non-blank observations). However, when comparing this result with that of the original procedure (Graphic 1), important distortions are produced. Several points lie outside the diagonal line, which suggest that the results will change considerably. This provides support to considering missing information as zero.

Graphic 1. Comparison of score assuming missing data as zero and score calculated only with non-blank observations.



Source: analysis by the authors

As shown in Table 6, most of the missing values in the data set are concentrated in indicators I14, I16, II06b, II07a, II07b, III03, III07c, III12, III14, III15a, III15c, IV02 and IV7b, where missing values account for over 25%.

Table 6. Missing observations by indicator

Pillar I: National Collaborative Governance			Pillar II: Policy Design Principles			Pillar III: Digital Development			Pillar IV: Digital Economy Policy Agenda		
Indicator	Number missing	% Missing	Indicator	Number missing	% Missing	Indicator	Number missing	% Missing	Indicator	Number missing	% Missing
I01	7	3.63%	II01	7	3.63%	III01a	29	15.03%	IV01	0	0.00%
I02	7	3.63%	II02	1	0.52%	III01b	44	22.80%	IV02	0	0.00%
I03	23	11.92%	II03	27	13.99%	III02	43	22.28%	IV03	40	20.73%
I04	48	24.87%	II04	21	10.88%	III03	55	28.50%	IV04	40	20.73%
I05	6	3.11%	II05	19	9.84%	III04	2	1.04%	IV05	16	8.29%
I06	42	21.76%	II06a	29	15.03%	III05	15	7.77%	IV06	14	7.25%
I07	7	3.63%	II06b	149	77.20%	III06	7	3.63%	IV07a	38	19.69%
I08	12	6.22%	II07a	64	33.16%	III07a	15	7.77%	IV07b	49	25.39%
I09	48	24.87%	II07b	64	33.16%	III07b	16	8.29%	IV08a	16	8.29%
I10	4	2.07%	II08	11	5.70%	III07c	49	25.39%	IV08b	16	8.29%
I11	31	16.06%	II09	0	0.00%	III08a	6	3.11%	IV08c	16	8.29%
I12	6	3.11%	II10	48	24.87%	III08b	0	0.00%	IV09	14	7.25%
I13	47	24.35%				III09a	22	11.40%	IV10	7	3.63%
I14	51	26.42%				III09b	0	0.00%	IV11	48	24.87%
I15	19	9.84%				III10a	0	0.00%			
I16	51	26.42%				III10b	32	16.58%			
						III11a	16	8.29%			
						III11b	46	23.83%			
						III12	50	25.91%			
						III13	0	0.00%			
						III14	85	44.04%			
						III15a	74	38.34%			
						III15b	36	18.65%			
						III15c	73	37.82%			

Source: analysis by the authors

Country inclusion is decided based on the available data while providing a reasonable depiction of the situation. Following a similar criterion as in the ICT Regulatory Tracker, countries are included if the available data covers at least 50 per cent of data required for each of the four pillars. Following the experience of ITU in the Regulatory Tracker, this threshold provides for a robust metric of the Benchmark. Included and excluded countries following these criteria are detailed in Table 7.

Table 7. Countries included and excluded due to data availability

Included countries					Excluded
Afghanistan	Chile	Guinea	Malawi	Russian Federation	Andorra
Albania	China	Guinea-Bissau	Malaysia	Rwanda	Belarus
Algeria	Colombia	Guyana	Mali	Samoa	Cuba
Angola	Comoros	Haiti	Malta	Sao Tome and Principe	Djibouti
Antigua and Barbuda	Congo (Rep. of the)	Honduras	Marshall Islands	Saudi Arabia	Eritrea
Argentina	Costa Rica	Hungary	Mauritania	Senegal	Kazakhstan
Armenia	Côte d'Ivoire	Iceland	Mauritius	Serbia	Libya
Australia	Croatia	India	Mexico	Singapore	Maldives
Austria	Cyprus	Indonesia	Micronesia	Slovakia	Monaco
Azerbaijan	Czech Republic	Iran (Islamic Republic of)	Moldova	Slovenia	Mozambique
Bahamas	Dem. Rep. of the Congo	Iraq	Mongolia	South Africa	Myanmar
Bahrain	Denmark	Ireland	Montenegro	Spain	Nauru
Bangladesh	Dominica	Israel	Morocco	Sri Lanka	Nepal (Republic of)
Barbados	Dominican Rep.	Italy	Namibia	Sudan	Palestine
Belgium	Ecuador	Jamaica	Netherlands	Sweden	Papua New Guinea
Belize	Egypt	Japan	New Zealand	Switzerland	Saint Kitts and Nevis
Benin	El Salvador	Jordan	Nicaragua	Tanzania	Saint Lucia
Bhutan	Equatorial Guinea	Kenya	Niger	Thailand	Saint Vincent and the Grenadines
Bolivia (Plurinational State of)	Estonia	Kiribati	Nigeria	Togo	San Marino
Bosnia and Herzegovina	Eswatini	Korea (Rep. of)	North Macedonia	Trinidad and Tobago	Seychelles
Botswana	Ethiopia	Kuwait	Norway	Turkey	Sierra Leone
Brazil	Fiji	Kyrgyzstan	Oman	Uganda	Solomon Islands
Brunei Darussalam	Finland	Lao P.D.R.	Pakistan	Ukraine	Somalia
Bulgaria	France	Latvia	Panama	United Arab Emirates	South Sudan
Burkina Faso	Gabon	Lebanon	Paraguay	United Kingdom	Suriname
Burundi	Gambia	Lesotho	Peru	United States	Syrian Arab Republic
Cabo Verde	Georgia	Liberia	Philippines	Uruguay	Tajikistan
Cambodia	Germany	Liechtenstein	Poland	Uzbekistan	Timor-Leste
Cameroon	Ghana	Lithuania	Portugal	Viet Nam	Tonga
Canada	Greece	Luxembourg	Qatar	Zambia	Tunisia
Central African Rep.	Grenada	Madagascar	Romania	Zimbabwe	Turkmenistan
Chad	Guatemala				Tuvalu
					Vanuatu
					Venezuela
					Yemen

Source: analysis by the authors

4.3.3. Normalization and weighting

To check the robustness of the results, each of the four pillar scores could be normalized according to the min-max formula. Thus, the raw pillar score for any given country, can be scaled into a normalized pillar score by subtracting from the raw pillar the theoretical minimum score for that pillar (zero) and dividing by the difference between the theoretical maximum and the theoretical minimum value for the pillar. By following this procedure, each of the four pillars would now have a minimum of zero, and a maximum of 100, and then calculate the overall score as the weighted average of those normalized pillar scores.

The original score can then be compared with a normalized and weighted score, to assess if substantial changes occur. The weights to be used for this calculation can be, for instance, equal to each pillar: 25% each. This marks a departure from the original scoring procedure without weights, as each pillar had a relative importance according to the number of

indicators included within each one. As shown in Graphic 2, the overall scores following this approach are very close to the original ones.

Graphic 2. Comparison of score without weights and score with equally weighted pillars



Source: analysis by the authors

4.3.4. Statistical coherence

To check the statistical coherence of the results, we carry out a correlation analysis to evaluate whether the indicators fit statistically in their respective pillar. As expected, results in Table 8 (where we identify with the darkest color the biggest correlation of each row) confirm that the grouping of indicators into pillars is statistically coherent, since individual indicators tend to be more correlated to their own pillar than to any other.

Table 8. Correlation Matrix among indicators and pillars

	Pillar I	Pillar II	Pillar III	Pillar IV
I01	0.11	-0.04	-0.08	-0.09
I02	0.34	0.36	0.24	0.28
I03	0.32	0.18	0.15	0.10
I04	0.64	0.49	0.50	0.54
I05	0.60	0.40	0.42	0.51
I06	0.45	0.19	0.19	0.21
I07	0.06	0.02	0.02	0.02
I08	0.43	0.21	0.28	0.23
I09	0.46	0.32	0.33	0.34
I10	0.44	0.38	0.35	0.31
I11	0.30	0.21	0.27	0.22
I12	0.47	0.33	0.31	0.33
I13	0.54	0.03	0.05	0.05
I14	0.49	0.13	0.13	0.12
I15	0.53	0.12	0.16	0.15
I16	0.49	0.12	0.04	0.13
II01	0.27	0.51	0.30	0.34
II02	0.25	0.57	0.25	0.28
II03	0.25	0.42	0.27	0.26
II04	0.03	0.43	0.17	0.25
II05	0.48	0.51	0.42	0.38
II06a	0.18	0.49	0.45	0.51
II06b	0.12	0.15	-0.06	0.19
II07a	0.36	0.51	0.42	0.57
II07b	0.22	0.38	0.29	0.31
II08	0.17	0.59	0.39	0.39
II09	0.24	0.60	0.46	0.40
II10	0.27	0.37	0.28	0.29
III01a	0.26	0.19	0.41	0.34
III01b	0.17	0.23	0.34	0.29
III02	0.10	0.02	0.35	0.11
III03	0.03	0.05	0.29	0.17
III04	0.43	0.65	0.72	0.79
III05	0.42	0.56	0.59	0.55
III06	0.26	0.49	0.65	0.55
III07a	0.12	0.24	0.42	0.34
III07b	0.06	0.17	0.27	0.21
III07c	-0.04	0.13	0.27	0.17
III08a	0.21	0.30	0.47	0.42
III08b	0.44	0.57	0.57	0.57
III09a	0.25	0.39	0.47	0.42
III09b	0.20	0.29	0.31	0.37
III10a	0.03	0.13	0.28	0.17
III10b	0.15	0.20	0.33	0.27
III11a	0.22	0.44	0.48	0.48
III11b	0.13	0.37	0.47	0.37
III12	0.10	0.17	0.31	0.16
III13	0.21	0.34	0.49	0.40
III14	0.38	0.46	0.61	0.51
III15a	-0.16	-0.11	-0.05	-0.24
III15b	0.03	0.00	0.21	0.04
III15c	-0.11	-0.12	0.08	-0.17
IV01	0.28	0.32	0.38	0.45
IV02	0.06	0.05	0.06	0.23
IV03	0.41	0.50	0.61	0.71
IV04	0.30	0.56	0.55	0.66
IV05	0.23	0.55	0.66	0.70
IV06	0.13	0.32	0.37	0.37
IV07a	0.34	0.19	0.34	0.38
IV07b	-0.10	0.15	0.24	0.14
IV08a	0.09	0.38	0.56	0.54

