

Global Innovation Index 2021

Executive Summary



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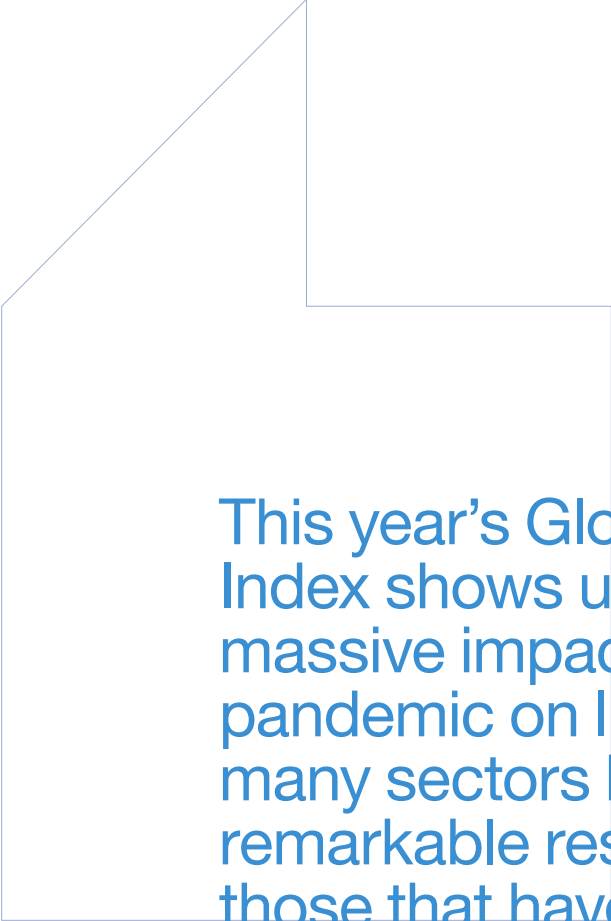


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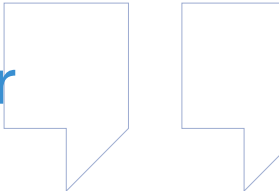


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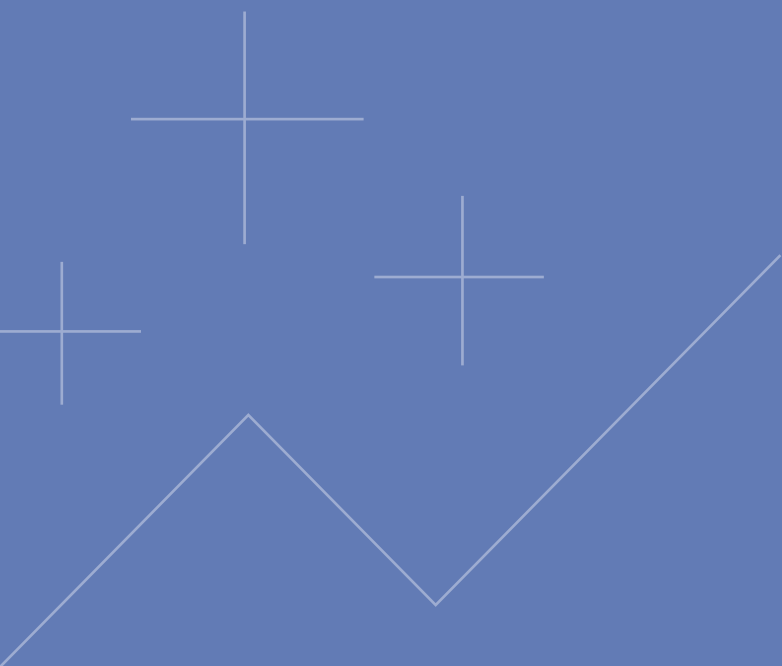
This year's Global Innovation Index shows us that in spite of the massive impact of the COVID-19 pandemic on lives and livelihoods, many sectors have shown remarkable resilience – especially those that have embraced digitalization, technology and innovation. As the world looks to rebuild from the pandemic, we know that innovation is integral to overcoming the common challenges that we face and to constructing a better future. The Global Innovation Index is a unique tool to guide policy-makers and businesses in charting plans to ensure that we emerge stronger from the pandemic.



Daren Tang, Director General, World Intellectual Property Organization

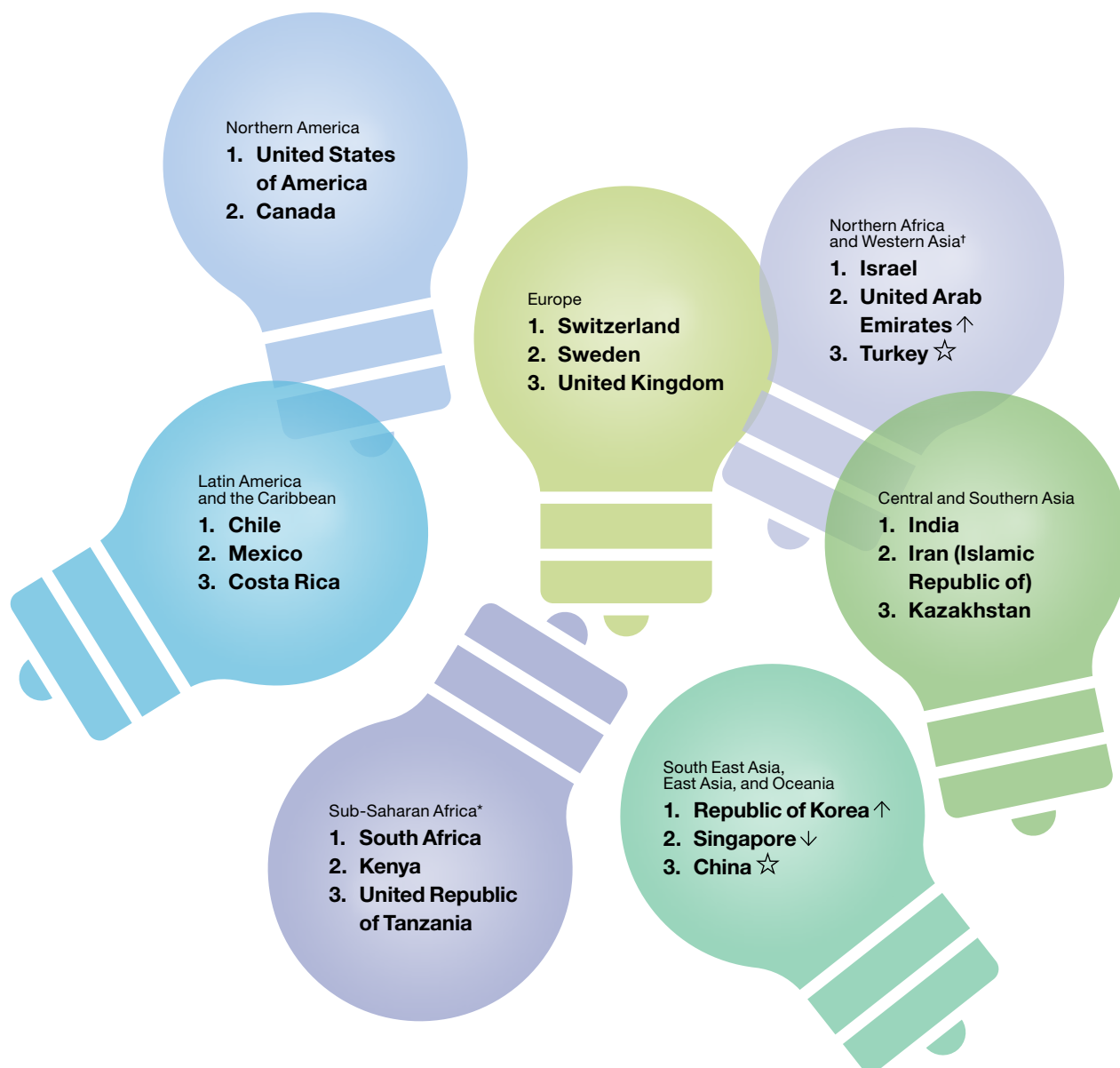
GII 2021 at a glance

The Global Innovation Index 2021 captures the innovation ecosystem performance of 132 economies and tracks the most recent global innovation trends.



