

The background of the entire slide is a stylized globe composed of numerous small, colored dots in shades of blue, red, and white. The dots are arranged in a grid-like pattern that follows the curvature of the globe, creating a sense of depth and movement. The globe is tilted, and the dots are more densely packed in some areas than others, giving it a textured appearance.

Consumer
Technology
Association®

2023 CTA International Innovation Scorecard

JANUARY 2023

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Any general questions should be directed to research@CTA.tech.

About Consumer Technology Association:

As North America's largest technology trade association, CTA® is the tech sector. Our members are the world's leading innovators — from startups to global brands — helping support more than 18 million American jobs. CTA members enjoy benefits including policy advocacy, market

research, technical education, industry promotion, standards development, and the fostering of business and strategic relationships. CTA also owns and produces CES® — the most influential tech event in the world. Find us at cta.tech and follow us @CTAtech and @CES.

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Welcome



Welcome

Since 2018, the Consumer Technology Association has produced the International Innovation Scorecard, assessing the policies and practices that fuel the fires of technological progress — or starve them of oxygen. When we turned the page on our last report in 2019, we had no idea how radically the world would change.

First came Covid, taking millions of lives and disrupting billions. Then Russia's invasion of Ukraine, which has devastated a civilian population, upset global trade, and shaken the international order. Though the Scorecard does not evaluate Ukraine this year, the world has witnessed the Ukrainian people demonstrating extraordinary resilience, and the power of technology to unite people in the face of the most

dire challenges. Already one of the most rapidly digitizing populations in the world, Ukrainians applied their tech savvy to source necessary materials, coordinate volunteer efforts, and channel an outpouring of aid from abroad. Widely-deployed e-government services have helped citizens stay informed and organized.

Similarly, amid the pandemic, people around the world have dusted themselves off and employed technology in every way they could to get on with their lives, their education and their work. The past several years make clear that innovation thrives in moments of challenge. Innovators developed vaccines with incredible speed, delivered more medical care than ever across borders, created new online tools for

education and commerce, and managed complex supply chain challenges. The 2023 International Innovation Scorecard captures this surge in entrepreneurship, assessing 70 countries on 17 categories, encompassing 40 indicators. This year's "Innovation Champions" showcase the best of collaboration between government and industry, empowering diverse communities to bring new technologies to life and to market.

Many of these innovations have the power to improve millions of lives. I'm thrilled to share the 2023 International Innovation Scorecard, our assessment of the global innovation landscape, and our vision for the policies and practices making innovation thrive.



Gary Shapiro

Gary Shapiro

A handwritten signature in black ink, reading "Gary Shapiro". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

President and CEO,
Consumer Technology
Association, CTA®

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Executive Summary



Executive Summary

The 2023 International Innovation Scorecard is our most ambitious effort yet to distill the key ‘ingredients’ of the innovation cocktail. The 2023 edition expanded to include nine additional countries for a total of 70 nations spanning the globe – including all members of the EU and G20.

In choosing the 17 categories and 40 indicators, which range from immigration data, to regulations around self-driving vehicles, to R&D investment, we attempted to identify the policies and practices needed to support the next generation of entrepreneurs and innovators and bring groundbreaking new technologies to life. Do governments make it

easy for founders to start their own businesses? Do they encourage research and experimentation and solicit input from various stakeholders? Do they value diversity, and make it possible for people of all backgrounds to thrive in the workplace? Our 2023 edition, adds four new indicators to capture how

countries realize the promise of vital and exciting emerging technologies: telemedicine, cybersecurity, digital assets, and artificial intelligence. After crunching the numbers, we saw exciting results: a record 24 countries and the European Union as an entity received our highest honor – a designation as “Innovation Champion.”

These countries pushed the boundaries of the possible in a time of incredible change and disruption for both business and daily lives of people around the globe. We congratulate Australia, Austria, Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Israel, Japan, Lithuania, Luxembourg, The Netherlands, New

Zealand, Norway, Singapore, Spain, Sweden, Switzerland, the United Kingdom, the United States, and the European Union on their success in creating vibrant innovation ecosystems.

The next tier – Innovation Leaders – includes dynamic Asian economies including South Korea and Malaysia, as well as a group of democracies only a generation removed from the Cold War, including Poland, the Czech Republic, Slovenia and Hungary. Four Innovation Leaders — Bulgaria, Malta, Slovakia and Greece — are new entrants to the group, reflecting the ever-expanding frontier of technological progress.

Our Innovation Adopters, including several countries making their first appearance on the Scorecard, have introduced policies or improved regulation in areas including self-driving vehicles and entrepreneurial

activity. And while our Modest Innovators have more to do to support and capitalize on the benefits of a vibrant technology industry, we see encouraging signs in new fields such as telemedicine and digital assets.

Each of the 70 countries in this year's Scorecard has a unique story to tell. But across the board, they are introducing technological innovations that improve citizens' lives and build bridges between our fast-paced, interconnected societies. We're thrilled to showcase their successes and offer lessons learned from challenges. In doing so, we hope to inspire new entrepreneurs, experienced business leaders, and policymakers to bring about the next great strides in human development.

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Overview



Overview



The 2023 Innovation Champions are the top-scoring countries in the world, earning high marks for diversity in the workforce, personal and economic freedom, high-speed broadband connections, highly-skilled workforces, a friendly climate for entrepreneurs, and an openness to new technologies and business models. They allow payments using digital assets including cryptocurrencies and allow testing of self-driving vehicles and advanced air mobility technologies. The 25 Innovation Champions include longtime global leaders such as the United States and United Kingdom, economic heavyweights such as France, Germany and Japan, Nordic states such as Norway, and small but vibrant economies including Belgium, Ireland, Israel and Lithuania.