IV08b	0.06	0.17	0.30	0.27
IV08c	0.18	0.36	0.48	0.47
IV09	0.28	0.18	0.15	0.37
IV10	0.37	0.31	0.31	0.49
IV11	0.31	0.38	0.43	0.59

Source: analysis by the authors

The four pillars are also strongly correlated to each other and to the overall index, which suggests that the index is well balanced in its four pillars (Table 9).

Table 9. Correlation Matrix among pillars and overall score

	Pillar I	Pillar II	Pillar III	Pillar IV	Overall
Pillar I	1	0.46	0.49	0.55	0.76
Pillar II	0.46	1	0.69	0.71	0.82
Pillar III	0.49	0.69	1	0.82	0.89
Pillar IV	0.55	0.71	0.82	1	0.91
Overall	0.76	0.82	0.89	0.91	1

Source: analysis by the authors

4.3.5. Impact of modelling assumptions

In this section we assess the extent to which the final ranks would be affected by changes in the weights assigned to each pillar. Table 10 shows the different sources of uncertainty considered for the analysis. The 2,000 simulated scenarios used in the analysis result from the randomly generated weights within an interval of +/- 20% of the reference values provided by the original scoring procedure.

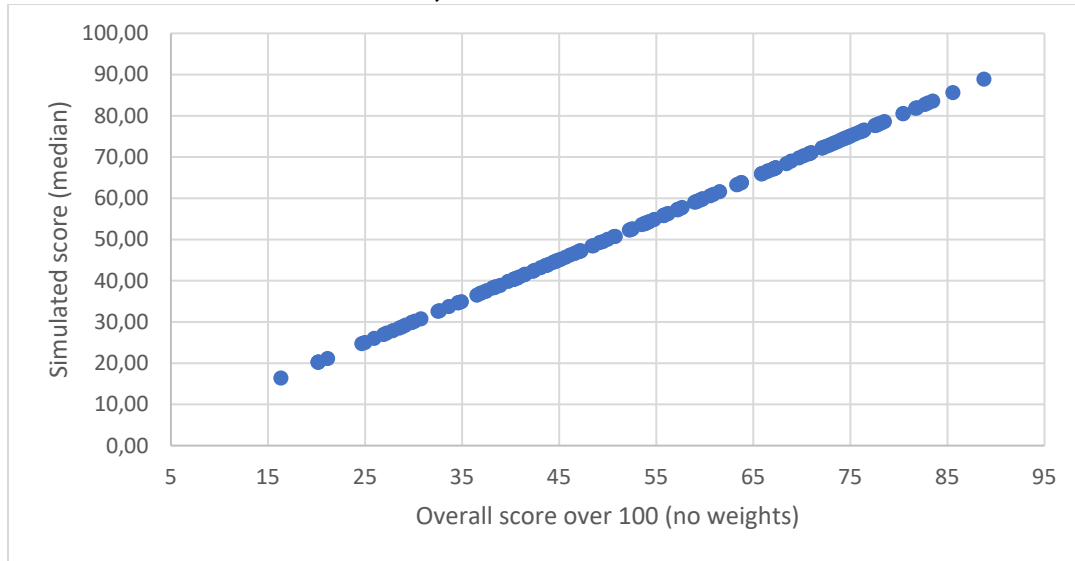
Table 10. Conditions for uncertainty analysis

Pillar	Indicators	Reference values (based on number of indicators per pillar)	Confidence interval	
			Min	Max
Pillar I	16	30.8%	24.6%	36.9%
Pillar II	10	19.2%	15.4%	23.1%
Pillar III	15	28.8%	23.1%	34.6%
Pillar IV	11	21.2%	16.9%	25.4%

Source: analysis by the authors

By comparing the overall score of each country for the baseline scenario and the median score of the 2,000 simulated values, it seems clear in Graphic 3 that the results seem to be consistent, reaching almost identical scores.

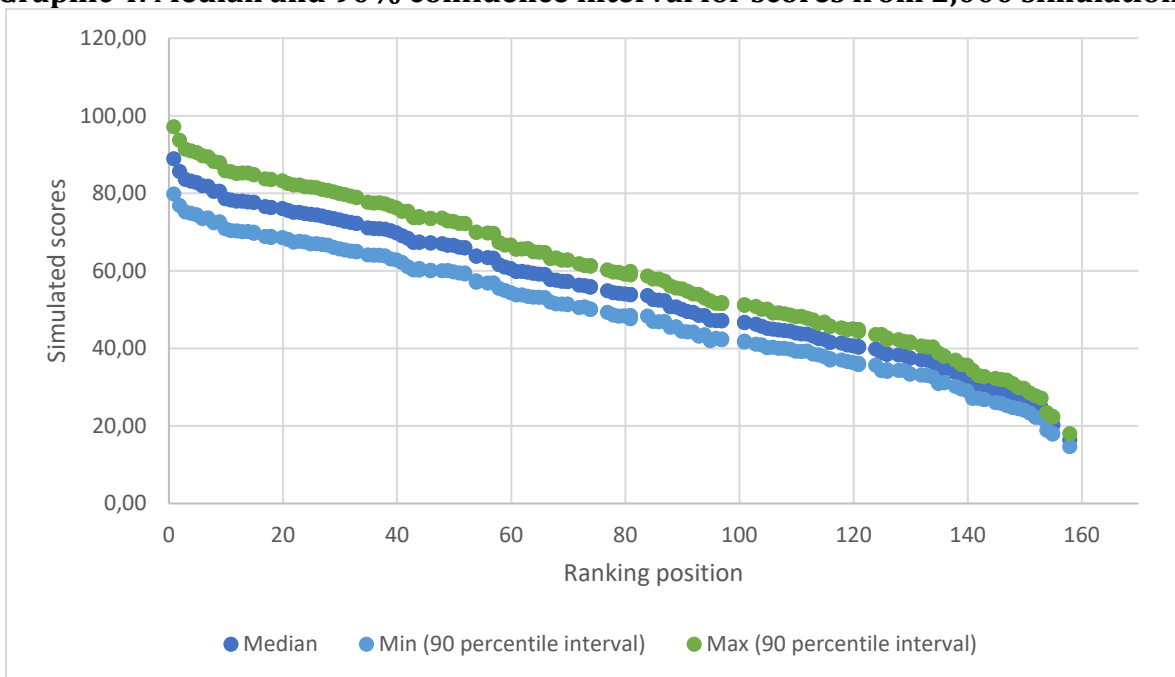
Graphic 3. Comparison of score from the baseline procedure and median score from 2,000 simulations



Source: analysis by the authors

We also show in Graphic 4 the uncertainty analysis by including median ranks and 90% confidence intervals computed across the simulated 2,000 scenarios. With very few exceptions, the width of the confidence intervals is narrow enough. Only 9% of the country's present confidence interval widths over 15 points in terms of the final score.

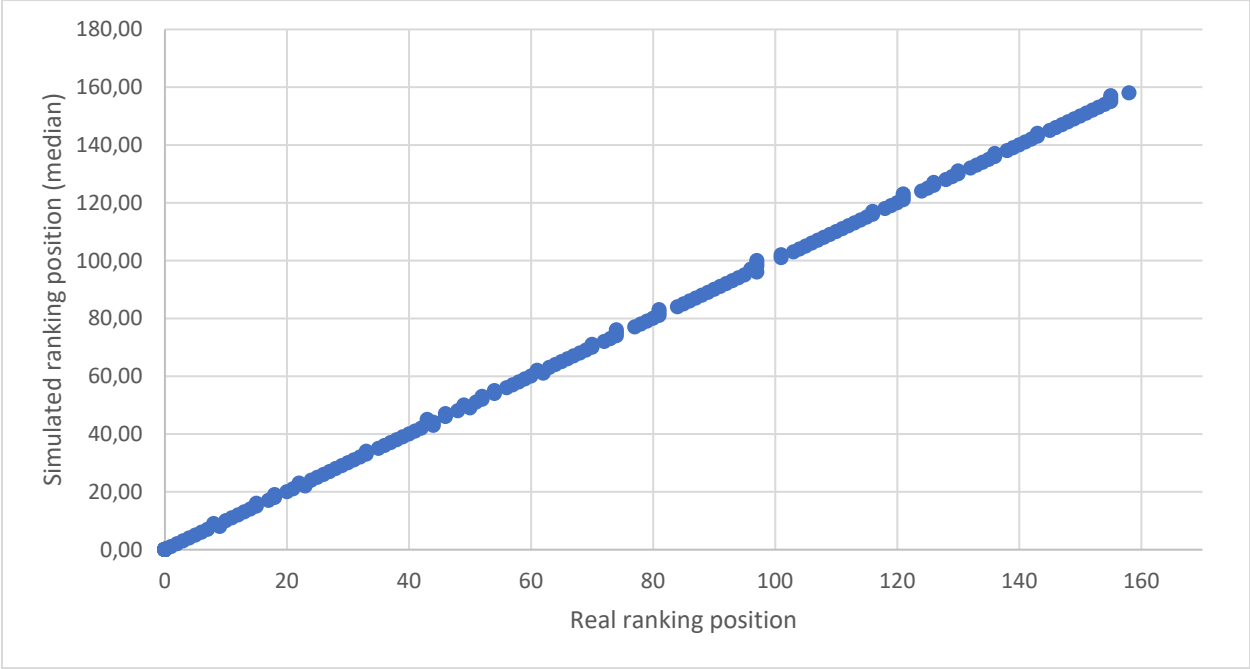
Graphic 4. Median and 90% confidence interval for scores from 2,000 simulations