Global leaders in innovation, 2021

Top three innovation economies by region



Top three innovation economies by income group

High-income	Upper middle-income	Lower middle-income	Low-income
1. Switzerland 2. Sweden 3. United States of America	1. China 2. Bulgaria ↑ 3. Malaysia ↓	1. Viet Nam 2. India ↑ 3. Ukraine ↓	1. Rwanda ↑ 2. Tajikistan ☆ 3. Malawi ☆

↑↓ Indicates the movement of rank within the top three, relative to 2020, and ☆ indicates a new entrant into the top three in 2021.

† Top three in Northern Africa and Western Asia (NAWA) – excluding island economies. The top four in the region, including all economies, are as follows: Israel (1st), Cyprus (2nd), United Arab Emirates (3rd) and Turkey (4th).

* Top three in sub-Saharan Africa (SSA) – excluding island economies. The top five in the region comprise Mauritius (1st), South Africa (2nd), Kenya (3rd), Cabo Verde (4th) and the United Republic of Tanzania (5th).

Source: Global Innovation Index Database, WIPO, 2021.

Notes: World Bank Income Group Classification (June 2020). Year-on-year GII rank changes are influenced by performance and methodological considerations; some economy data are incomplete (see Appendix I).

Global Innovation Index 2021 rankings

GII rank	Economy	Score	Income group rank	Region rank	GII rank	Economy	Score	Income group rank	Region rank
1	Switzerland	65.5	1	1	67	Colombia	31.7	17	6
2	Sweden	63.1	2	2	68	Qatar	31.5	45	7
3	United States of America	61.3	3	1	69	Armenia	31.4	18	8
4	United Kingdom	59.8	4	3	70	Peru	31.2	19	7
5	Republic of Korea	59.3	5	1	71	Tunisia	30.7	7	9
6	Netherlands	58.6	6	4	72	Kuwait	29.9	46	10
7	Finland	58.4	7	5	73	Argentina	29.8	20	8
8	Singapore	57.8	8	2	74	Jamaica	29.6	21	9
9	Denmark	57.3	9	6	75	Bosnia and Herzegovina	29.6	22	38
10	Germany	57.3	10	7	76	Oman	29.4	47	11
11	France	55.0	11	8	77	Morocco	29.3	8	12
12	China	54.8	1	3	78	Bahrain	28.8	48	13
13	Japan	54.5	12	4	79	Kazakhstan	28.6	23	3
14	Hong Kong, China	53.7	13	5	80	Azerbaijan	28.4	24	14
15	Israel	53.4	14	1	81	Jordan	28.3	25	15
16	Canada	53.1	15	2	82	Brunei Darussalam	28.2	49	13
17	Iceland	51.8	16	9	83	Panama	28.0	50	10
18	Austria	50.9	17	10	84	Albania	28.0	26	39
19	Ireland	50.7	18	11	85	Kenya	27.5	9	3
20	Norway	50.4	19	12	86	Uzbekistan	27.4	10	4
21	Estonia	49.9	20	13	87	Indonesia	27.1	27	14
22	Belgium	49.2	21	14	88	Paraguay	26.4	28	11
23	Luxembourg	49.0	22	15	89	Cabo Verde	25.7	11	4
24	Czech Republic	49.0	23	16	90	United Republic of Tanzania	25.6	12	5
25	Australia	48.3	24	6	91	Ecuador	25.4	29	12
26	New Zealand	47.5	25	7	92	Lebanon	25.1	30	16
27	Malta	47.1	26	17	93	Dominican Republic	25.1	31	13
28	Cyprus	46.7	27	2	94	Egypt	25.1	13	17
29	Italy	45.7	28	18	95	Sri Lanka	25.1	14	5
30	Spain	45.4	29	19	96	El Salvador	25.0	15	14
31	Portugal	44.2	30	20	97	Trinidad and Tobago	24.8	51	15
32	Slovenia	44.1	31	21	98	Kyrgyzstan	24.5	16	6
33	United Arab Emirates	43.0	32	3	99	Pakistan	24.4	17	7
34	Hungary	42.7	33	22	100	Namibia	24.3	32	6
35	Bulgaria	42.4	2	23	101	Guatemala	24.1	33	16
36	Malaysia	41.9	3	8	102	Rwanda	23.9	1	7
37	Slovakia	40.2	34	24	103	Tajikistan	23.9	2	8
38	Latvia	40.0	35	25	104	Bolivia (Plurinational State of)	23.4	18	17
39	Lithuania	39.9	36	26	105	Senegal	23.3	19	8
40	Poland	39.9	37	27	106	Botswana	22.9	34	9
41	Turkey	38.3	4	4	107	Malawi	22.9	3	10
42	Croatia	37.3	38	28	108	Honduras	22.8	20	18
43	Thailand	37.2	5	9	109	Cambodia	22.8	21	15
44	Viet Nam	37.0	1	10	110	Madagascar	22.5	4	11
45	Russian Federation	36.6	6	29	111	Nepal	22.5	22	9
46	India	36.4	2	1	112	Ghana	22.3	23	12
47	Greece	36.3	39	30	113	Zimbabwe	21.9	24	13
48	Romania	35.6	40	31	114	Côte d'Ivoire	21.0	25	14
49	Ukraine	35.6	3	32	115	Burkina Faso	20.5	5	15
50	Montenegro	35.4	7	33	116	Bangladesh	20.2	26	10
51	Philippines	35.3	4	11	117	Lao People's Democratic Republic	20.2	27	16
52	Mauritius	35.2	41	1	118	Nigeria	20.1	28	16
53	Chile	35.1	42	1	119	Uganda	20.0	6	17
54	Serbia	35.0	8	34	120	Algeria	19.9	29	18
55	Mexico	34.5	9	2	121	Zambia	19.8	30	18
56	Costa Rica	34.5	10	3	122	Mozambique	19.7	7	19
57	Brazil	34.2	11	4	123	Cameroon	19.7	31	20
58	Mongolia	34.2	5	12	124	Mali	19.5	8	21
59	North Macedonia	34.1	12	35	125	Togo	19.3	9	22
60	Iran (Islamic Republic of)	32.9	13	2	126	Ethiopia	18.6	10	23
61	South Africa	32.7	14	2	127	Myanmar	18.4	32	17
62	Belarus	32.6	15	36	128	Benin	18.0	33	24
63	Georgia	32.4	16	5	129	Niger	17.8	11	25
64	Republic of Moldova	32.3	6	37	130	Guinea	16.7	12	26
65	Uruguay	32.2	43	5	131	Yemen	15.4	13	19
66	Saudi Arabia	31.8	44	6	132	Angola	15.0	34	27

Source: Global Innovation Index Database, WIPO, 2021.

Note: For an explanation of classifications, see Economy profiles, note 1.