Australia
Austria
Belgium
Canada
Denmark
Estonia
European Union
Finland
France
Germany
Iceland
Ireland
Israel
Japan
Lithuania
Luxembourg
Netherlands
New Zealand
Norway
Singapore
Spain
Sweden
Switzerland
United Kingdom
United States



The 16 Innovation Leaders earn high grades in most of the 17 categories on the Scorecard. Most of these countries have relatively high degrees of economic and personal freedom, enjoy well-educated and highly skilled workforces, and have high levels of entrepreneurial activity and R&D investment. This group includes industrial and manufacturing giants such as South Korea and Malaysia, and many advancing Eastern European economies, including Bulgaria, the Czech Republic, Latvia, Poland, Slovakia and Slovenia.

Bulgaria
Chile
Croatia
Cyprus
The Czech Republic
Greece
Hungary
Italy
Latvia
Malaysia
Malta
Poland
Portugal
Slovakia
Slovenia
South Korea

Overview



The 20 Innovation Adopters show strong pro-innovation policies and trends in some categories, but not most. Bright spots include the diversity of the workforce in Mexico and Costa Rica, the business-friendly tax policies of Romania and Kazakhstan, and the Philippines' commitment to free trade. Most Innovation Adopters could take steps to make it easier to establish and operate businesses, and some could improve technical education.

Argentina
Brazil
China
Colombia
Costa Rica
India
Jordan
Kazakhstan
Mexico
Panama
Peru
Philippines
Romania
Russian Federation
Saudi Arabia
South Africa
Thailand
Turkey
Uruguay
Vietnam

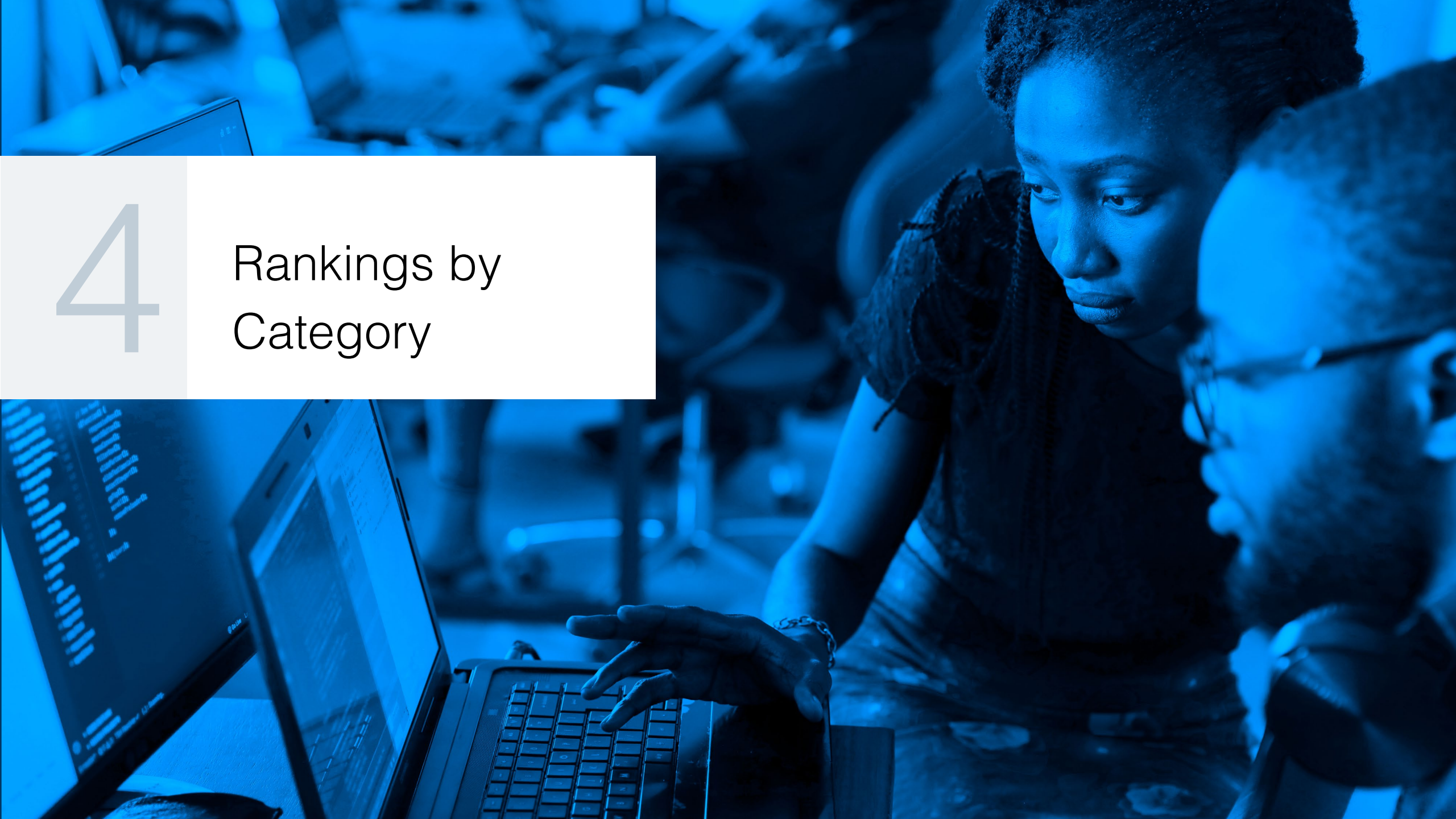


The lowest tier on the Scorecard also has the fewest members. The 10 Modest Innovators have the greatest room for improvement. Whether that means increasing the ethnic and gender diversity of their workforces, loosening restrictions on the ownership and use of digital assets, or eliminating barriers to entrepreneurship and innovation in one or more other areas. And while our Modest Innovators have more to do to deliver the benefits of vibrant technology industries, we see encouraging signs in fields including telemedicine.