Source: analysis by the authors

The robustness is even more clear when we analyze the original ranking position in comparison with the ranks from the simulated median values (Graphic 5). Only 16% of the sample changes more than one position in the rank when the simulation is carried out.

Graphic 5. Comparison of rank position from the baseline procedure and median rank from 2,000 simulations



Source: analysis by the authors

This analysis confirms the robustness of the Benchmark, as it is not influenced by the assumptions on importance of the pillars and by the aggregation procedure.

4.3.6. Conclusion

The statistical robustness assessment underscores the fact that the conceptual structure of the Benchmark seems to be supported by the results of the analysis. The grouping of indicators into pillars is statistically coherent, and the overall score appears to be a good and balanced summary measure of its four underlying pillars. Moreover, the robustness of the Benchmark with respect to changes in the modelling assumptions is supported also by the results of the uncertainty and sensitivity analysis.

5. BENCHMARK RESULTS AND INTERPRETATION

5.1. A worldwide perspective

The calculation of the Benchmark allows identifying the breakdown of countries by threshold level (see table 11).

**Table 11. Number of countries by G5 Benchmark threshold
(Total countries assessed: 157)**

	Advanced	Transitional	Limited	Total
Africa	4	27	8	39
North America	2	0	0	2
Latin America and the Caribbean	7	17	3	27
Arab States	3	10	2	15
Asia Pacific	11	14	2	27
CIS	0	4	1	5
Europe	33	9	0	42
Total	60	81	16	157

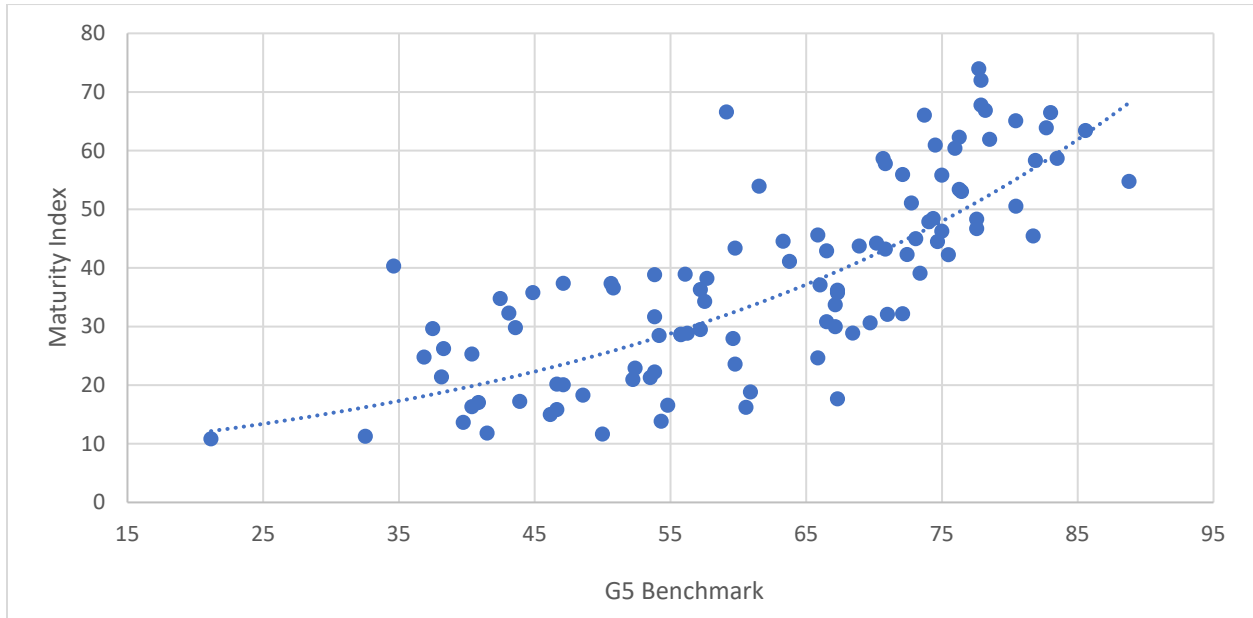
Source: Analysis by the authors

As indicated in table 11, 60 countries (38% of the sample of 157) have a G5 score corresponding to the Advanced level, 81 countries (or 52% of the sample) depict a transitional score, and 16 countries (10% of 157) exhibit a limited score. This indicates that, while a sizable group of countries have reached a significant G5 Benchmark score, most countries still need to fulfill the conditions reflected in the Advanced Level.

At an aggregate level, and as expected, the G5 Benchmark score is associated with high digital economy development⁸ (see Graphic 6).

⁸ The Digital Economy Development Index (DEDI) is a PwC composite index, based on 86 indicators structured around five pillars: (i) Digital Foundations, which consists of investments in Information and Communications infrastructure, increased connectivity relating to digital coverage, broadband service quality and affordability, and enabling digital regulations; (ii) Digital Talent measures human capital development initiatives; (iii) Digital Innovation relates to the scale of research and development (R&D), and the prevalence of successful start-ups and incubation ecosystems, including adequate availability of funding sources, mentoring, and service providers; (iv) Digital Adoption measures the adoption of services, devices and online platforms by individuals, enterprises and governments; (v) Digital Localization refers to the level of domestically generated digital products and services, as well as digital content and apps. This is measured through the importance of locally developed Internet platforms and content as well as the export of digital goods and services.

Graphic 6. G5 Benchmark versus Digital Economy Development Index



Source: Analysis by the authors

The correlation analysis presented in Graphic 6 might indicate that, in addition to the direct relation between the G5 Benchmark and the Digital Economy Development Index, once countries exceed the 55-score threshold in the Benchmark, the digital economy begins to grow at a faster pace. While this analysis would suggest a causal relationship between regulation and policy framework and digital economy development, more research is required to understand this link.

Europe is the world's region with more countries with advanced regulatory and policy framework (15 out of top twenty countries), indicating that the region depicts the highest level of regulatory and policy framework shaping the digital economy. However, five countries out of the top twenty belong to regions outside Europe (Asia Pacific 4, and Americas 1), indicating a consistent approach to boosting digital industries.

Table 12. G5 Benchmark. Top-twenty countries

Country	Region	G5 Benchmark (max: 100)	Pillar I: National Regulatory Governance (max: 30.77)	Pillar II: Policy Design Principles (max: 19.23)	Pillar III: Digital Development Toolbox (max: 28.85)	Pillar IV: Digital Economy Policy Agenda (max: 21.15)
Germany	Europe	88.78	28.85	18.27	23.40	18.27
United Kingdom	Europe	85.58	29.81	17.31	21.15	17.31
Korea (Rep. of)	Asia Pacific	83.50	26.92	15.38	23.56	17.63
Finland	Europe	83.01	25.96	14.42	23.40	19.23
Netherlands	Europe	82.69	26.92	15.38	23.08	17.31
Australia	Asia Pacific	81.89	29.81	16.35	20.03	15.71
Italy	Europe	81.73	25.00	17.31	21.15	18.27
Lithuania	Europe	80.45	28.85	17.31	17.31	16.99
Denmark	Europe	80.45	20.19	17.31	22.76	20.19
Israel	Europe	78.53	20.19	16.35	23.72	18.27
Switzerland	Europe	78.21	25.00	15.38	21.15	16.67
United States	Americas	77.89	20.19	17.31	22.76	17.63
Sweden	Europe	77.88	25.00	15.38	21.15	16.35
Singapore	Asia Pacific	77.72	26.92	15.38	17.15	18.27
Portugal	Europe	77.56	25.00	16.35	21.47	14.74
Spain	Europe	77.56	22.12	16.35	22.12	16.99
Japan	Asia Pacific	76.44	25.00	16.35	19.07	16.03
Austria	Europe	76.28	24.04	17.31	16.67	18.27
Norway	Europe	76.28	26.92	16.35	17.31	15.71
Ireland	Europe	75.96	24.04	13.46	20.19	18.27

Source: analysis by the authors

A region by region review will provide a better perspective of the geographic clustering of the G5 benchmark.