High-income
Upper middle-income
Lower middle-income
Low-income

Europe
Northern America
Latin America and the Caribbean

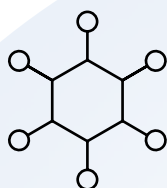
South East Asia, East Asia, and Oceania
Central and Southern Asia

Northern Africa and Western Asia
Sub-Saharan Africa

Innovation performance at different income levels, 2021

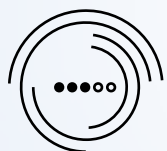
	High-income group	Upper middle-income group	Lower middle-income group	Low-income group
Performance above expectations for level of development	Switzerland	China	Viet Nam	Rwanda
	Sweden	Bulgaria	India	Malawi
	United States of America	Thailand	Ukraine	Madagascar
	United Kingdom	Brazil	Philippines	Tajikistan
	Republic of Korea	Iran (Islamic Republic of)	Mongolia	Burkina Faso
	Netherlands	South Africa	Republic of Moldova	Uganda
	Finland	Peru	Tunisia	Mozambique
	Singapore	Malaysia	Morocco	Mali
	Denmark	Turkey	Kenya	Togo
	Germany	Russian Federation	United Republic of Tanzania	Niger
	France	Montenegro	Uzbekistan	Ethiopia
	Japan	Serbia	Cabo Verde	Guinea
	Hong Kong, China	Mexico	El Salvador	Yemen
	Israel	Costa Rica	Kyrgyzstan	
	Canada	North Macedonia	Pakistan	
	Iceland	Belarus	Bolivia (Plurinational State of)	
	Austria	Georgia	Senegal	
	Ireland	Colombia	Honduras	
	Norway	Armenia	Cambodia	
	Estonia	Jamaica	Nepal	
Belgium	Bosnia and Herzegovina	Ghana		
Luxembourg	Azerbaijan	Zimbabwe		
Czech Republic	Jordan	Zambia		
Australia	Albania	Egypt		
Performance in line with level of development	New Zealand	Indonesia	Sri Lanka	
	Malta	Paraguay	Côte d'Ivoire	
	Cyprus	Ecuador	Bangladesh	
	Italy	Namibia	Lao People's Democratic Republic	
	Spain	Guatemala	Republic	
	Portugal	Argentina	Nigeria	
	Slovenia	Kazakhstan	Algeria	
	Hungary	Lebanon	Cameroon	
	Slovakia	Dominican Republic	Myanmar	
	Latvia	Botswana	Benin	
	Poland		Angola	
	Croatia			
	Mauritius			
	Chile			
	Uruguay			
All other economies	United Arab Emirates			
	Lithuania			
	Greece			
	Romania			
	Saudi Arabia			
	Qatar			
	Kuwait			
	Oman			
	Bahrain			
	Brunei Darussalam			
	Panama			
	Trinidad and Tobago			

Source: Global Innovation Index Database, WIPO, 2021.



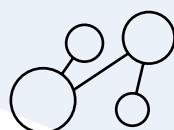
Science and innovation investments

Short term	Scientific publications	R&D expenditures		International patent filings	Venture capital deals
		Total	Business		
	7.6% 2019 → 2020	8.5% 2018 → 2019	7.2% 2018 → 2019	3.5% 2019 → 2020	5.8% 2019 → 2020
Long term	5.4% 2010 → 2020 (annual growth)	4.9% 2009 → 2019 (annual growth)	5.2% 2009 → 2019 (annual growth)	5.3% 2010 → 2020 (annual growth)	3.6% 2010 → 2020 (annual growth)



Technological progress

Short term	Microchip transistor count	Costs of renewable energy		Drug approvals
		Solar photovoltaic	Onshore wind	
	90.5% 2018 → 2019	-13.1% 2018 → 2019	-9.2% 2018 → 2019	10.4% 2019 → 2020
Long term	32.3% 2009 → 2019 (annual growth)	-6.9% 2010 → 2019 (annual growth)	-3.7% 2010 → 2019 (annual growth)	9.7% 2010 → 2020 (annual growth)



Socioeconomic impact

Short term	Labor productivity	Life expectancy	Carbon dioxide emissions
Long term	2.2% 2010 → 2020 (annual growth)	0.3% 2009 → 2019 (annual growth)	1.48% 2009 → 2019 (annual growth)

Notes: See the Data notes section below for a definition of indicators and their data sources. Long-term annual growth refers to the compound annual growth rate (CAGR) over the indicated period.

Key takeaways

The state of innovation throughout the COVID-19 crisis

1. The GII 2021 finds that investment in innovation has shown great resilience during the COVID-19 pandemic, often reaching new peaks, but that it varies across sectors and regions

Investment in innovation reached an all-time high prior to the pandemic, with research and development (R&D) having grown an exceptional 8.5 percent in 2019.

When the pandemic hit, the big question was what its effect on innovation would be. Historical evidence suggested a severe cutback in innovation investments.

However, despite the human toll and the economic shock resulting from the pandemic, scientific output, R&D expenditure, IP filings and venture capital (VC) deals continued to grow in 2020, building on peak pre-crisis performance:

- Publication of scientific articles worldwide grew by 7.6 percent in 2020.
- Government budget allocations for the top R&D spending economies that have already disclosed their R&D budgets continued to grow in 2020. The top global corporate R&D spenders, for which data is available, grew overall R&D expenditure by around 10 percent in 2020, with 60 percent of R&D-intensive firms reporting an increase.
- International patent filings via WIPO reached a new all-time high in 2020. An increase of 3.5 percent was driven by medical technology, pharmaceuticals and biotechnology.
- VC deals grew by 5.8 percent in 2020, exceeding the average growth rate for the past 10 years. Strong growth in the Asia Pacific region more than compensated for declines in Northern America and Europe. Africa and Latin America and the Caribbean also registered double-digit increases. First quarter figures suggest VC activity will be even more vibrant in 2021.

Firms whose innovation was at the heart of measures to contain the pandemic and its fallout – notably (i) software and information and communication technology (ICT) services, (ii) ICT hardware and electrical equipment and (iii) pharmaceuticals and biotechnology – amplified their investments in innovation. Firms in sectors heavily hit by the pandemic's containment measures – such as transport and travel – cut back their innovation outlays.

However, despite such cutbacks, available data suggest that innovation investments overall proved resilient in the face of the pandemic; and especially so when compared to the depth of the economic downturn.

2. Technological progress at the frontier holds substantial promise

The rapid development of COVID-19 vaccines powerfully fulfills the promise of technological progress. Progress also continues apace in other technology fields – for example, ICT and renewable energy – with the potential to raise living standards, improve human health and protect the environment.

Results of the Global Innovation Index 2021

3. Only a few economies have consistently delivered peak innovation performance

- Switzerland, Sweden, the U.S., and the U.K. have all ranked among the top 5 in the past three years, while the Republic of Korea joins the top 5 of the GII for the first time in 2021.
- The majority of the GII top 25 most innovative economies continue to be from Europe.
- Five Asian economies feature among the top 15 – the Republic of Korea (5th) and Singapore (8th) are in the top 10, followed by China (12th), Japan (13th) and Hong Kong, China (14th).

4. Selected middle-income economies are changing the innovation landscape, starting with China, Turkey, Viet Nam, India and the Philippines are now pulling their weight

- China remains the only middle-income economy among the top 30 most innovative economies globally. Few other middle-income economies have managed to catch-up in innovation.
- Turkey (41st), Thailand (43rd), Viet Nam (44th), the Russia Federation (45th), India (46th), Ukraine (49th) and Montenegro (50th) make it into the GII top 50 this year.
- The TVIP economies alone (Turkey, Viet Nam, India and the Philippines) are systematically catching up. Beyond China, these four particularly large economies together have the potential to change the global innovation landscape for good.