Ecuador
Egypt
Ghana
Indonesia
Kenya
Morocco
Nigeria
Pakistan
Rwanda
Tunisia

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Rankings by Category



Rankings by Category

The Scorecard categories — 17 in all, based on 40 qualitative and quantitative metrics — span a broad range of sectors and activities that fuel the development of new ideas.

Ranking our results by category reveals the sheer diversity of global innovation. Some countries have dynamic startup economies but are held back by stifling regulations. Others, despite a deficit of broadband access and a mature R&D ecosystem, have been quick to embrace technologies such as digital assets and artificial intelligence.

Artificial Intelligence



United States
Finland
Estonia
Sweden
Norway
Iceland
United Kingdom
Canada
Ireland
Netherlands

Broadband



Iceland
Japan
The Netherlands
United States
Sweden
Estonia
Luxembourg
Malta
Denmark
France

Cybersecurity



United States
Finland
Estonia
Sweden
Iceland
Netherlands
Luxembourg
Lithuania
Belgium
Austria

Digital Currencies



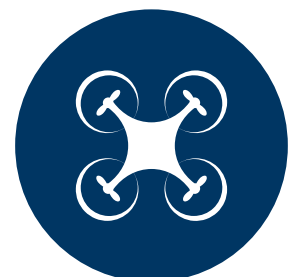
United States
Finland
Estonia
Sweden
Norway
Iceland
United Kingdom
Canada
Ireland
Netherlands

Diversity



Luxembourg
New Zealand
Australia
Canada
Singapore
Switzerland
Estonia
Iceland
Philippines
United States

Drones & Advanced Air Mobility



United States
Finland
Sweden
Norway
United Kingdom
Canada
Ireland
Netherlands
Australia
Lithuania

Entrepreneurial Activity



Estonia
New Zealand
United Kingdom
South Korea
Australia
United States
Singapore
Luxembourg
Cyprus
Chile

Environment



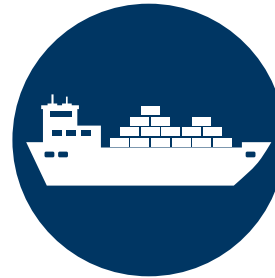
Australia
Canada
Finland
Iceland
New Zealand
Spain
Sweden
Uruguay
Argentina
Belgium

Freedom



Sweden
New Zealand
Finland
Norway
Canada
Ireland
Luxembourg
Uruguay
Denmark
Switzerland

Global Tech Trade



Philippines
Singapore
Malaysia
China
The Czech Republic
Thailand
Vietnam
Hungary
The Netherlands
Slovakia

Human Capital



Singapore
Finland
Malaysia
United States
Russian Federation
Canada
Germany
United Kingdom
Switzerland
Tunisia

R&D Investment



Israel
South Korea
Sweden
Austria
Germany
Japan
Switzerland
United States
Belgium
Denmark

Resilience & Digital Transparency



Denmark
Finland
The Netherlands
Estonia
Norway
South Korea
United States
Sweden
Australia
Iceland

Self-Driving Vehicles



United States
Finland
Estonia
Sweden
Norway
Iceland
United Kingdom
Canada
Ireland
Netherlands

Tax Friendliness



Bulgaria
Hungary
Saudi Arabia
Romania
Lithuania
Kazakhstan
Russian Federation
Singapore
Cyprus
Estonia

Telehealth/ Telemedicine



United States
Finland
Estonia
Sweden
Norway
Iceland
United Kingdom
Canada
Ireland
Netherlands

Unicorns



Iceland
Singapore
Israel
Malta
United States
Luxembourg
Estonia
Ireland
Finland
Norway



Country	Grade	Score	Artificial Intelligence	Broadband	Cybersecurity	Digital Currencies	Diversity	Drones & Advanced Air Mobility	Entrepreneurial Activity	Environment
Argentina	Innovation Adopter	2.451	A	C-	B	A	C-	B	D+	A-
Australia	Innovation Champion	3.489	A	B	B	A	A	A	A	A+
Austria	Innovation Champion	3.216	A	B-	A	A	B+	B	C-	B
Belgium	Innovation Champion	3.333	A	B+	A	A	B+	B	B	A-
Brazil	Innovation Adopter	2.343	A	C	F	A	C+	B	C-	B-
Bulgaria	Innovation Leader	2.726	A	B	A	A	C+	C	C	B-
Canada	Innovation Champion	3.607	A	B+	B	A	A	A	B	A+
Chile	Innovation Leader	2.676	A	C	A	A	C	D	B+	B-
China	Innovation Adopter	2.440	B	C+	F	C	D	B	B+	C-
Colombia	Innovation Adopter	2.460	A	D+	A	A	C-	B	C+	C-
Costa Rica	Innovation Adopter	2.470	F	C	A	A	B	C	C-	C
Croatia	Innovation Leader	2.667	F	B-	B	A	C-	C	C+	C