5.2. A view from the regions

From an aggregate regional perspective, Europe and North America are the only regions with an average G5 Benchmark in the Advanced performance level, indicating national formal collaboration mechanisms and institutions, the implementation of highly developed policy design principles, the implementation of digital economy enabling frameworks and a digitization development agenda. That being said, some regions exhibit scores at the Pillar level that are not that far from Europe and North America. In particular, Latin America and the Caribbean and Asia Pacific depict high scores in Regulatory Governance (indicating the existence of strong formal collaboration), while Asia Pacific (a region including technology-advanced countries) presents a Digital Economy Policy Agenda score somewhat close to those of North America and Europe (see table 15).

Table 15. Regional Averages: G5 Benchmark (2020)

Country	G5 Benchmark	Pillar I: National Regulatory Governance	Pillar II: Policy Design Principles	Pillar III: Digital Development Toolbox	Pillar IV: Digital Economy Policy Agenda
Africa	42.69	16.86	8.65	10.23	6.94
North America	76.21	22.60	17.79	19.80	16.03
Latin America and the Caribbean	50.59	18.27	11.57	12.21	8.53
Arab States	47.01	15.83	8.53	12.90	9.74
Asia Pacific	53.76	18.20	11.00	14.07	10.48
CIS	47.69	13.85	11.34	12.50	10.00
Europe	69.88	22.07	14.97	18.08	14.76

Source: Analysis by the authors

The low scores in Pillars III and IV – digital economy policy toolbox and agendas- for Africa, Latin America and the Caribbean, and Arab States highlight the future challenge for developing regions. These two pillars are fundamental to the development of a digital economy, a critical lever of post-COVID 19 recovery.

5.2.1. Africa

The G5 Benchmark was calculated for 39 sub-Saharan African countries, yielding an average score of 42.69 (of a maximum of 100), underlining the region’s transitional position with regards to the G5 benchmark. The average score for Pillar I (National Regulatory Governance), which is primarily focused on measuring the extent of collaboration across multiple regulatory and policy making stakeholders, is 16.86 (of a maximum possible of 30.77). The average score for Pillar II (Policy Design Principles), measuring policy development and transparency is 8.65 (of a total possible of 19.23). The average score of Pillar III (Digital Development Toolbox), which assesses the existence of strategies to develop the digital economy and the alignment of such policies with the SDGs is 10.23 (of a maximum possible score of 28.85). Finally, the average score of Pillar IV (Digital Economy Policy Agenda), measuring the frameworks for digital innovation development, digital transformation, as well as taxation disincentives, is 6.94 (of a maximum possible of 21.15).

The regional average scores for Africa mask wide differences among countries. While most countries exhibit a score positioning them in a transitional level, four countries are already in the Advanced category (Ghana, Nigeria, Rwanda, and South Africa). At the other end, eight countries received a score that positions them in the limited level of G5 Benchmark development (Burundi, Central African Republic, Republic of the Congo, Equatorial Guinea, Guinea, Guinea-Bissau, Namibia, and São Tome and Principe).

Table 16. Africa: G5 Benchmark (2020)⁹

Country	G5 Benchmark	Pillar I: National Regulatory Governance	Pillar II: Policy Design Principles	Pillar III: Digital Development Toolbox	Pillar IV: Digital Economy Policy Agenda
Angola	41.51	16.35	6.73	9.46	8.97
Benin	54.33	21.15	14.42	11.38	7.37
Botswana	52.40	25.00	8.65	9.46	9.29
Burkina Faso	39.74	11.54	10.58	10.90	6.73
Burundi	21.15	9.62	1.92	5.77	3.85
Cameroon	40.38	22.12	4.81	7.37	6.09
Cabo Verde	45.67	17.31	8.65	12.02	7.69
Central African Republic	16.35	6.73	3.85	2.88	2.88
Chad	36.54	17.31	4.81	8.97	5.45
Republic of the Congo	24.68	7.69	5.77	8.65	2.56
Cote d'Ivoire	48.56	25.96	6.73	9.13	6.73
Democratic Republic of the Congo	47.12	19.23	11.54	8.65	7.69
Equatorial Guinea	28.53	16.35	3.85	4.81	3.53
Eswatini	47.28	23.08	7.69	11.38	5.13
Ethiopia	48.40	16.35	9.62	12.82	9.62
Gabon	38.46	15.38	7.69	8.65	6.73
Gambia	38.94	23.08	0.96	7.21	7.69
Ghana	63.46	25.00	9.62	17.31	11.54
Guinea	28.85	14.42	3.85	4.81	5.77
Guinea-Bissau	25.00	12.50	6.73	1.92	3.85
Kenya	52.24	10.58	15.38	16.67	9.62
Lesotho	43.75	19.23	5.77	10.58	8.17
Liberia	37.02	14.42	8.65	9.13	4.81
Madagascar	32.53	11.54	7.69	9.46	3.85
Malawi	50.00	25.00	9.62	9.62	5.77
Mali	44.71	19.23	8.65	10.10	6.73
Mauritius	57.21	21.15	9.62	14.90	11.54
Namibia	27.88	13.46	7.69	4.81	1.92
Niger	41.35	15.38	9.62	11.22	5.13
Nigeria	60.58	25.00	9.62	14.42	11.54
Rwanda	67.31	22.12	15.38	20.51	9.29
Sao Tome & Principe	20.19	6.73	6.73	5.77	0.96
Senegal	53.53	13.46	8.65	15.38	16.03
South Africa	69.71	17.31	17.31	20.03	15.06
Tanzania	46.15	17.31	14.42	10.58	3.85
Togo	33.65	7.69	13.46	7.69	4.81
Uganda	54.81	21.15	8.65	13.46	11.54
Zambia	43.91	15.38	12.50	10.90	5.13
Zimbabwe	40.87	15.38	9.62	10.10	5.77
AVERAGE	42.69	16.86	8.65	10.23	6.94

Source: Analysis by the authors

⁹ The following countries were excluded due to insufficient observations: Eritrea, Mozambique, Seychelles, Sierra Leone, and South Sudan.

Of note, while most countries in the region exhibit low scores in the Digital Development Toolbox and the Digital Economy Policy Agenda, some depict a higher performance in both domains. For example, within the Digital Development Toolbox Pillar, South Africa, Rwanda, Senegal, Nigeria, Ghana, Kenya, Mauritius exhibit higher performance than their regional peers. Similarly, regarding the Digital Economy Policy Agenda Pillar, Uganda, South Africa, Senegal, Nigeria, Mauritius, and Ghana are positioned ahead of the rest of countries in the region.

5.2.2. Americas

The Americas Region is a composite of four clearly defined groups of countries as measured with regards to the G5 Benchmark. First, the two North American nations, the United States and Canada, exhibit advanced scores for the Benchmark and in all pillars (see table 17).

Table 17. North America: G5 Benchmark (2020)

Country	G5 Benchmark	Pillar I: National Regulatory Governance	Pillar II: Policy Design Principles	Pillar III: Digital Development Toolbox	Pillar IV: Digital Economy Policy Agenda
Canada	74.52	25.00	18.27	16.83	14.42
United States	77.89	20.19	17.31	22.76	17.63
AVERAGE	76.21	22.60	17.79	19.80	16.03

Source: Analysis by the authors

As indicated in table 17, the average G5 Benchmark for North America is 76.21 (of a maximum possible of 100), the Pillar I score average is 22.60 (of a maximum possible of 30.77). The average score for Pillar II is 17.79 (very close to the maximum possible of 19.23). The average score of Pillar III is 19.80 (of a maximum possible score of 28.85)., while the average score of Pillar IV is 16.03 (of a maximum possible of 21.15).

The Latin America and the Caribbean region is split into three categories of countries: those with an advanced G5 Benchmark score (Chile, Colombia, Costa Rica, Dominican Republic, Mexico, and Peru), the nations with a transitioning score (Argentina, Bahamas, Barbados, Bolivia, Brazil, Dominica, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Panama, Paraguay, Trinidad and Tobago, and Uruguay), and a group of countries scoring at the limited level (Antigua and Barbuda, Belize, and Nicaragua). It should be noted that the group of countries with a transitional score exhibit, in turn, a wide variance.