5. Several developing economies are performing above expectation on innovation relative to their level of economic development

- India, Kenya, the Republic of Moldova, and Viet Nam hold the record for overperforming on innovation relative to their level of development for the 11th year in a row.
- Brazil, the Islamic Republic of Iran and Peru overperformed in 2021 for the first time ever.
- Sub-Saharan Africa is the region with the largest number of overperforming economies.

6. The geography of global innovation is changing unevenly

- Northern America and Europe continue to lead far in front of other regions for innovation.
- The innovation performance of South East Asia, East Asia, and Oceania (SEAO) has been the most dynamic in the past decade, and is the only region closing the gap.
- Northern Africa and Western Asia, Latin America and the Caribbean, Central and Southern Asia, and sub-Saharan Africa then follow in that order, albeit – despite strong performances by the Islamic Republic of Iran, Chile, the United Arab Emirates and South Africa – they remain stubbornly a long distance behind.
- In Latin America and the Caribbean, only Chile, Mexico, Costa Rica and Brazil rank among the top 60. Except for Mexico, few economies in this region have managed consistently to up their ranking over the past 10 years.
- In sub-Saharan Africa, only Mauritius and South Africa rank in the top 65; and only Kenya and the United Republic of Tanzania have remained firmly in the top 100 and improved their performance over time. Rwanda regained the lead position among low-income economies in this year's edition of the GII.

7. New science and technology (S&T) clusters are emerging, with the majority located in only a handful of countries

- Tokyo–Yokohama is the top performing S&T cluster once again, followed by Shenzhen–Hong Kong–Guangzhou, Beijing, Seoul and San Jose–San Francisco.
- The U.S. continues to host the highest number of clusters, followed by China, Germany, and Japan. Clusters in China recorded the largest increases in S&T output.
- Brazil, China, India, the Islamic Republic of Iran, Turkey, and the Russian Federation are all middle-income economies hosting top S&T clusters, with big growth seen in Delhi, Mumbai and Istanbul.

GII 2021 results

The GII helps create an environment that evaluates innovation factors continuously.

In 2021, it provides detailed innovation metrics for 132 economies.



The following sections present the results of the GII 2021. Appendix I provides details on how to interpret and analyze the results, in particular regarding year-on-year comparison of the GII ranks, which requires cautious interpretation.

The GII 2021 innovation leaders

Only a few economies have consistently delivered peak innovation performance.

Only Switzerland and Sweden have remained in the top three of the innovation ranking for more than a decade. Switzerland, Sweden, the United States of America and the United Kingdom have ranked in the top five for the past three years, while the Republic of Korea joins the top five of the GII for the first time in 2021 (Figure 1).

The top 25 of the most innovative economies are mainly from Europe, with France (11th) and Estonia (21st) making notable progress. Five Asian economies shine in the top 15 – the Republic of Korea (5th) and Singapore (8th) in the top 10, with China (12th), Japan (13th) and Hong Kong, China (14th) following. Singapore has been among the top 10 most innovative economies consistently for the past 14 years.

China is still the only middle-income economy to make it into the top 30. China reaches the top three in the South East Asia, East Asia, and Oceania (SEAO) region for the first time and remains top of the upper middle-income group (Figure 2).

Bulgaria (35th) and Malaysia (36th) are the only other middle-income economies close to the top 30 of the GII (see Table 5), but with no consistent increase in rank over time. Indeed, Malaysia has been hovering close to the top 30 for the past 11 years but has not yet reached the mark.

Japan ranks 13th, up from 16th in 2020. The United Arab Emirates (UAE) (33rd) remains in the top 35 this year and moves up one place. The UAE has been moving up the rankings since 2018, when it ranked 38th. Turkey (41st) makes a big jump into the top 50 and Brazil (57th) moves closer.

Since 2013, China has moved up the GII ranks consistently and steadily, establishing itself as a global innovation leader and getting closer to the top 10 every year. The performance of China is at the frontier of achievement, notably in innovation outputs. For instance,

China's levels of patents by origin, scaled by GDP, are higher than those of Japan, Germany and the United States, and are even more impressive when considered in absolute terms. The same is true with regard to the levels of Trademarks and Industrial designs by origin as a percentage of GDP. However, China is still behind, relative to Germany and the United States, in Human capital and research and in indicators such as Researchers (45th) and Tertiary enrolment (57th). China also trails the United States in Market sophistication and Business sophistication, and is even further behind in Institutions (61st).

The Republic of Korea (5th) made notable advances in the Innovation Output Sub-Index (5th) and, in particular, in the indicators Trademarks by origin (8th), Global brand value (5th) and Cultural and creative services exports (40th). It also ranks 3rd worldwide in the new GII output indicator Production and export complexity. In terms of innovation inputs, the Republic of Korea moved up the rankings in two pillars: Institutions (28th) and Infrastructure (12th). It also comes top in the sub-pillar ICTs (1st) and, notably, in Government's online service and E-participation.

A changing global innovation landscape

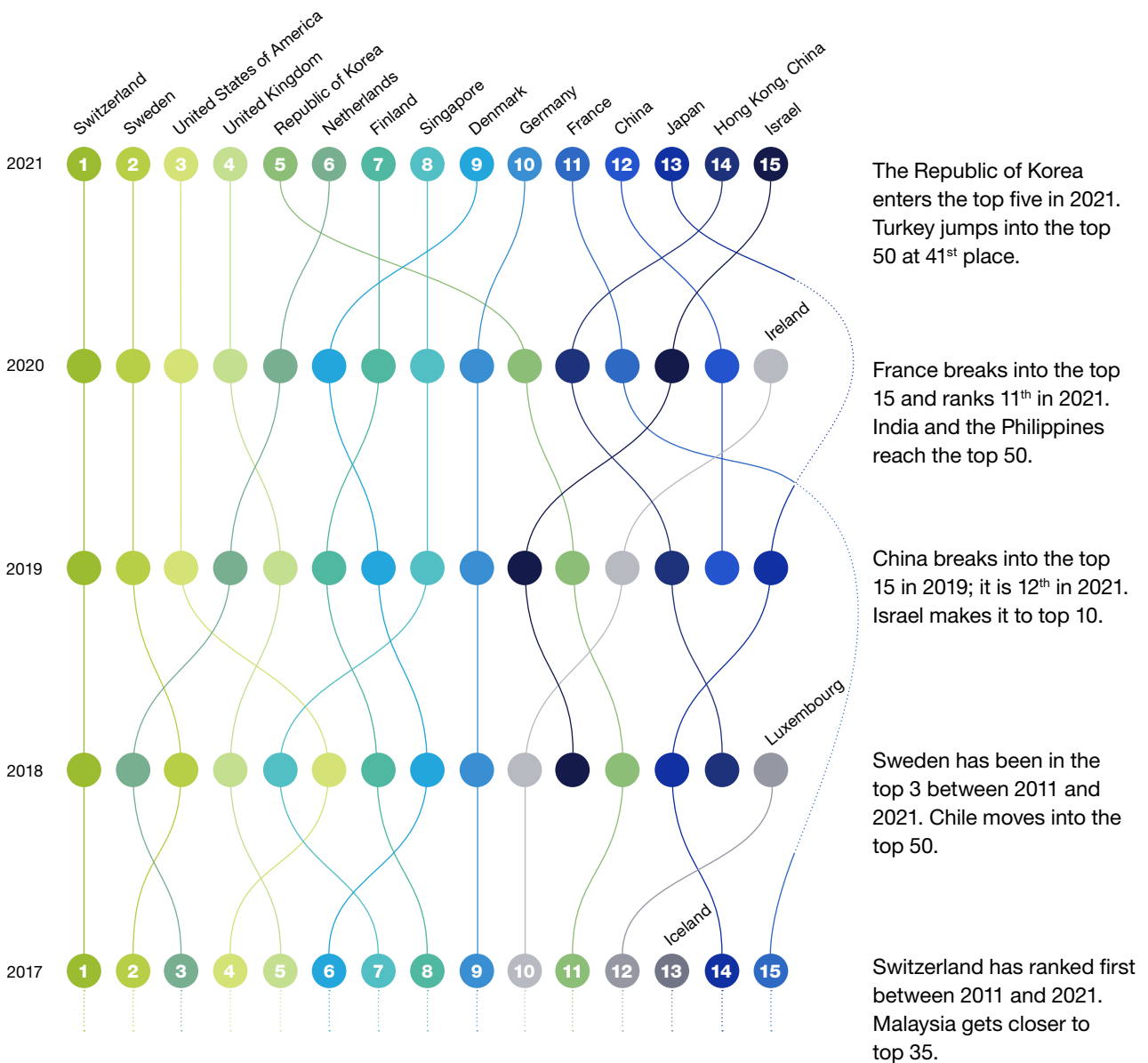
Selected middle-income economies are changing the innovation landscape, starting with China, Turkey, Viet Nam, India and the Philippines are now pulling their weight.