Country	Freedom	Global Tech Trade	Human Capital	R&D Investment	Resilience & Digital Transparency	Self-Driving Vehicles	Tax Friendliness	Telehealth/Telemedicine	Unicorns
Argentina	B	F	D+	C-	C	A	B	A+	F
Australia	A	B	B+	B	A	A	D+	A+	C
Austria	A-	B	B+	A-	A-	A	D+	A+	C
Belgium	A	B-	B-	A-	B+	A	C-	A+	C
Brazil	B-	D-	D+	B	C+	C	C	A+	C
Bulgaria	B-	B	C-	C	B-	C	A+	A	F
Canada	A+	B	A	B	B+	A	B-	A+	B
Chile	A-	F	B	D-	B	A	C	A+	C
China	D-	A	C+	B+	B-	A	C	A+	C
Colombia	C+	C-	C	D-	C+	A	C-	A+	D
Costa Rica	B+	B	C+	D	C+	A	B	A+	F
Croatia	B	B-	C-	B	B-	A	B+	A+	B



Country	Grade	Score	Artificial Intelligence	Broadband	Cybersecurity	Digital Currencies	Diversity	Drones & Advanced Air Mobility	Entrepreneurial Activity	Environment
Cyprus	Innovation Leader	2.863	A	B	B	A	C-	C	A-	A-
Czech Republic	Innovation Leader	3.019	A	B	B	A	B	C	C	B-
Denmark	Innovation Champion	3.392	A	A-	B	A	B-	C	B+	A-
Ecuador	Modest Innovator	1.608	C	D	F	A	D+	C	F	C-
Egypt	Modest Innovator	1.843	A	D	F	C	C-	D	C	C
Estonia	Innovation Champion	3.725	A	A-	A	A	A	C	A+	A-
Finland	Innovation Champion	3.744	A	B+	A	A	B	A	B	A+
France	Innovation Champion	3.372	A	A-	B	A	B	B	B	A-
Germany	Innovation Champion	3.392	A	B+	B	A	B	A	C-	A-
Ghana	Modest Innovator	1.794	C	D-	B	C	B-	C	B	F
Greece	Innovation Leader	2.941	A	B	B	A	C	C	B	A-
Hungary	Innovation Leader	2.902	A	B	B	A	C	C	B-	B-



Country	Freedom	Global Tech Trade	Human Capital	R&D Investment	Resilience & Digital Transparency	Self-Driving Vehicles	Tax Friendliness	Telehealth/Telemedicine	Unicorns
Cyprus	B+	B-	B	C-	B	C	A-	A+	F
Czech Republic	B+	A-	C+	B+	B	A	A-	A+	F
Denmark	A+	B	B	A-	A+	A	C-	A+	B
Ecuador	C+	F	F	D	C-	C	B	A+	D
Egypt	F	C-	D+	C	D+	A	B+	A	F
Estonia	A	B	B+	B	A+	A	A-	A+	A
Finland	A+	B	A+	A-	A+	A	C	A+	A
France	B+	B	B+	B+	A-	A	C	A+	B
Germany	A-	B	A	A-	A	A	D+	A+	B
Ghana	B-	F	D	D	D+	C	B	A+	F
Greece	B-	B	B+	B	B-	A	C+	A+	F
Hungary	C+	B+	C	B	B-	A	A+	A+	F

Data



Country	Grade	Score	Artificial Intelligence	Broadband	Cybersecurity	Digital Currencies	Diversity	Drones & Advanced Air Mobility	Entrepreneurial Activity	Environment
Iceland	Innovation Champion	3.646	A	A+	A	A	A-	C	B+	A+
India	Innovation Adopter	2.186	A	D-	F	A	D+	A	D+	C-
Indonesia	Modest Innovator	1.960	F	D+	F	C	B	D	B-	B-
Ireland	Innovation Champion	3.607	A	B	B	A	B+	A	B+	A-
Israel	Innovation Champion	3.470	A	B	B	A	B+	A	B	B
Italy	Innovation Leader	2.980	A	B-	A	A	C	C	C+	B
Japan	Innovation Champion	3.186	A	A+	A	A	D-	A	C	B
Jordan	Innovation Adopter	2.098	A	D	F	A	B+	D	C-	C-
Kazakhstan	Innovation Adopter	2.079	F	C-	F	A	B+	C	B	C
Kenya	Modest Innovator	1.647	F	F	F	A	B+	B	C-	D
Latvia	Innovation Leader	3.038	A	B+	B	A	B+	C	B+	B
Lithuania	Innovation Champion	3.470	A	B	A	A	B-	A	B	B



Country	Freedom	Global Tech Trade	Human Capital	R&D Investment	Resilience & Digital Transparency	Self-Driving Vehicles	Tax Friendliness	Telehealth/ Telemedicine	Unicorns
Iceland	A	B-	B	B+	A	A	B	A+	A
India	C	C-	B+	C	C-	C	D+	A+	C
Indonesia	C	C-	C+	F	C	A	B+	A+	D
Ireland	A+	B	B+	B	A-	A	B+	A+	A
Israel	C+	B+	A-	A+	A-	A	C	A+	A
Italy	A-	B-	B-	B	B	A	C+	A+	D
Japan	A	B+	A-	A-	B+	A	F	A+	C
Jordan	D+	C-	B	C	D+	C	B+	A+	F
Kazakhstan	D	C-	A-	F	B-	C	A	A+	F
Kenya	C-	F	C-	C	D	C	C+	A+	F
Latvia	A-	B+	C	C-	B+	A	B+	A+	F
Lithuania	B+	B	B	B-	A	A	A	A+	B