Table 18. Latin America and the Caribbean: G5 Benchmark (2020)¹⁰

Country	G5 Benchmark	Pillar I: National Regulatory Governance	Pillar II: Policy Design Principles	Pillar III: Digital Development Toolbox	Pillar IV: Digital Economy Policy Agenda
Antigua and Barbuda	29.81	11.54	6.73	5.77	5.77
Argentina	57.69	18.27	10.58	17.31	11.54
Bahamas	44.39	14.42	13.46	9.46	7.05
Barbados	34.62	12.50	8.65	5.77	7.69
Belize	29.81	9.62	8.65	3.85	7.69
Bolivia	53.85	25.96	16.35	2.88	8.65
Brazil	73.40	24.04	17.31	16.99	15.06
Chile	65.87	23.08	11.54	18.11	13.14
Colombia	72.12	18.27	19.23	22.12	12.50
Costa Rica	67.31	23.08	11.54	22.44	10.26
Dominica	34.62	11.54	6.73	8.65	7.69
Dominican Republic	68.43	28.85	12.50	18.75	8.33
Ecuador	59.62	26.92	10.58	11.54	10.58
El Salvador	46.63	16.35	8.65	12.98	8.65
Grenada	32.69	10.58	5.77	8.97	7.37
Guatemala	47.12	17.31	9.62	11.54	8.65
Guyana	45.19	22.12	12.50	4.81	5.77
Haiti	38.46	20.19	7.69	6.73	3.85
Honduras	46.63	17.31	11.54	13.46	4.33
Jamaica	57.21	21.15	15.38	11.54	9.13
Mexico	67.15	22.12	16.35	20.03	8.65
Nicaragua	27.24	7.69	9.62	5.13	4.81
Panama	54.17	22.12	13.46	11.86	6.73
Paraguay	36.86	10.58	11.54	10.26	4.49
Peru	67.15	23.08	15.38	17.79	10.90
Trinidad and Tobago	50.64	18.27	10.58	11.22	10.58
Uruguay	57.21	16.35	10.58	19.71	10.58
AVERAGE	50.59	18.27	11.57	12.21	8.53

Source: Analysis by the authors

Considering the importance of digitization for the future economic growth of the region, it is important to note that only a few countries exhibit a relatively high score in the Digital Development Toolbox (Argentina, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Mexico, and Uruguay) and only Brazil, Chile and Colombia present a score higher than 50% of the total maximum value in the Digital Economy Policy Agenda Pillar.

5.2.3. Arab States

¹⁰ The following countries were excluded due to insufficient observations: Cuba, St. Kitts and Nevis, Saint Lucia, St. Vincent, Suriname, and Venezuela.

The G5 Benchmark for the Arab States region denotes two levels of development: Saudi Arabia, Qatar, and the United Arab Emirates present an advanced score, while the rest of countries depict a score that places them within the transitional level (except for Comoros that exhibits a limited G5 score).

Table 19. Arab States: G5 Benchmark (2020)¹¹

Country	G5 Benchmark	Pillar I: National Regulatory Governance	Pillar II: Policy Design Principles	Pillar III: Digital Development Toolbox	Pillar IV: Digital Economy Policy Agenda
Algeria	38.30	16.35	4.81	9.13	8.01
Bahrain	53.85	17.31	10.58	14.42	11.54
Comoros	26.92	11.54	6.73	4.81	3.85
Egypt	55.77	13.46	8.65	20.51	13.14
Iraq	30.13	8.65	9.62	6.09	5.77
Jordan	43.59	9.62	10.58	13.78	9.62
Kuwait	44.87	12.50	11.54	13.14	7.69
Lebanon	37.50	20.19	5.77	4.81	6.73
Mauritania	37.50	14.42	5.77	12.50	4.81
Morocco	56.25	22.12	8.65	13.94	11.54
Oman	50.80	20.19	4.81	14.90	10.90
Qatar	63.78	18.27	9.62	20.19	15.71
Saudi Arabia	74.68	20.19	14.42	21.47	18.59
Sudan	25.96	8.65	4.81	8.01	4.49
United Arab Emirates	74.36	24.04	13.46	21.15	15.71
AVERAGE	47.01	15.83	8.53	12.90	9.74

Source: Analysis by the authors

The Advanced countries in the Arab States region exhibit a relatively high score in the two Pillars that have an impact on the development of the digital economy. The scores of UAE, Saudi Arabia and Qatar in these two pillars are significantly close to what was observed in advanced economies of North America and Europe.

5.2.4. Asia Pacific

As in the case of other regions, the G5 scores within Asia Pacific are dichotomic. Several countries (Australia, China, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, Pakistan, Philippines, Singapore, and Thailand) depict a score that places them in the Advanced category. However, this group of countries is, in turn, comprised of “highly-advanced” nations (Australia, Korea, Japan, and New Zealand), with a score higher than 70, and the “moderately-advanced” ones, with a score between 60 and 70. The remainder of countries in this region is placed within the transitional category, although two are on the cusp of moving to the advanced threshold (India, Sri Lanka).

¹¹ The following countries were excluded due to insufficient observations: Djibouti, Libya, Somalia, Syria, Yemen.

Table 20. Asia Pacific: G5 Benchmark (2020)¹²

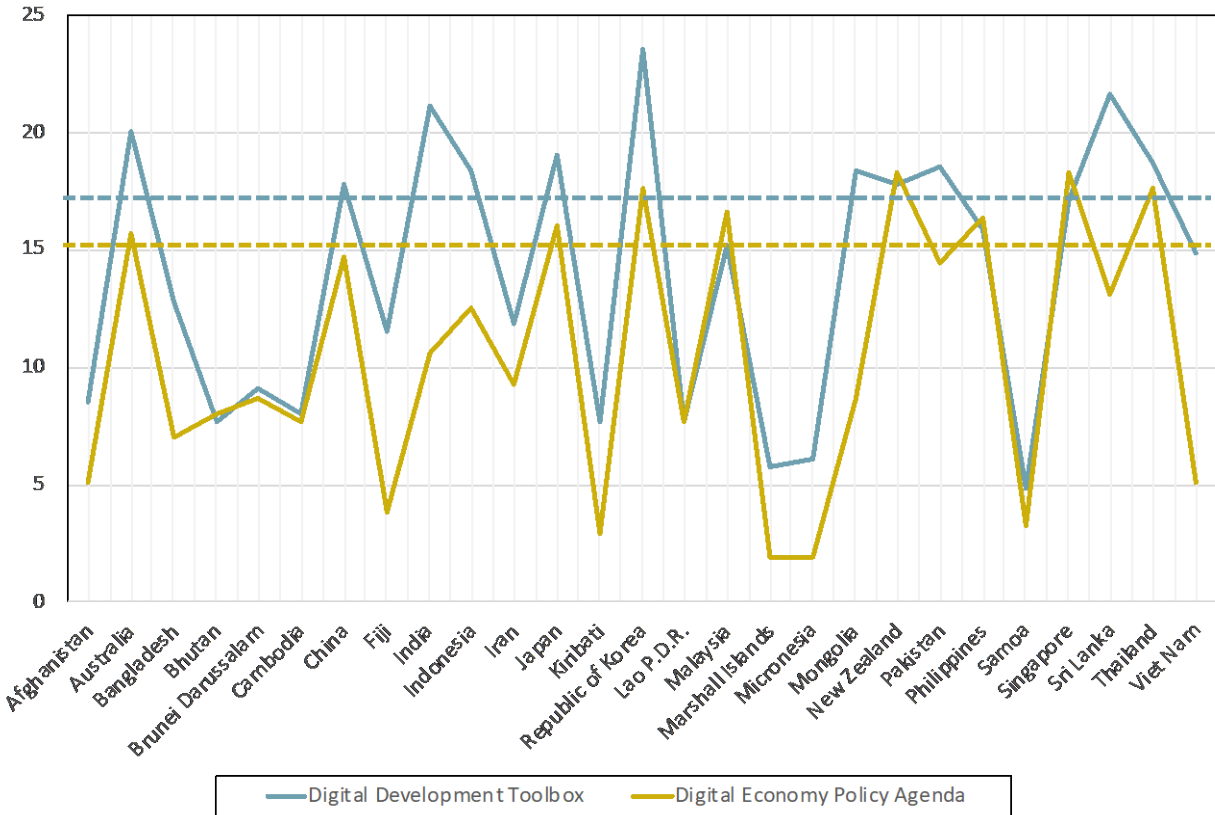
Country	G5 Benchmark	Pillar I: National Regulatory Governance	Pillar II: Policy Design Principles	Pillar III: Digital Development Toolbox	Pillar IV: Digital Economy Policy Agenda
Afghanistan	41.51	18.27	9.62	8.49	5.13
Australia	81.89	29.81	16.35	20.03	15.71
Bangladesh	38.14	9.62	8.65	12.82	7.05
Bhutan	44.55	17.31	11.54	7.69	8.01
Brunei Darussalam	49.52	24.04	7.69	9.13	8.65
Cambodia	40.71	20.19	4.81	8.01	7.69
China	63.30	23.08	7.69	17.79	14.74
Fiji	40.38	18.27	6.73	11.54	3.85
India	55.77	11.54	12.50	21.15	10.58
Indonesia	66.51	20.19	15.38	18.43	12.50
Iran	47.12	11.54	14.42	11.86	9.29
Japan	76.44	25.00	16.35	19.07	16.03
Kiribati	30.77	17.31	2.88	7.69	2.88
Republic of Korea	83.50	26.92	15.38	23.56	17.63
Lao P.D.R.	42.31	20.19	6.73	7.69	7.69
Malaysia	66.51	21.15	13.46	15.22	16.67
Marshall Islands	20.19	8.65	3.85	5.77	1.92
Micronesia	34.94	17.31	9.62	6.09	1.92
Mongolia	49.20	12.50	9.62	18.43	8.65
New Zealand	70.67	18.27	16.35	17.79	18.27
Pakistan	60.90	14.42	13.46	18.59	14.42
Philippines	65.87	21.15	12.50	15.87	16.35
Samoa	29.17	12.50	8.65	4.81	3.21
Singapore	77.72	26.92	15.38	17.15	18.27
Sri Lanka	59.78	13.46	11.54	21.63	13.14
Thailand	70.99	20.19	14.42	18.75	17.63
Viet Nam	43.11	11.54	11.54	14.9	5.13
AVERAGE	53.76	18.20	11.00	14.07	10.48

Source: Analysis by the authors

The scores of Pillars III, IV confirm the existence of countries in the region that are leaders in the development of their digital economies (see graphic 7).