It is challenging for emerging economies to consistently improve their innovation performance and systems to match high-income, more prosperous economies. Only a limited number of middle-income economies have managed to catch up in innovation, by complementing successful domestic innovation with international technology transfer.

In addition to China, Bulgaria and Malaysia, which lead the middle-income group rankings, only Turkey (41st), Thailand (43rd), Viet Nam (44th), the Russian Federation (45th), India (46th), Ukraine (49th) and Montenegro (50th) make it into the top 50.

However, besides China, only the TVIPs (Turkey, Viet Nam, India and the Philippines) are systematically catching up. All four Asian economies have romped up the ranks by an average of 22 positions in the past decade: Turkey from

Figure 1
Movement in the GII top 15, 2017–2021



Source: Global Innovation Index Database, WIPO, 2021.

Note: Year-on-year comparisons of the GII ranks are influenced by changes in the GII model and data availability.

Figure 2
Global innovation leaders, 2021

Top three innovation economies by region

Europe

- 1 Switzerland
- 2 Sweden
- 3 United Kingdom

Northern America

- 1 United States of America
- 2 Canada

Latin America and the Caribbean

- 1 Chile
- 2 Mexico
- 3 Costa Rica

Central and Southern Asia

- 1 India
- 2 Iran (Islamic Republic of)
- 3 Kazakhstan

South East Asia, East Asia, and Oceania

- 1 Republic of Korea ↑
- 2 Singapore ↓
- 3 China ☆

Northern Africa and Western Asia†

- 1 Israel
- 2 United Arab Emirates ↑
- 3 Turkey ☆

Sub-Saharan Africa*

- 1 South Africa
- 2 Kenya
- 3 United Republic of Tanzania

Top three innovation economies by income group

High-income

- 1 Switzerland
- 2 Sweden
- 3 United States of America

Upper middle-income

- 1 China
- 2 Bulgaria ↑
- 3 Malaysia ↓

Lower middle-income

- 1 Viet Nam
- 2 India ↑
- 3 Ukraine ↓

Low-income

- 1 Rwanda ↑
- 2 Tajikistan ☆
- 3 Malawi ☆

↑↓ Indicates the movement of rank within the top three, relative to 2020, and

☆ indicates a new entrant into the top three in 2021.

† Top three in Northern Africa and Western Asia (NAWA) – excluding island economies. The top four in the region, including all economies, are as follows: Israel (1st), Cyprus (2nd), United Arab Emirates (3rd) and Turkey (4th).

* Top three in sub-Saharan Africa (SSA) – excluding island economies. The top five in the region comprise Mauritius (1st), South Africa (2nd), Kenya (3rd), Cabo Verde (4th) and the United Republic of Tanzania (5th).

Source: Global Innovation Index Database, WIPO, 2021.

Notes: World Bank Income Group Classification (June 2020). Year-on-year GII rank changes are influenced by performance and methodological considerations; some economy data are incomplete (see Appendix I).

65th in 2011 to 41st in 2021; Viet Nam from 76th in 2012 to 44th this year; India from 62nd to 46th; and the Philippines from 91st to 51st. It is noteworthy that these are particularly large economies, which have the potential to radically change the global innovation landscape for good.

Turkey makes it into the top 50, gaining 10 ranks this year to reach the 41st position. Viet Nam is overtaken by Thailand, as it declines by two ranks, from 42nd to 44th. This is nevertheless a considerable improvement on its average rank of 68th during the period 2013–2015. Viet Nam continues to lead the lower middle-income group (Table 1).

India (46th) moves further ahead, by two spots (48th in GII 2020), after making it into the top 50 last year. It takes 2nd place in the lower middle-income group. India held the 3rd position in its income group in 2019 and 2020 having entered the top three in 2019. India has also been portrayed as successful in developing sophisticated services that are technologically dynamic and can be traded internationally (Aghion *et al.*, 2021). It continues to lead the world in the ICT services exports indicator (1st)

and holds top ranks in other indicators, such as Domestic industry diversification (12th) and Graduates in science and engineering (12th).

Aside from the TVIPs, there are other economies that move up the rankings this year. Among the most notable movers are the Islamic Republic of Iran (60th), Oman (76th), Uzbekistan (86th), Paraguay (88th), Cabo Verde (89th) and Sri Lanka (95th).

Outside the top 100, Guatemala (101st), Tajikistan (103rd), Madagascar (110th) and Zimbabwe (113th) have made the most progress through the ranks, improving by between five and seven positions overall.

Rwanda (102nd) regains the 1st position in the low-income group after being 2nd in 2020. It ranked 1st in 2019, 2016 and 2015 and has been consistently in the top three of its income group since 2014.

Tajikistan (103rd) and Malawi (107th) make it into the top three in the low-income economies group (see Table 1).

Table 1
10 best-ranked economies by income group

Rank	Global Innovation Index 2021	Rank	Global Innovation Index 2021
High-income economies (51 in total)		Upper middle-income economies (34 in total)	
1	Switzerland (1)	1	China (12)
2	Sweden (2)	2	Bulgaria (35)
3	United States (3)	3	Malaysia (36)
4	United Kingdom (4)	4	Turkey (41)
5	Republic of Korea (5)	5	Thailand (43)
6	Netherlands (6)	6	Russian Federation (45)
7	Finland (7)	7	Montenegro (50)
8	Singapore (8)	8	Serbia (54)
9	Denmark (9)	9	Mexico (55)
10	Germany (10)	10	Costa Rica (56)
Lower middle-income economies (34 in total)		Low-income economies (13 in total)	
1	Viet Nam (44)	1	Rwanda (102)
2	India (46)	2	Tajikistan (103)
3	Ukraine (49)	3	Malawi (107)
4	Philippines (51)	4	Madagascar (110)
5	Mongolia (58)	5	Burkina Faso (115)
6	Republic of Moldova (64)	6	Uganda (119)
7	Tunisia (71)	7	Mozambique (122)
8	Morocco (77)	8	Mali (124)
9	Kenya (85)	9	Togo (125)
10	Uzbekistan (86)	10	Ethiopia (126)

Source: Global Innovation Index Database, WIPO, 2021.

Note: The overall Global Innovation Index rank is reported in brackets next to the economy.

Innovation overperformers

Several developing economies are performing above expectation on innovation relative to their level of economic development.

For several years, the GII has demonstrated the positive relationship between innovation and economic development: the more developed an economy is, the more it innovates, and vice versa (Figure 3). However, some economies break out of this pattern. Some perform above or below expectations, relative to their predicted performance and level of development.