Country	Grade	Score	Artificial Intelligence	Broadband	Cybersecurity	Digital Currencies	Diversity	Drones & Advanced Air Mobility	Entrepreneurial Activity	Environment
Luxembourg	Innovation Champion	3.549	A	A-	A	A	A+	C	A-	A-
Malaysia	Innovation Leader	2.666	A	C	F	A	B	D	C	B-
Malta	Innovation Leader	2.961	A	A-	B	A	B-	C	B	A-
Mexico	Innovation Adopter	2.049	C	C-	F	C	B	C	C	D
Morocco	Modest Innovator	1.726	C	D	A	C	F	F	B-	C-
Netherlands	Innovation Champion	3.568	A	A	A	A	B	A	B	A-
New Zealand	Innovation Champion	3.313	A	B+	F	A	A	A	A+	A+
Nigeria	Modest Innovator	1.804	C	F	B	A	B	C	C	F
Norway	Innovation Champion	3.705	A	A-	B	A	B+	A	B+	A-
Pakistan	Modest Innovator	1.293	C	F	F	A	D+	D	C+	F
Panama	Innovation Adopter	2.353	C	C-	B	A	B+	C	B	B
Peru	Innovation Adopter	2.235	A	D	B	A	B	C	C	D

									
Country	Freedom	Global Tech Trade	Human Capital	R&D Investment	Resilience & Digital Transparency	Self-Driving Vehicles	Tax Friendliness	Telehealth/ Telemedicine	Unicorns
Luxembourg	A+	B-	B-	B	A	A	C	A+	A
Malaysia	C-	A+	A+	B-	C+	B	B	A+	D
Malta	B	B	C	C-	B+	C	D	A+	A
Mexico	C	D+	B-	D-	C+	A	C	A+	C
Morocco	D	C-	C	C	C-	C	C-	A	F
Netherlands	A	B+	B	B+	A+	A	C-	A+	B
New Zealand	A+	B	B	B	A	A	B-	A+	F
Nigeria	C-	F	D	C-	F	C	B	A+	D
Norway	A+	B	A-	B+	A+	A	B	A+	A
Pakistan	D+	F	D+	F	F	C	C+	A+	F
Panama	B-	C+	C-	F	C	C	B	A+	F
Peru	B-	C-	C+	F	C+	C	B-	A+	F



Country	Grade	Score	Artificial Intelligence	Broadband	Cybersecurity	Digital Currencies	Diversity	Drones & Advanced Air Mobility	Entrepreneurial Activity	Environment
Philippines	Innovation Adopter	2.353	A	D	B	A	A-	D	F	D
Poland	Innovation Leader	2.941	A	A-	B	A	D	A	C-	B-
Portugal	Innovation Leader	3.000	A	B	A	A	C+	C	B	A-
Romania	Innovation Adopter	2.529	F	B	A	A	C	B	B-	B-
Russian Federation	Innovation Adopter	2.294	B	C+	F	C	C	D	B	B
Rwanda	Modest Innovator	1.559	C	F	F	A	B-	C	B	F
Saudi Arabia	Innovation Adopter	2.470	B	C+	F	A	B	B	B-	C
Singapore	Innovation Champion	3.431	A	B+	F	A	A	B	A-	B
Slovakia	Innovation Leader	2.666	A	B-	B	A	C	C	C+	B
Slovenia	Innovation Leader	2.922	A	B	B	A	B-	B	B	B-
South Africa	Innovation Adopter	2.313	A	D+	B	A	B-	C	B	C
South Korea	Innovation Leader	3.157	A	B+	F	A	D	A	A	B-



Country	Freedom	Global Tech Trade	Human Capital	R&D Investment	Resilience & Digital Transparency	Self-Driving Vehicles	Tax Friendliness	Telehealth/ Telemedicine	Unicorns
Philippines	C	A+	B+	F	C-	A	C	A	D
Poland	B-	B	C+	B	B+	A	B+	A+	F
Portugal	A	B	B	B	B	C	B-	A+	F
Romania	B-	B	C	D+	C+	C	A	A+	F
Russian Federation	D	C-	A	B-	C+	B	A-	A+	F
Rwanda	D	F	D-	C-	D	C	C+	A+	F
Saudi Arabia	F	C-	B+	C	B-	A	A	A+	F
Singapore	C-	A+	A+	B	A	A	A-	A+	A
Slovakia	B	B+	C-	C	B-	C	B+	A+	F
Slovenia	B+	B-	B-	B+	B+	C	B-	A+	F
South Africa	B-	F	D+	C	C+	C	C-	A+	D
South Korea	B-	B-	A-	A+	A	A	C	A+	B

Data



Country	Grade	Score	Artificial Intelligence	Broadband	Cybersecurity	Digital Currencies	Diversity	Drones & Advanced Air Mobility	Entrepreneurial Activity	Environment
Spain	Innovation Champion	3.215	A	B+	A	A	B	C	C+	A+
Sweden	Innovation Champion	3.724	A	A-	A	A	B+	A	B+	A+
Switzerland	Innovation Champion	3.353	A	B+	B	A	A	C	B-	B
Thailand	Innovation Adopter	2.470	A	C	F	A	D+	C	B-	B-
Tunisia	Modest Innovator	1.804	A	D+	F	C	F	F	B	C-
Turkey	Innovation Adopter	2.451	A	C-	B	C	C	B	C+	C-
United Kingdom	Innovation Champion	3.627	A	B+	B	A	B	A	A	A-
United States	Innovation Champion	3.744	A	A	A	A	B+	A	A-	A-
Uruguay	Innovation Adopter	2.333	A	B-	F	A	C-	C	C+	A+
Vietnam	Innovation Adopter	2.255	B	C-	F	A	C-	D	C	B-
European Union	Innovation Champion	3.235	A	B+	B	A	B-	A	C+	B