¹² The following countries were excluded due to insufficient observations: Democratic People’s Republic of Korea, Maldives, Myanmar, Nauru, Republic of Nepal, Papua New Guinea, Timor-Leste, Tonga, Tuvalu, Vanuatu.

Graphic 7. Asia Pacific: Pillars III and IV Scores



Source: Analysis by the authors

Australia, China, India, Indonesia, Japan, Korea, New Zealand, Pakistan, Singapore, Sri Lanka, and Thailand depict a Digital development Toolbox score higher than 17 (out of a maximum possible of 28.85), while Australia, Japan, Korea, Malaysia, New Zealand, Philippines, Singapore, and Thailand (and China on the cusp) exhibit a Digital Economy Policy Agenda score higher than 15 (out of a maximum possible of 21.15).

5.2.5. Commonwealth of Independent Nations

No Advanced G5 Benchmark can be found in the Commonwealth of Independent States region, although the Russian Federation is on cusp of scoring its minimum threshold. This performance is not consistent with the Pillar scores: the highest score in the Pillar I that measures collaborative regulation and Pillar II, a metric for policy design principles, is Armenia, while Russia is the highest in Pillars III and IV, underlining its focus on digital economy development efforts.

Table 21. CIS: G5 Benchmark (2020)¹³

Country	G5 Benchmark	Pillar I: National Regulatory Governance	Pillar II: Policy Design Principles	Pillar III: Digital Development Toolbox	Pillar IV: Digital Economy Policy Agenda
Armenia	57.53	23.08	15.38	11.38	7.69
Azerbaijan	53.85	21.15	8.65	13.78	10.26
Russian Federation	59.78	10.58	13.46	19.71	16.03
Kyrgyzstan	47.12	12.50	12.50	8.97	13.14
Uzbekistan	20.19	1.92	6.73	8.65	2.88
AVERAGE	47.69	13.85	11.34	12.50	10.00

Source: Analysis by the authors

5.2.6. Europe

As mentioned above, Europe is the region with the highest concentration of countries with an advanced G5 Benchmark score: 33 out of 42 countries measured. As a result, the regional average for the G5 Benchmark score is 69.88, while the Pillar averages are always at the highest level of the sampled countries.

Table 22. Europe: G5 Benchmark (2020)¹⁴

Country	G5 Benchmark	Pillar I: National Regulatory Governance	Pillar II: Policy Design Principles	Pillar III: Digital Development Toolbox	Pillar IV: Digital Economy Policy Agenda
Albania	66.99	26.92	11.54	16.99	11.54
Austria	76.28	24.04	17.31	16.67	18.27
Belgium	72.12	17.31	16.35	22.12	16.35
Bosnia and Herzegovina	40.38	14.42	11.54	9.62	4.81
Bulgaria	56.09	11.54	15.38	13.46	15.71
Croatia	75.48	21.15	15.38	21.47	17.47
Cyprus	61.54	18.27	14.42	15.38	13.46
Czech Republic	74.04	22.12	16.35	19.23	16.35
Denmark	80.45	20.19	17.31	22.76	20.19
Estonia	70.83	19.23	15.38	18.59	17.63
Finland	83.01	25.96	14.42	23.4	19.23
France	75.00	17.31	16.35	24.04	17.31
Georgia	47.12	16.35	13.46	7.69	9.62
Germany	88.78	28.85	18.27	23.4	18.27
Greece	70.83	21.15	15.38	16.35	17.95

¹³ The following countries were excluded due to insufficient observations: Belarus, Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan.

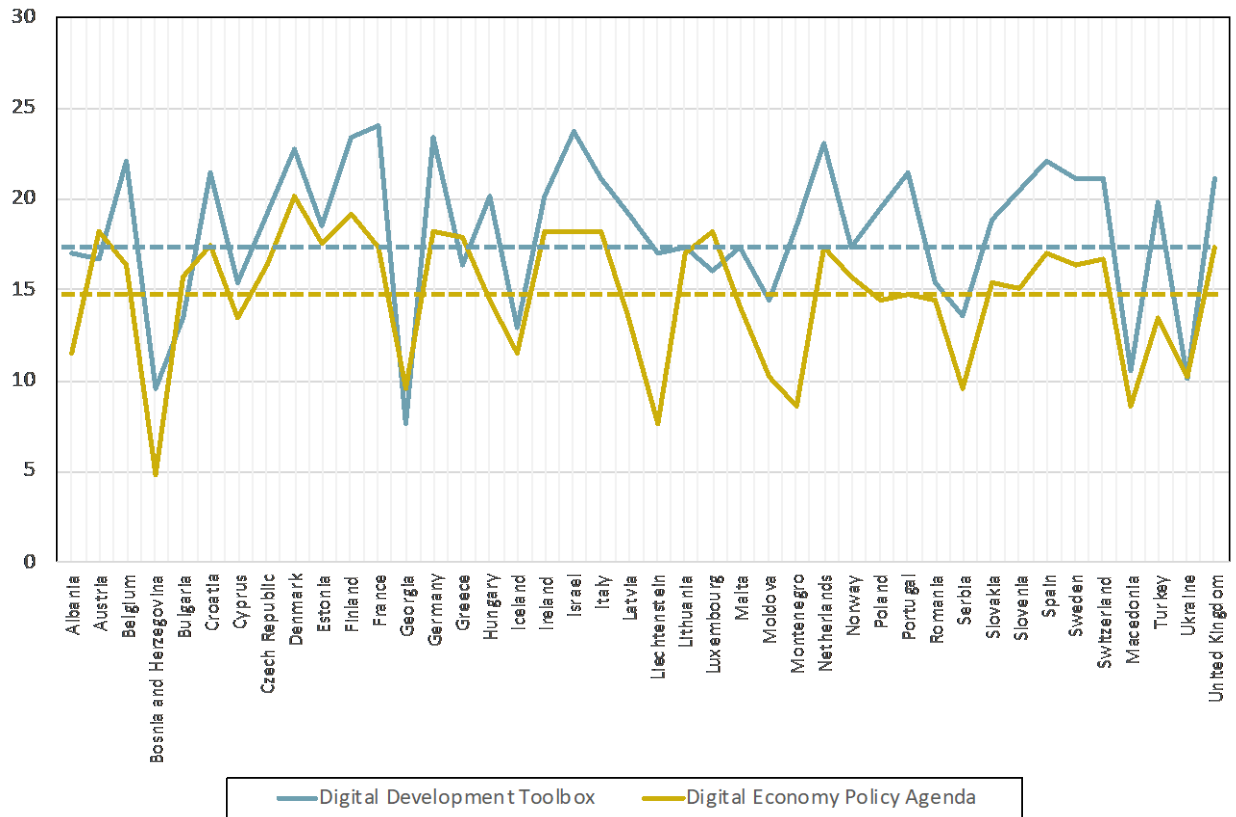
¹⁴ The following countries were excluded due to insufficient observations: Andorra, Monaco, San Marino, Vatican.

Hungary	73.08	24.04	14.42	20.19	14.42
Iceland	59.13	20.19	14.42	12.98	11.54
Ireland	75.96	24.04	13.46	20.19	18.27
Israel	78.53	20.19	16.35	23.72	18.27
Italy	81.73	25.00	17.31	21.15	18.27
Latvia	70.19	22.12	15.38	19.23	13.46
Liechtenstein	52.56	19.23	8.65	16.99	7.69
Lithuania	80.45	28.85	17.31	17.31	16.99
Luxembourg	73.72	23.08	16.35	16.03	18.27
Malta	72.76	25.96	15.38	17.31	14.10
Moldova	59.29	19.23	15.38	14.42	10.26
Montenegro	63.78	23.08	13.46	18.59	8.65
Netherlands	82.69	26.92	15.38	23.08	17.31
Norway	76.28	26.92	16.35	17.31	15.71
Poland	72.44	24.04	14.42	19.55	14.42
Portugal	77.56	25.00	16.35	21.47	14.74
Romania	67.31	21.15	16.35	15.38	14.42
Serbia	54.01	20.19	10.58	13.62	9.62
Slovakia	68.91	20.19	14.42	18.91	15.38
Slovenia	75.00	25.00	14.42	20.51	15.06
Spain	77.56	22.12	16.35	22.12	16.99
Sweden	77.88	25.00	15.38	21.15	16.35
Switzerland	78.21	25.00	15.38	21.15	16.67
Macedonia	55.77	23.08	13.46	10.58	8.65
Turkey	66.03	20.19	12.50	19.87	13.46
Ukraine	42.47	9.62	12.50	10.10	10.26
United Kingdom	85.58	29.81	17.31	21.15	17.31
AVERAGE	69.88	22.07	14.97	18.08	14.76

Source: Analysis by the authors

The scores of Pillars III, IV confirm the number of European countries leading in the development of their digital economies: twenty-five countries (of a total sample of 42) exhibit a Digital Development Toolbox score more than 17 (from a maximum possible score of 28.85); similarly, twenty-four countries depict a Digital Economy Policy Agenda score higher than 15 (out of a maximum possible of 21.15) (see graphic 8).