In the GII 2021, 19 economies are performing above expectations relative to their level of development – termed innovation achievers (Table 2).

India, Kenya, the Republic of Moldova and Viet Nam are still record holders for being innovation achievers for 11 consecutive years. India's innovation performance is above the average for the upper middle-income group in five of the seven innovation pillars (it scores below average in the pillars of Infrastructure and Creative outputs). Kenya keeps its 3rd place in sub-Saharan Africa and scores above its income group in Institutions, Market and Business sophistication and Knowledge and technology outputs. It also scores above the average for its region in Human capital and research and Creative outputs. Viet Nam continues to score above the lower middle-income group average in all pillars and scores even above the average of the upper middle-income group in Market and Business sophistication, as well as in both output pillars.

However, there is change too this year. Brazil (57th), the Islamic Republic of Iran (60th) and Peru (70th) are innovation achievers in 2021 for the first time ever. In the case of Brazil, this distinction coincides with an upward move in the rankings to gain the 57th place.

Sub-Saharan Africa is the region with the highest number of economies performing above expectations (six in total). South East Asia, East Asia, and Oceania is 2nd (with four economies), Europe is 3rd (three economies), and Northern Africa and Western Asia, Latin America and the Caribbean, and Central and Southern Asia tie in 4th place (with two innovation achievers each).

Conversely, 31 economies are performing below expectations on innovation. In the high-income group, three are European Union economies – Greece, Lithuania and Romania. In the upper middle-income group, there are two Latin American and Caribbean economies – Argentina and the Dominican Republic. In the lower middle-income group, 11 economies are performing below

expectations for their level of development, notably five from sub-Saharan Africa – Angola, Benin, Côte d'Ivoire, Cameroon and Nigeria.

Relative to 2020, 30 economies changed performance groups. Fifteen economies changed their performance status from below expectations to matching expectations. The majority of these cases (six economies) are from Latin America and the Caribbean – the Plurinational State of Bolivia, Chile, Ecuador, Guatemala, Paraguay and Uruguay.

The persistent regional innovation divide

The geography of innovation is changing unevenly. South East Asia, East Asia, and Oceania is closing the global innovation divide with Northern America and Europe.

Despite some innovation “catch-up”, divides still exist with respect to national innovation performance in the world regions. This year, there are no changes in terms of which world regions perform best in innovation. Northern America and Europe continue to lead, followed by South East Asia, East Asia, and Oceania (SEAO), and, more distantly, by Northern Africa and Western Asia, Latin America and the Caribbean, Central and Southern Asia, and sub-Saharan Africa, respectively.

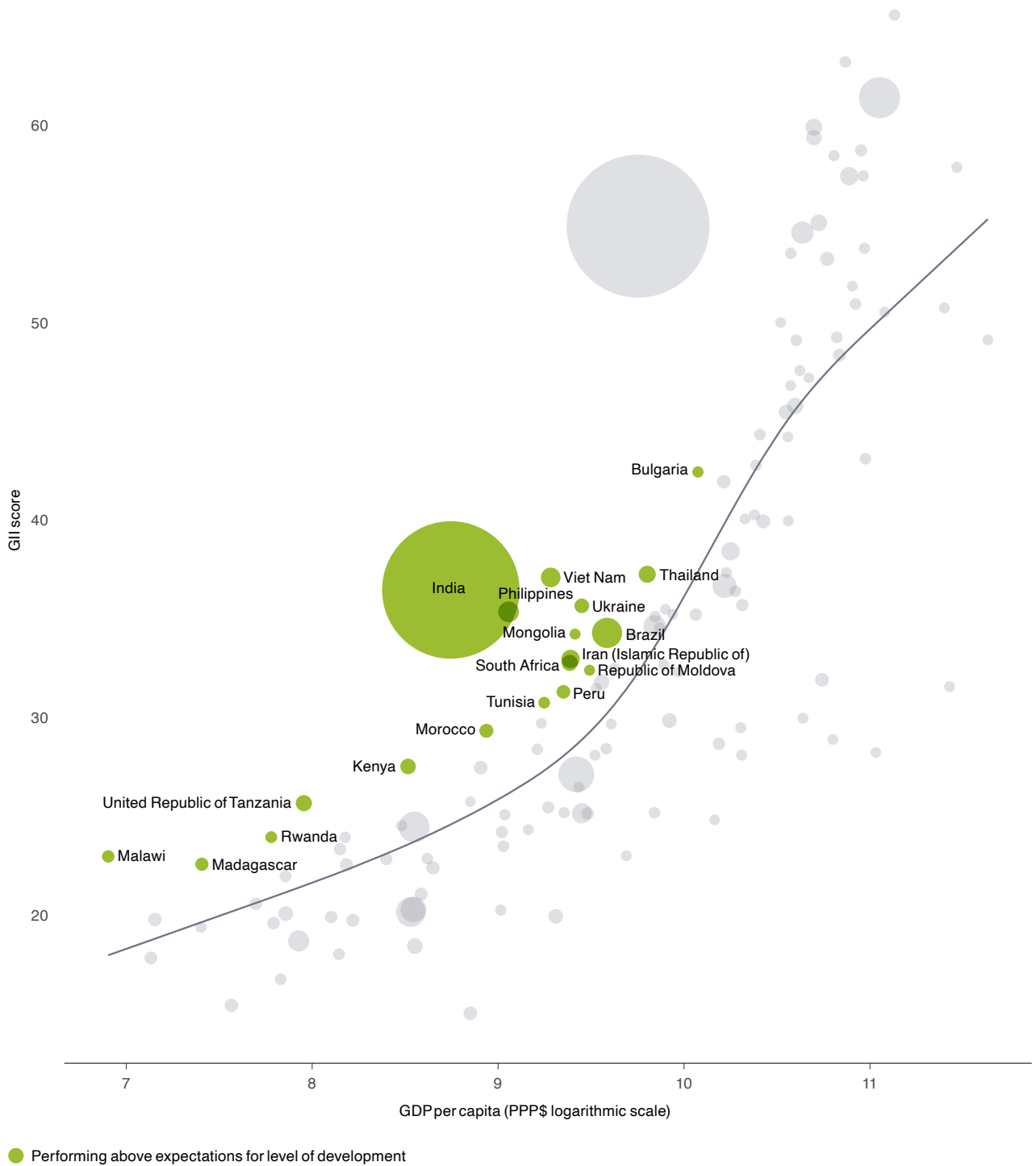
Northern America

Northern America, composed of the United States and Canada, is the most innovative world region. The United States keeps its 3rd place in the GII ranking, and Canada goes up one spot to reach the 16th place. The region is the highest performer in all GII pillars compared to all other world regions. The United States performs best in Business sophistication (2nd) and Knowledge and technology outputs (3rd), while Canada comes top in Market sophistication (1st) and fifth in Institutions.

Europe

Europe is still the second most innovative region in the world. It hosts a large number of innovative economies: 16 European economies are innovation leaders (i.e., in the top 25). A total of 10 economies move up the ranks this year: France (11th), Iceland (17th), Austria (18th), Estonia (21st), Hungary (34th), Bulgaria (35th), Slovakia (37th), Lithuania (39th), the Russian Federation (45th) and Belarus (62nd).

Figure 3
The positive relationship between innovation and development



Source: Global Innovation Index Database, WIPO, 2021.
 Note: Bubbles sized by population.