Country	Freedom	Global Tech Trade	Human Capital	R&D Investment	Resilience & Digital Transparency	Self-Driving Vehicles	Tax Friendliness	Telehealth/ Telemedicine	Unicorns
Spain	B+	B-	B	B	B+	A	C	A+	C
Sweden	A+	B	A-	A	A	A	C+	A+	B
Switzerland	A+	B-	A	A-	A-	C	B+	A+	B
Thailand	C-	B+	B-	B-	C+	C	B+	A+	D
Tunisia	C	F	A-	C-	C-	C	B+	A+	F
Turkey	D	C-	C-	B	C+	A	B	A+	D
United Kingdom	A-	B	A	B	A-	A	B	A+	A
United States	B+	B+	A	A-	A	A	C+	A+	A
Uruguay	A+	F	D	D	B	C	B	A+	F
Vietnam	D	B+	C-	D+	C+	A	B+	A+	D
European Union	B+	B	B	B+	B+	A	B-	A	C

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Methodology



Methodology

In its latest edition, CTA's International Innovation Scorecard has expanded to evaluate 70 countries, including the entire G-20, and all 27 members of the European Union. It includes countries that have trade agreements with the United States, and many emerging markets driving new tech innovations in fields ranging from health to finance and transportation.

In total, the International Scorecard is a comparative analysis of 40 indicators across 17 categories. Our measurements determine which countries create the most welcoming environments for entrepreneurship, economic growth, and the social progress that supports innovation, and suggest strategies other countries might emulate if their people wish to enjoy similar benefits.

Some of the factors we consider relate to demographics, such as the share of immigrants in a country's population and the gender equality of its workforce, while others include the availability

of high-skilled workers and the ease with which its people can start new businesses. Other factors are political and cultural, including the freedom of movement, information and expression. We also evaluate the health of a country's environment, including the quality of its air and water.

We consider whether countries have signed international conventions on cybersecurity, and whether they have defined strategies to encourage the development of promising commercial uses of artificial intelligence.

Finally, we consider a country's rules surrounding technological trade, and emerging technologies of great potential, such as faster payments systems and digital assets, drones, air taxis and self-driving vehicles.

All third-party sources and policy inputs reflect the latest information available as of September 30, 2022. As always, we welcome your comments and feedback by email at scorecard@cta.tech.

Eligibility of Countries

In the 2023 International Innovation Scorecard, CTA evaluates countries for which:

- Publicly available, verifiable and independent third-party data exists;
- Comparable data across nations exists; and
- Governments can influence public policy.

European Union

Under the treaties on which the European Economic Community is based, the European Union establishes policies in certain areas, but allows its member states to establish policies of their own in others. This presents a challenge when evaluating EU states, as they must be evaluated on their merits, but also should not be penalized for policies they themselves have not chosen to enact. As a result, CTA has both graded the EU in its entirety, and evaluated each of its 27 member states individually, on the respective indicators in each category.



Artificial Intelligence

Artificial Intelligence evaluates the extent to which a country promotes the development of AI for non-strictly governmental applications. Metric A assesses whether a country has a stated national strategy to guide the commercial development of artificial intelligence. Metric B assesses whether the country holds public consultations of stakeholders and experts that allow non-government actors, such as representatives of the research community, businesses, journalists and members of the public, to express their views or provide expert advice that inform policy-making processes. A country earns an 'A' if it both has a national AI strategy and holds public consultations, a 'B' if it has an AI strategy but does not hold fully public consultations, a 'C' if it has no AI strategy but does hold fully public consultations, and an 'F' if it has neither an AI strategy nor fully public consultations.



Broadband

Broadband measures a country's number of mobile broadband subscriptions per 100 inhabitants (Metric A, using International Telecommunications Union data indicator i911w), number of fixed broadband subscriptions per 100 inhabitants (Metric B, using International Telecommunications Data indicator i992b) and the mean download speeds of its internet connections (Metric C, using cable.co.uk's Worldwide broadband speed league). The three metrics are each weighted equally, and the combined scores are normalized.



Cybersecurity

Cybersecurity considers whether a country has signed the Council of Europe Convention on Cybercrime (ETS No. 185), and whether it has signed the Second Additional Protocol to the Convention on Cybercrime on Enhanced Cooperation and Disclosure of Electronic Evidence (CETS No. 224). Countries that have signed both conventions earn an 'A', countries that have signed the first convention but not the second earn a 'B', and countries that have signed neither convention earn an 'F'.



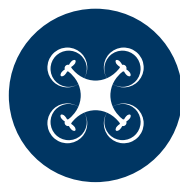
Digital Assets

Digital Assets considers the extent to which a country encourages the development of advanced financial technologies and related systems, such as blockchain applications. Metric A assesses whether a country allows for digital payments within its borders, meaning electronic settlement systems in which transactions are denominated in a country's own currency, or currencies recognized on international exchanges. Metric B assesses whether a country permits the use of digital assets, such as cryptocurrencies, for payment within its borders. A country earns an 'A' if it permits both electronic payments and payments with digital assets, a 'C' if it permits electronic payments but not payments with digital assets, and an 'F' if it permits neither.