Graphic 8. Europe: Pillars III and IV Scores



Source: Analysis by the authors

5.2.7. Conclusion

The region-by-region analysis of the G5 Benchmark provides a nuanced view of country progress. The G5 Benchmark is not an exclusive feature of developed economies. With the exception of CIS, all regions include nations that are leaders in the G5 benchmark score: Ghana, Nigeria, Rwanda, and South Africa in Africa, Chile, Colombia, Costa Rica, Dominican Republic, Mexico, and Peru in Latin America and the Caribbean, Saudi Arabia, Qatar, and the United Arab Emirates in Arab States, Australia, China, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, Pakistan, Philippines, Singapore, and Thailand in Asia Pacific. All these countries join the United States, Canada and thirty-three European countries.

This situation is good news for many developing countries in terms of their capability for future growth. While the average scores in Pillars III and IV – digital economy policy toolbox and agendas- for developing countries are low, many countries in each region exhibit higher scores, an indication that they might be increasingly ready from a policy standpoint to tackle the development of a digital economy, a critical lever of post-COVID 19 recovery.

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Annex A: List of members of Review Board

Name	Position	Represented Entity
Dr. Tim Kelly	Lead ICT Policy Specialist	World Bank Group
Dr. Lourdes Montenegro	Lead Digital Sector Transformation	World Benchmarking Alliance
Ms. Belinda Exelby	Head of International Relations	GSMA
Dr. Pau Castells	Head of Economic Analysis	GSMA
Ms. Lise Fuhr	Director General	European Telecommunications Network Operators (ETNO)
Prof. Andrea Renda	Senior Research Fellow and Head of the CEPS Unit on Global Governance, Regulation, Innovation, and the Digital Economy (GRID)	Center for European Policy Studies (CEPS)
Prof. Martin Cave	Professor	London School of Economics
Prof. Ahmad Reza Sharafat	Chairman, Management Committee	Asia Pacific Telecommunity Policy and Regulatory Forum
Mr. Ahmad Said	Chief, International Department, NTRA	AREGNET
Ms. Natasa Kuzmanovic	Expert Advisor in Telecommunications at Communications Regulatory Agency of Bosnia Herzegovina (RAK)	European Mediterranean Regulators Group (EMERG)
Ms. Inga Popovici	Head, Independent Regulators and Broadband Expert Working Group (IRB EWG)	Eastern Partnership Regulators Network (EaPeReg)
Mr. Bocar Ba	Chief Executive Officer	Samena Telecommunications Council

Annex B: Detailed Methodology of the G5 Benchmark

Pillars	Components	Indicators	Option	Score	Source
Pillar I: National Collaborative Governance	Cooperation among ICT bodies	Collaboration with (Independent) Spectrum Authority/	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
			Yes, informal or semi-formal collaboration	1	
			No collaboration, no entity in charge, or no data	0	
			ICT regulator has the mandate / same authority	2	
			Activities carried out under the same ministry	1	
		Collaboration with (Independent) Broadcasting (content) Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
			Yes, informal or semi-formal collaboration	1	
			No collaboration, no entity in charge, or no data	0	
			ICT regulator has the mandate / same authority	2	
			Activities carried out under the same ministry	1	
		Collaboration with Cyber security agency	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
			Yes, informal or semi-formal collaboration	1	
			No collaboration, no entity in charge, or no data	0	
			ICT regulator has the mandate / same authority	2	
			Activities carried out under the same ministry	1	
		Collaboration with CERT	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
			Yes, informal or semi-formal collaboration	1	
			No collaboration, no entity in charge, or no data	0	
			ICT regulator has the mandate / same authority	2	
			Activities carried out under the same ministry	1	
	Collaboration with (Independent) Data Protection Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research	
		Yes, informal or semi-formal collaboration	1		
		No collaboration, no entity in charge, or no data	0		
		ICT regulator has the mandate / same authority	1		
Activities carried out under the same ministry		1			
Collaboration with ICT ministry OR ICT regulator AND Information Society Agency	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research		
	Yes, informal or semi-formal collaboration	1			
	No collaboration, no entity in charge, or no data	0			
	ICT regulator has the mandate / same authority	2			
	Activities carried out under the same ministry	1			
			Yes, formal collaboration (MOU or joint program or committee)	2	

Cooperation with other sector agencies	Collaboration with (Independent) Finance Regulator	Yes, informal or semi-formal collaboration	1	TREG20 & desktop research
		No collaboration, no entity in charge, or no data	0	
		ICT regulator has the mandate / same authority	0	
		Activities carried out under the same ministry	0	
	Collaboration with Energy regulatory Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
		Yes, informal or semi-formal collaboration	1	
		No collaboration, no entity in charge, or no data	0	
		ICT regulator has the mandate / same authority	2	
		Activities carried out under the same ministry	1	
	Collaboration with Transport regulatory Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
		Yes, informal or semi-formal collaboration	1	
		No collaboration, no entity in charge, or no data	0	
		ICT regulator has the mandate / same authority	2	
		Activities carried out under the same ministry	1	
	Collaboration with (Independent) Competition Authorities	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
		Yes, informal or semi-formal collaboration	1	
		No collaboration, no entity in charge, or no data	0	
		ICT regulator has the mandate / same authority	1	
		Activities carried out under the same ministry	1	
	Collaboration with Postal regulation Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
		Yes, informal or semi-formal collaboration	1	
		No collaboration, no entity in charge, or no data	0	
		ICT regulator has the mandate / same authority	2	
		Activities carried out under the same ministry	1	
Collaboration with (Independent) Consumer Protection Authority	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research	
	Yes, informal or semi-formal collaboration	1		
	No collaboration, no entity in charge, or no data	0		
	ICT regulator has the mandate / same authority	1		
	Activities carried out under the same ministry	1		
Collaboration with Ministry of Health (e-health)	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research	
	Yes, informal or semi-formal collaboration	1		
	No collaboration, no entity in charge, or no data	0		
	ICT regulator has the mandate / same authority	1		

			Activities carried out under the same ministry	1	
		Collaboration with Ministry of Education (e-education)	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
			Yes, informal or semi-formal collaboration	1	
			No collaboration, no entity in charge, or no data	0	
			ICT regulator has the mandate / same authority	2	
			Activities carried out under the same ministry	1	
		Collaboration with Ministry of Environment (e-waste)	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
			Yes, informal or semi-formal collaboration	1	
			No collaboration, no entity in charge, or no data	0	
			ICT regulator has the mandate / same authority	2	
			Activities carried out under the same ministry	1	
		Collaboration with Ministry of Economic development OR similar focusing on a single or a subset of economic sector/s, (e.g., Industry, Agriculture, Fishery)	Yes, formal collaboration (MOU or joint program or committee)	2	TREG20 & desktop research
			Yes, informal or semi-formal collaboration	1	
			No collaboration, no entity in charge, or no data	0	
			ICT regulator has the mandate / same authority	2	
			Activities carried out under the same ministry	1	
Pillar II: Policy Design Principles	Regulatory design procedures	Are public consultations designed as a tool to gather feedback from national stakeholders and guide regulatory decision-making?	Yes	2	TREG20 & desktop research
			Yes, but there is no requirement/it is unclear what the timeline and process is and whether the regulator incorporates results in their decision-making/ there is no obligation to consider/respond to all comments	1	
			Not undertaken or required by law/No data	0	
		Is there a formal requirement for Regulatory Impact Assessment (RIA) before regulatory decisions are made AND/OR ex-post or rolling reviews?	Yes	2	World Bank
			Yes, but not consistently applied to all decisions	1	
			No	0	
		Are the decisions of the regulatory authority (entity in charge of regulation) subject to a general administrative procedures law?	Yes	2	TREG20 & desktop research
			No	0	
		Can affected parties can request reconsideration or appeal adopted regulations to the relevant administrative agency (all sectors)?	Yes, administrative review by an independent body / the judiciary	2	World Bank
			Yes, administrative review by the regulatory body	1	
			No	0	

		Are national policy and regulatory frameworks technology and service-neutral?		Yes, for both authorization/operating licences and spectrum	2	TREG20		
				Yes, for authorization/operating licences or spectrum, but not for both / There are exceptions to which bands of the spectrum are technology neutral	1			
				No	0			
		Regulatory experimentation	Are there mechanisms for regulatory experimentation?		Yes	2	TREG20 & desktop research	
					No	0		
			Are there regulatory sandboxes for digital financial inclusion?		Yes	2	CGAP	
					No	0		
		Policy reviews	Do ministries/regulatory agencies conduct ex-post policy reviews?		Yes	2	World Bank	
					No	0		
			Do ministries/regulatory agencies conduct policy rolling reviews?		Yes	2	World Bank	
					No	0		
		Are the laws (all sectors) that are currently in effect available on a single website managed by the government?		Yes	2	World Bank		
				No	0			
		Is public access to information ensured and fundamental freedoms protected, in accordance with national legislation and international agreements?		Yes	2	United Nations		
No								
Are there ethics rules in place that apply to the regulator's staff, including Head/Chairperson and Members/Commissioners (e.g., improper acceptance of gifts, personal and financial conflicts of interest, post-employment obligations)?		Yes		TREG20				
		No						
Pilar III: Digital Development Toolbox	Digital strategy for development	Strategy design and implementation	Is there an overarching digital strategy in place?		Yes	2	TREG20 & desktop research	
			Expired, or being planned, is part of a broader development strategy, only covers specific plans or not clearly implemented		1			
			No		0			
			The digital strategy has mechanisms for implementation/operational objectives?		Yes	2	TREG20 & desktop research	
					Yes, but only partially, or the strategy has expired			1
					No, or no strategy			0
		Is broadband considered as part of UAS definition?		Yes	2	TREG20 & desktop research		
No	0							
		Yes	2					