Table 2

Innovation achievers in 2021, their income group, region, and years as an innovation achiever

Economy	Income group	Region	Years as an innovation achiever (total)
India	Lower-middle income	Central and Southern Asia	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 (11)
Kenya	Lower-middle income	Sub-Saharan Africa	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 (11)
Republic of Moldova	Lower-middle income	Europe	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 (11)
Viet Nam	Lower-middle income	South East Asia, East Asia, and Oceania	2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 (11)
Malawi	Low-income	Sub-Saharan Africa	2012, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 (9)
Mongolia	Lower-middle income	South East Asia, East Asia, and Oceania	2011, 2012, 2013, 2014, 2015, 2018, 2019, 2020, 2021 (9)
Rwanda	Low-income	Sub-Saharan Africa	2012, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 (9)
Ukraine	Lower-middle income	Europe	2012, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 (9)
Thailand	Upper-middle income	South East Asia, East Asia, and Oceania	2011, 2014, 2015, 2018, 2019, 2020, 2021 (7)
Bulgaria	Upper-middle income	Europe	2015, 2017, 2018, 2020, 2021 (5)
Madagascar	Low-income	Sub-Saharan Africa	2016, 2017, 2018, 2020, 2021 (5)
South Africa	Upper-middle income	Sub-Saharan Africa	2018, 2019, 2020, 2021 (4)
Morocco	Lower-middle income	Northern Africa and Western Asia	2015, 2020, 2021 (3)
Philippines	Lower-middle income	South East Asia, East Asia, and Oceania	2019, 2020, 2021 (3)
Tunisia	Lower-middle income	Northern Africa and Western Asia	2018, 2020, 2021 (3)
United Republic of Tanzania	Lower-middle income	Sub-Saharan Africa	2017, 2020, 2021 (3)
Brazil	Upper-middle income	Latin America and the Caribbean	2021 (1)
Iran (Islamic Republic of)	Upper-middle income	Central and Southern Asia	2021 (1)
Peru	Upper-middle income	Latin America and the Caribbean	2021 (1)

Source: Global Innovation Index Database, WIPO, 2021.

Notes: Income group classification follows the World Bank Income Group Classification (June, 2020). Geographic regions correspond to the United Nations publication on standard country or area codes for statistical use (M49).

On average, Europe is the second best performer worldwide, behind Northern America, in all GII pillars, except for Market sophistication, where it is also behind the average of the SEAO region. Finland has the most highly performing Institutions in the region (2nd worldwide). Sweden leads in Human capital and research (2nd) and Business sophistication (1st), Norway comes top in Infrastructure worldwide (1st), while the United Kingdom leads in Market sophistication (4th). Switzerland is the regional leader in innovation outputs: it ranks 1st worldwide in Knowledge and technology outputs and 2nd in Creative outputs.

South East Asia, East Asia, and Oceania (SEAO)

The innovation performance of the SEAO region has been the most dynamic in the past decade, closing the gap with Northern America and Europe. Five SEAO economies are world innovation leaders: the Republic of Korea (5th), Singapore (8th), China (12th), Japan (13th), and Hong Kong, China (14th). Among these leaders, China, the Republic of Korea and Japan have made the greatest advances up the rankings in the past 10 years (see Table 3).

Thailand (43rd), Viet Nam (44th), the Philippines (51st) and Indonesia (87th) have moved up between 5 and 40 GII ranks over the past decade. Thailand and Viet Nam rank among the top 30 worldwide in Market sophistication, as does the Philippines in Knowledge and technology outputs. They are now leaders in key innovation indicators, too. For instance, Thailand ranks 1st in R&D financed by business; and Viet Nam and the Philippines are world leaders in High-tech exports.

Northern Africa and Western Asia

In Northern Africa and Western Asia, the United Arab Emirates (UAE) remains in the top 35 and moves up to achieve the 33rd rank. Turkey makes a big jump into the top 50, reaching the 41st spot. An additional eight economies in the region move up the ranks, including Egypt (94th) and Algeria (120th).

Cyprus is the regional leader in Institutions (26th) and Creative outputs (20th), while Israel leads in Knowledge and technology outputs (6th), Market sophistication (8th), Business sophistication (8th) and Human capital and research (19th). The UAE tops the region in Infrastructure (14th).

Table 3
GII 2021 rankings in Asia (excluding Western Asia)

Rank	Top 15	Rank	Top 50	Rank	Top 60	Rank	Top 100	Rank	Top 130
5	Republic of Korea	36	Malaysia	51	Philippines	79	Kazakhstan	103	Tajikistan
8	Singapore	43	Thailand	58	Mongolia	82	Brunei Darussalam	109	Cambodia
12	China	44	Viet Nam	60	Iran (Islamic Republic of)	86	Uzbekistan	111	Nepal
13	Japan	46	India			87	Indonesia	116	Bangladesh
14	Hong Kong, China					95	Sri Lanka	117	Lao People's Democratic Republic
						98	Kyrgyzstan		
						99	Pakistan	127	Myanmar

Source: Global Innovation Index Database, WIPO, 2021

Table 4
GII 2021 rankings in Latin America and the Caribbean

Rank	Top 60	Rank	Top 80	Rank	Top 100	Rank	Top 110
53	Chile	65	Uruguay	83	Panama	101	Guatemala
55	Mexico	67	Colombia	88	Paraguay	104	Bolivia (Plurinational State of)
56	Costa Rica	70	Peru	91	Ecuador	108	Honduras
57	Brazil	73	Argentina	93	Dominican Republic		
		74	Jamaica	96	El Salvador		
				97	Trinidad and Tobago		

Source: Global Innovation Index Database, WIPO, 2021

Latin America and the Caribbean

In Latin America and the Caribbean, no economy makes it into the top 50. Chile (53rd), Mexico (55th), Costa Rica (56th) and Brazil (57th) are the only economies in the region in the top 60 (see Table 4). Moreover, with the exception of Mexico, these Latin American innovation pockets have not improved their rankings consistently over the past 10 years. However, Brazil makes a strong advance this year, improving by five positions and achieving its best rank since 2012.

Chile has the most balanced innovation system, ranking highest in the region in Institutions (40th) and Infrastructure (47th) (Table 5). Conversely, and relative to their performance in all GII pillars, Mexico is still behind in Institutions (77th) and Infrastructure (67th), while Costa Rica and Brazil are lagging in Infrastructure and Market sophistication. Brazil is the only economy in the region for which expenditures on R&D are above 1 percent of GDP and comparable to some European economies, such as Croatia and Luxembourg. Brazil also ranks highest in the region in the indicator Global corporate R&D investors (26th), above Mexico (31st) and Argentina (36th).

In the top 80, Uruguay (65th), Colombia (67th), Peru (70th) and Argentina (73rd) all moved up the ranks in 2021. Over the

past 10 years, Colombia and Peru have improved their rankings, but not at a steady pace and with some difficulty. Colombia still has a relatively unbalanced innovation system, performing less well in Human capital and research (78th) and in the innovation outputs pillars, in contrast to its relatively good performance in Market sophistication (42nd) and Business sophistication (50th). Peru achieves its best ranking this year in Market and Business sophistication (38th and 37th, respectively), but still struggles to translate its innovation inputs into outputs. It is also an innovation achiever for the first time this year, highlighting its potential for further improvements in the future (see Table 2).

Central and Southern Asia

In Central and Southern Asia, India leads in 46th position, having consistently risen up the ranks since 2015, when it ranked 81st. The Islamic Republic of Iran is 2nd in the region, going up to 60th place. Kazakhstan ranks 3rd at the 79th position (see Table 3). Uzbekistan continues to move upward, by seven places, and achieves the 86th rank in 2021. The innovation performance of Kazakhstan (79th) and Tajikistan (103rd) improved in 2021 but has been less steady over the past years.