Diversity

Diversity measures the concentration of various ethnic groups within a country and the gender gap in its workforce. Metric A assesses the country's ethnic diversity based on immigration data, using an adaptation of the Herfindahl-Hirschman Index, a method most commonly used to measure corporate concentration within a given industry, relying on the CIA World Factbook, and World Atlas (France) Istituto Nazionale di Statistica (Italy), Britannica (Malta), and minorityrights.org (Rwanda). Metric B assesses the share of immigrants as a percentage of a country's population, using the United Nations Department of Economic and Social Affairs, Population Division, International Migrant Stock 2020. Metric C assesses the ratio of female-to-male participation in the country's labor force among people ages 25-54, drawing on the World Economic Forum: Global Gender Gap Report, 2022. The scores in each metric are normalized, and then averaged, producing a letter grade.



Drones & Advanced Air Mobility

Drones & Advanced Air Mobility evaluates laws, regulations and policymaking activities on the use of drones, and advanced air mobility — often referred to as urban air mobility or air taxis.

Metric A assesses whether a country has any government-led working groups or committees of stakeholders focused on urban/advanced air mobility.

Metric B assesses whether a country has as national or regional strategy for urban air mobility/advanced air mobility.

Metric C assesses whether a country has permanent national rules (as opposed to temporary or interim rules) for Drones and Advanced Air Mobility that support innovation and economic growth, meaning, that allow businesses to use drones to deliver items, and air taxis to transport people.

Metric D assesses whether a country has permanent national rules supporting recreational and hobbyist drone operators, meaning, it allows ordinary people to fly drones without obtaining licenses that are difficult to get.

Metric E assesses whether a country has a consistent drone policy framework at different levels of government (municipal, state/regional, national).

Countries receive 1 point for an affirmative answer in each metric, and -1 point for each negative answer in each metric, resulting in a combined score of anywhere from -5 to 5 points. A country that earns 4 to 5 points receives an 'A', 2 to 3 points receives a 'B', 0 to 1 points receives a 'C', -3 to -1 points a 'D', and -5 to -4 points an 'F'.



Entrepreneurial Activity

Entrepreneurial Activity evaluates how easy it is to start a new business in a country. Metric A assesses the country's annual rate of new business creation per 1,000 people aged 15-64, based on the World Bank Entrepreneurship Database (2020). Metric B assesses the ease of starting a business, according to the World Bank's "Doing Business: Ease of Starting a Business" 2020 Corrected Data. These measures are each normalized, then averaged, combined, normalized again, and converted to letter grades.



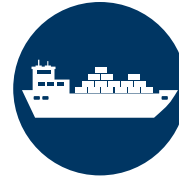
Environment

Environment evaluates the quality of a country's air and drinking water. Metric A considers air quality, measuring concentrations of fine particulate matter (PM2.5, in $\mu\text{g}/\text{m}^3$) using World Health Organization data (Source 1). Countries earn an 'A' for meeting or falling below the WHO Air Quality Guideline, an annual mean of PM2.5 of $10\mu\text{g}/\text{m}^3$, a 'B' for $10\text{--}15\mu\text{g}/\text{m}^3$, 'C' for $15\text{--}25\mu\text{g}/\text{m}^3$, 'D' for $25\text{--}35\mu\text{g}/\text{m}^3$, and 'F' for over $35\mu\text{g}/\text{m}^3$ or data not available.



Freedom

Freedom evaluates the degree to which a country grants its citizens certain civil and political liberties. The grades are derived by equally weighting select components of CATO Institute's Human Freedom Index (to include freedom of movement; religious freedom; the freedoms of association, assembly and civil society; freedom of expression and information; and freedom of relationships), and scores from Freedom House's Freedom in the World 2022. The combined scores are then normalized.



Global Tech Trade

Tech Trade considers four factors: Metric A, based on a country's participation in the 1997 Information Technology Agreement (ITA), according to the World Trade Organization information; Metric B, a country's participation in the 2015 expansion of the ITA, based on the World Trade Organization Declaration on the Expansion of Trade in Information Technology Products; Metrics C and D, the share of Information and Communication Technologies (ICT) as a percentage of a country's total exports (Metric C) and as a percentage of total imports (Metric D), both derived from the United Nations Conference on Trade and Development (UNCTADSTAT). Metrics C and D are normalized, and then all four measures are averaged and normalized again, producing letter grades.



Human Capital

Human Capital evaluates a country's population on the basis of educational attainment, availability of high-skilled workers, and the share of STEM-related advanced degrees. Metric A assesses the percentage of a country's population possessing a tertiary degree based on the INSEAD Global Talent Competitiveness Index 2021. Metric B assesses the availability of scientists and engineers, based on an average score of a survey of business leaders, also using the INSEAD Global Talent Competitiveness Index 2021. Metric C assesses the percentage of overall degrees institutions of higher learning confer in STEM-related disciplines, using the WIPO Global Innovation Index. Each of these three metrics is normalized, and the scores are then combined into a composite, yielding a letter grade.



R&D Investment

R&D Investment measures a country’s gross expenditure on research and development, as a percentage of its GDP, using data from the WIPO 2021 Global Innovation Index. The score is normalized, and converted to a letter grade.