		Is there a digital identity framework in place?	No	0	TREG20 & desktop research
		Is there an e-gov/ Digital first government National e-government strategy or equivalent?	Very high development	2	United Nations
			High development	1	
			Medium development	0	
			Low development	0	
		Has your country adopted e-waste regulations or e-waste management standards?	Yes	2	Global E-waste Statistics Partnership (GESP)
			No	0	
		Does a regulatory framework exist for ICT accessibility for persons with disabilities?	Yes	2	TREG20
			No clear evidence/enforcement or partial	1	
			No	0	
Public services	Has your country adopted any policy/legislation/regulation related to Smart Cities?	Yes	2	Desktop research	
		No	0		
	Has your country adopted any policy/legislation/regulation related to e-Health or Smart Health?	Yes	2	Desktop research	
		No	0		
	Has your country adopted any policy/legislation/regulation related to e-applications and/or m-applications on Education and Learning?	Yes	2	Desktop research	
		No	0		
	Cybersecurity	Is there cybersecurity legislation or regulation?	Yes	2	TREG20, GCI, UNCTAD & desktop research
			Partial coverage	1	
			No	0	
Has your country signed or ratified the Budapest convention on cybersecurity?			2	Council of Europe	
	0				
Data protection	Are there formal data protection rules (e.g., law, regulations)?	There is a law and a data protection agency has been established	2	TREG20, UNCTAD & desktop research	
		There is a law but either: i) a data protection agency has not yet been established, ii) the law is not yet implemented, or iii) the law covers only a limited number of activities	1		
		No	0		
	Has your country signed on international agreements determining jurisdiction and/or managing cross	Yes, determining jurisdiction and managing cross border flows	2	Desktop research	
		Yes, determining jurisdiction or managing cross border flows	1		
		No	0		

			border flows on data privacy?				
		Emergency situations	Has your country signed or ratified the Tampere convention for communications in emergency situations?	Yes	2	UNTC	
				No	0		
			Does a National Emergency (Telecommunications) Plan exist?	Yes	2	TREG20 & desktop research	
				No	0		
		Infrastructure sharing	Does an official register or a mapping exist in your country of all telecommunication /ICT infrastructure?	Yes	2	TREG20 & desktop research	
				Yes, but only for some infrastructure or evidence is not clear	1		
				No	0		
			Is there any cross-sector (ICT and other) infrastructure sharing or fiber co-deployment regulations/agreements/promotion initiatives in your country?	Yes	2	Desktop research	
				No	0		
SDG			Is the digital strategy SDG-oriented OR has mention of SDGs or other international development goals (e.g., MDGs, WSIS goals, EU Strategic objectives)?	Yes	2	UNSTAT	
				No	0		
				Are there policy instruments aimed at supporting the shift to sustainable consumption and production, or coordination mechanism for sustainable consumption and production?	Yes	2	UNSTAT
					No	0	
				Is there a developed and operationalized global strategy for youth employment and to implement the Global Jobs Pact of the ILO?	Yes	2	Desktop research
					Developed, not yet operationalized	1	
					No	0	
		Strategies for targeted groups		Broadband plan / initiative includes to promote the provision of broadband services to women and girls	Yes	2	Desktop research
					No	0	
					Broadband plan / initiative includes to promote the provision of broadband	Yes	2
No						0	

			services to persons with disabilities?				
			Broadband plan / initiative includes to promote the provision of broadband services to youth people	Yes	2	Desktop research	
				No	0		
Pillar IV: Digital Economy Policy Agenda	International collaboration	Does your country belong to regional integration initiatives with ICT chapters?		Yes	2	Desktop research	
				Yes, partial	1		
				No	0		
			Has your country have made commitment to facilitate trade in telecommunications services?	Yes		WTO	
		No					
	Framework for innovation	Is there a holistic innovation policy or one tailored to the ICT/digital sector?		Yes	2	Desktop research	
				Planned or not clearly implemented	1		
				No	0		
		Is there a forward-looking competition policy, law or regulation applied to digital markets?		Yes	2	TREG20& Desktop research	
				Planned	1		
				No	0		
	Framework for digital transformation	Has your country adopted a forward-looking or innovative national strategy, policy or initiative focusing on spectrum (e.g., IMT-2000, 5G, FWA)		Yes	2	TREG20& Desktop research	
				No	0		
		Are there policies and regulations for e-commerce/e-transactions?		Yes	2	TREG20, UNCTAD, & Desktop research	
				Rules at regional level exist (e.g., EU) but has not yet formulated national rules to match or no monitoring and enforcement of rules or has limited provisions	1		
				No	0		
		Policies for specific sectors	Does the digital strategy include multiple sectors of the economy?		Yes	2	Desktop research
					Partly / Not clearly expounded	1	
					No	0	
			Has your country adopted any policy/legislation/regulation related to cloud computing?		Yes, for Agriculture/Science/Financial Services	2	Desktop research
				Yes, for two of Agriculture/Science/Financial Services	1.3		
	Yes, for only one of Agriculture/Science/Financial Services			0.7			
Industry 4.0	Does it include a strategy, policy or initiative focusing on IoT? Or applied any measure regarding spectrum management and availability for IoT?		Yes	2	TREG20& Desktop research		
			No	0			
	Has your country adopted any		Yes	2	TREG20& Desktop research		
		No	0				

		policy/legislation/regulation related to cloud computing?			
		Has your country adopted a national strategy, policy or initiative focusing on AI?	Yes	2	TREG20& Desktop research
			No	0	
Taxation framework	Are there specific taxes on the telecom/digital sector OR on Internet services?	Yes	0	ITU Tariff Policies 20 & desktop research	
		No	2		
	Are there regulatory incentives targeted at network operators or other digital market players?	Yes, for all	2	TREG20& Desktop research	
		Yes, but only for some	1		
		No	0		
Code of conduct	Do codes of conduct exist (voluntary or enforceable/required by regulator)?	Yes	2	Desktop research	
		No	0		

Annex C. List of countries in the G5 Benchmark 2020

While the list includes 194, 157 were considered because 37 countries did not meet the maximum omitted data hurdle.

1	Afghanistan
2	Albania
3	Algeria
4	Angola
5	Antigua and Barbuda
6	Argentina
7	Armenia
8	Australia
9	Austria
10	Azerbaijan
11	Bahamas
12	Bahrain
13	Bangladesh
14	Barbados
15	Belgium
16	Belize
17	Benin
18	Bhutan
19	Bolivia (Plurinational State of)
20	Bosnia and Herzegovina
21	Botswana
22	Brazil
23	Brunei Darussalam
24	Bulgaria
25	Burkina Faso
26	Burundi
27	Cabo Verde
28	Cambodia
29	Cameroon
30	Canada
31	Central African Rep.
32	Chad
33	Chile
34	China
35	Colombia
36	Comoros
37	Congo (Rep. of the)
38	Costa Rica
39	Côte d'Ivoire
40	Croatia
41	Cyprus
42	Czech Republic
43	Dem. Rep. of the Congo
44	Denmark
45	Dominica
46	Dominican Rep.
47	Ecuador

48	Egypt
49	El Salvador
50	Equatorial Guinea
51	Estonia
52	Eswatini
53	Ethiopia
54	Fiji
55	Finland
56	France
57	Gabon
58	Gambia
59	Georgia
60	Germany
61	Ghana
62	Greece
63	Grenada
64	Guatemala
65	Guinea
66	Guinea-Bissau
67	Guyana
68	Haiti
69	Honduras
70	Hungary
71	Iceland
72	India
73	Indonesia
74	Iran (Islamic Republic of)
75	Iraq
76	Ireland
77	Israel
78	Italy
79	Jamaica
80	Japan
81	Jordan
82	Kenya
83	Kiribati
84	Korea (Rep. of)
85	Kuwait
86	Kyrgyzstan
87	Lao P.D.R.
88	Latvia
89	Lebanon
90	Lesotho
91	Liberia
92	Liechtenstein
93	Lithuania
94	Luxembourg
95	Madagascar
96	Malawi
97	Malaysia
98	Mali
99	Malta

100	Marshall Islands
101	Mauritania
102	Mauritius
103	Mexico
104	Micronesia
105	Moldova
106	Mongolia
107	Montenegro
108	Morocco
109	Namibia
110	Netherlands
111	New Zealand
112	Nicaragua
113	Niger
114	Nigeria
115	North Macedonia
116	Norway
117	Oman
118	Pakistan
119	Panama
120	Paraguay
121	Peru
122	Philippines
123	Poland
124	Portugal
125	Qatar
126	Romania
127	Russian Federation
128	Rwanda
129	Samoa
130	Saudi Arabia
131	Senegal
132	Serbia
133	Sao Tome and Principe
134	Singapore
135	Slovakia
136	Slovenia
137	South Africa
138	Spain
139	Sri Lanka
140	Sudan
141	Sweden
142	Switzerland
143	Tanzania
144	Thailand
145	Togo
146	Trinidad and Tobago
147	Turkey
148	Uganda
149	Ukraine
150	United Arab Emirates
151	United Kingdom

152	United States
153	Uruguay
154	Uzbekistan
155	Viet Nam
156	Zambia
157	Zimbabwe