Resilience & Digital Transparency

Resilience evaluates the extent to which a country’s government provides services on the internet, and how well its business environment is prepared to withstand and recover from disruptive events. The category encompasses a Resilience Score (Metric A, based on the FM Global Resilience Index) and an E-Government Development Score (Metric B, from the UN E-Government Knowledgebase. The combined score is normalized.

Metric B measures drinking water by percentage of the population using improved drinking water sources, using the WHO. Countries earn an ‘A’ for 100% of the population using improved drinking-water sources, a ‘B’ for 91-99%, a ‘C’ for 76-90%, a ‘D’ for 50-75%, and an ‘F’ for less than 50% or data not available.

For both Metrics A and B, the letter grades are converted to numeric scores, with ‘A’ equaling 4 points, ‘B’ equaling 3 points, ‘C’ equaling 2 points, ‘D’ equaling 1 points, and ‘F’ equaling 0 points. The resulting scores are averaged into a composite score for the category, and converted back into letter grades according to the following table:

A+	(3.754-4.000)
A	(3.503-3.753)
A-	(3.252-3.502)
B+	(3.001-3.251)
B	(2.750-3.000)
B-	(2.405-2.749)
C+	(2.061-2.404)
C	(1.716-2.060)
C-	(1.372-1.715)
D+	(1.027-1.371)
D	(0.682-1.026)
D	(0.338-0.681)
F	(0.000-0.337)



Self-Driving Vehicles

Self-Driving Vehicles evaluates the extent to which a country permits the testing and operation of self-driving vehicles on its public roads. Metric A assesses whether a country allows for testing or operation of self-driving vehicles (SDVs). Metric B assesses whether a country has taken any action to encourage the development of SDVs, and if so, whether the rule or statute stipulates the use of a specific technology, or is open to all technologies. A country earns an 'A' if it allows testing or operation of SDVs and has taken technology-neutral action to encourage their development. A country earns a 'B' if it allows testing or operation of SDVs, but any action it has taken to encourage their development is specific to certain technologies. A country earns a 'C' if it allows neither testing nor operation of SDVs.



Tax Friendliness

Tax Friendliness evaluates the competitiveness of a country's tax system, based on its top federal corporate tax rate, and its top individual marginal tax rate. Metric A is based on KPMG Corporate Tax Rates 2011-2021. Metric B is based on KPMG Individual Income Tax Rates 2011-2021 and PwC Worldwide Tax Summaries (Rwanda). The scores in each metric are normalized, combined into a composite, and converted to a letter grade.



Telehealth/Telemedicine

Telehealth evaluates the extent to which a country permits Telemedicine for its population. If a country allows for doctors' visits and at least some treatments and prescriptions to be performed via Telemedicine (to include SMS or messaging, and video calls), it earns an 'A'. If a country also allows for doctors' visits and/or treatments by Telemedicine to be covered by either private insurance providers or a national healthcare system, it earns an 'A+'.



Unicorns

Unicorns considers the number of domestic companies that have achieved an actual or implied valuation of at least US \$1 billion, per 10 million people in population, drawing on data from Pitchbook, CBInsights, and Crunchbase.

Artificial Intelligence

- National AI strategy
- Public consultations on AI policy

Broadband

- Mobile broadband subscriptions per 100 inhabitants
- Fixed broadband subscriptions per 100 inhabitants
- Mean internet download speeds

Cybersecurity

- Status on Council of Europe Convention on Cybercrime
- Status on Second Additional Protocol to the Council of Europe Convention on Cybercrime

Digital Assets

- Digital payment regulation
- Digital asset regulation

Diversity

- Ethnic diversity
- Immigrants as a percentage of population
- Female-to-male participation in labor force

Drones & Advanced Air Mobility

- Government-led efforts on urban/advanced air mobility
- National/regional strategy for urban/advanced air mobility
- Rules for advanced air mobility supporting innovation and economic growth
- Rules for advanced air mobility supporting recreational drone operators
- Consistent drone policy framework

Entrepreneurial Activity

- Rate of new business creation per 1,000 people aged 15-64
- Ease of starting a business

Environment

- Air quality, measured against WHO Air Quality Guidelines
- Share of the population using improved drinking water sources

Freedom

- Measures of civil liberties
- Measures of political liberties

Human Capital

- Share of population attaining tertiary degrees
- Availability of scientists and engineers
- Share of overall degrees conferred in STEM-related disciplines

R&D Investment

- Expenditure on R&D as a percentage of GDP

Resilience

- Preparedness of business environment for disruptive shocks
- Online provision of government services

Self-Driving Vehicles

- Regulations on testing/operation of self-driving vehicles on public roads
- Technology-neutral approach to self-driving vehicles

Tax Friendliness

- Top federal corporate tax rate
- Top individual marginal tax rate

Tech Trade

- Participation in 1997 Information Technology Agreement
- Participation in the 2015 expansion of the ITAT
- Share of Information and Communication Technologies (ICT) as a percentage of a country's total exports
- Share of Information and Communication Technologies (ICT) as a percentage of total imports

Telehealth

- Availability of doctors' visits and treatments/prescriptions via telemedicine
- Coverage of telemedicine by private or public health insurance providers

Unicorns

- Number of domestic companies achieving valuations of at least US \$1 billion, per 10 million people

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The Honorable Mona Keijzer
State Secretary for Economic Affairs
and Climate Policy
Netherlands



The Honorable Dr. L.
Secretary of State
United Kingdom



The Honorable Mailis Reps
Minister of Research
Estonia



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