Table 5
GII 2021 rankings overall and by pillar

Country/Economy	Overall GII	Institutions	Human capital and research	Infrastructure	Market sophistication	Business sophistication	Knowledge and technology outputs	Creative outputs
Switzerland	1	13	6	2	6	4	1	2
Sweden	2	9	2	3	11	1	2	5
United States of America	3	12	11	23	2	2	3	12
United Kingdom	4	15	10	10	4	21	10	4
Republic of Korea	5	28	1	12	18	7	8	8
Netherlands	6	6	14	16	31	5	7	7
Finland	7	2	4	11	19	6	5	16
Singapore	8	1	9	15	5	3	13	17
Denmark	9	8	5	5	7	11	14	13
Germany	10	17	3	21	20	12	9	11
France	11	19	15	17	17	19	16	6
China	12	61	21	24	16	13	4	14
Japan	13	7	20	9	15	10	11	18
Hong Kong, China	14	11	25	6	3	24	62	1
Israel	15	34	19	40	8	8	6	30
Canada	16	5	18	30	1	20	23	19
Iceland	17	14	23	25	25	18	25	10
Austria	18	16	7	7	40	15	19	27
Ireland	19	18	27	4	48	17	15	29
Norway	20	3	13	1	21	23	28	25
Estonia	21	22	34	8	10	29	22	15
Belgium	22	23	8	35	33	16	17	36
Luxembourg	23	27	40	33	53	9	38	3
Czech Republic	24	32	33	19	50	25	12	22
Australia	25	10	12	20	9	26	42	24
New Zealand	26	4	17	22	14	30	39	23
Malta	27	37	41	18	63	14	44	9
Cyprus	28	26	42	28	46	28	21	20
Italy	29	36	31	26	43	32	18	34
Spain	30	31	30	13	32	35	26	32
Portugal	31	25	24	31	56	41	34	26
Slovenia	32	20	28	27	71	27	32	38
United Arab Emirates	33	30	22	14	26	22	59	40
Hungary	34	42	36	32	65	31	20	47
Bulgaria	35	47	65	36	72	42	27	21
Malaysia	36	41	39	51	30	39	31	37
Slovakia	37	39	58	39	73	43	30	43
Latvia	38	29	46	55	45	40	45	39
Lithuania	39	33	43	42	35	45	49	41
Poland	40	38	37	41	60	38	36	50
Turkey	41	93	26	48	49	46	50	35
Croatia	42	46	47	29	67	55	47	54
Thailand	43	64	63	61	27	36	40	55
Viet Nam	44	83	79	79	22	47	41	42
Russian Federation	45	67	29	63	61	44	48	56
India	46	62	54	81	28	52	29	68
Greece	47	51	16	45	70	60	52	69
Romania	48	53	76	37	76	54	35	72
Ukraine	49	91	44	94	88	53	33	48
Montenegro	50	48	59	60	41	67	78	33
Philippines	51	90	80	86	86	33	24	65
Mauritius	52	21	71	65	29	111	93	31
Chile	53	40	51	47	66	48	58	60
Serbia	54	50	62	44	58	63	43	76
Mexico	55	77	56	67	55	56	53	52
Costa Rica	56	66	61	71	85	49	56	45
Brazil	57	78	48	69	75	34	51	66
Mongolia	58	76	81	91	13	71	85	28
North Macedonia	59	52	73	49	12	65	57	83
Iran (Islamic Republic of)	60	124	49	70	82	115	46	46
South Africa	61	55	67	83	23	51	61	79
Belarus	62	85	38	59	101	69	37	93
Georgia	63	35	60	85	34	61	75	74
Republic of Moldova	64	81	77	82	74	87	54	53
Uruguay	65	44	64	53	108	81	63	64
Saudi Arabia	66	101	32	54	39	89	69	78
Colombia	67	56	78	57	42	50	72	82
Qatar	68	57	75	34	83	96	79	63
Armenia	69	65	94	80	99	98	64	49
Peru	70	70	53	78	38	37	87	77

Table 5
GII 2021 rankings overall and by pillar (continued)

Country/Economy	Overall GII	Institutions	Human capital and research	Infrastructure	Market sophistication	Business sophistication	Knowledge and technology outputs	Creative outputs
Tunisia	71	75	35	89	98	114	55	80
Kuwait	72	86	69	43	94	100	60	89
Argentina	73	102	50	64	110	57	73	73
Jamaica	74	43	86	104	116	58	95	51
Bosnia and Herzegovina	75	82	68	52	51	99	66	99
Oman	76	71	45	56	84	94	107	71
Morocco	77	74	82	84	91	105	67	70
Bahrain	78	49	83	38	78	90	82	106
Kazakhstan	79	45	66	58	80	78	86	110
Azerbaijan	80	58	89	88	36	92	115	67
Jordan	81	63	84	102	47	85	76	88
Brunei Darussalam	82	24	52	46	106	84	130	85
Panama	83	69	99	50	97	103	113	58
Albania	84	60	90	62	79	68	103	81
Kenya	85	80	92	114	54	77	65	95
Uzbekistan	86	94	72	72	24	123	77	113
Indonesia	87	107	91	68	57	110	74	91
Paraguay	88	110	98	77	89	66	117	62
Cabo Verde	89	88	95	66	128	74	122	59
United Republic of Tanzania	90	103	125	105	109	119	100	44
Ecuador	91	126	97	74	44	97	97	86
Lebanon	92	112	87	100	90	64	91	92
Dominican Republic	93	96	102	75	104	86	108	84
Egypt	94	114	93	92	96	106	70	104
Sri Lanka	95	119	118	73	118	62	68	100
El Salvador	96	98	106	99	105	80	124	57
Trinidad and Tobago	97	72	100	90	119	104	83	103
Kyrgyzstan	98	95	70	87	52	107	102	120
Pakistan	99	99	117	117	120	88	71	87
Namibia	100	73	57	112	92	112	119	105
Guatemala	101	117	120	122	77	79	90	75
Rwanda	102	54	114	101	93	82	96	117
Tajikistan	103	118	85	126	37	129	80	107
Bolivia (Plurinational State of)	104	131	55	106	59	75	112	111
Senegal	105	68	104	108	107	131	88	109
Botswana	106	59	130	93	113	73	101	112
Malawi	107	105	122	127	81	95	84	97
Honduras	108	121	96	116	62	72	118	102
Cambodia	109	111	109	107	69	117	111	98
Madagascar	110	108	116	132	122	125	99	61
Nepal	111	115	115	98	68	59	121	108
Ghana	112	120	101	97	115	108	104	94
Zimbabwe	113	129	88	128	64	101	109	101
Côte d'Ivoire	114	79	124	109	117	91	110	121
Burkina Faso	115	92	103	111	114	120	106	129
Bangladesh	116	122	128	95	95	122	92	123
Lao People's Democratic Republic	117	130	113	123	103	70	127	90
Nigeria	118	109	121	120	102	76	123	116
Uganda	119	89	131	103	111	118	105	126
Algeria	120	104	74	96	132	124	125	118
Zambia	121	125	107	119	87	83	120	125
Mozambique	122	127	112	76	126	127	116	115
Cameroon	123	113	105	115	129	93	98	124
Mali	124	106	123	124	121	109	94	122
Togo	125	87	110	110	112	128	128	119
Ethiopia	126	116	126	121	130	126	81	127
Myanmar	127	123	108	113	124	132	89	131
Benin	128	84	111	118	123	113	131	128
Niger	129	97	129	130	100	116	114	132
Guinea	130	100	132	131	131	121	132	96
Yemen	131	132	127	129	125	102	126	114
Angola	132	128	119	125	127	130	129	130

■ 4th quartile (best performers, ranks 1st to 33rd)
■ 3rd quartile (ranks 34th to 66th)
■ 2nd quartile (ranks 67th to 99th)
■ 1st quartile (ranks 100th to 132nd)

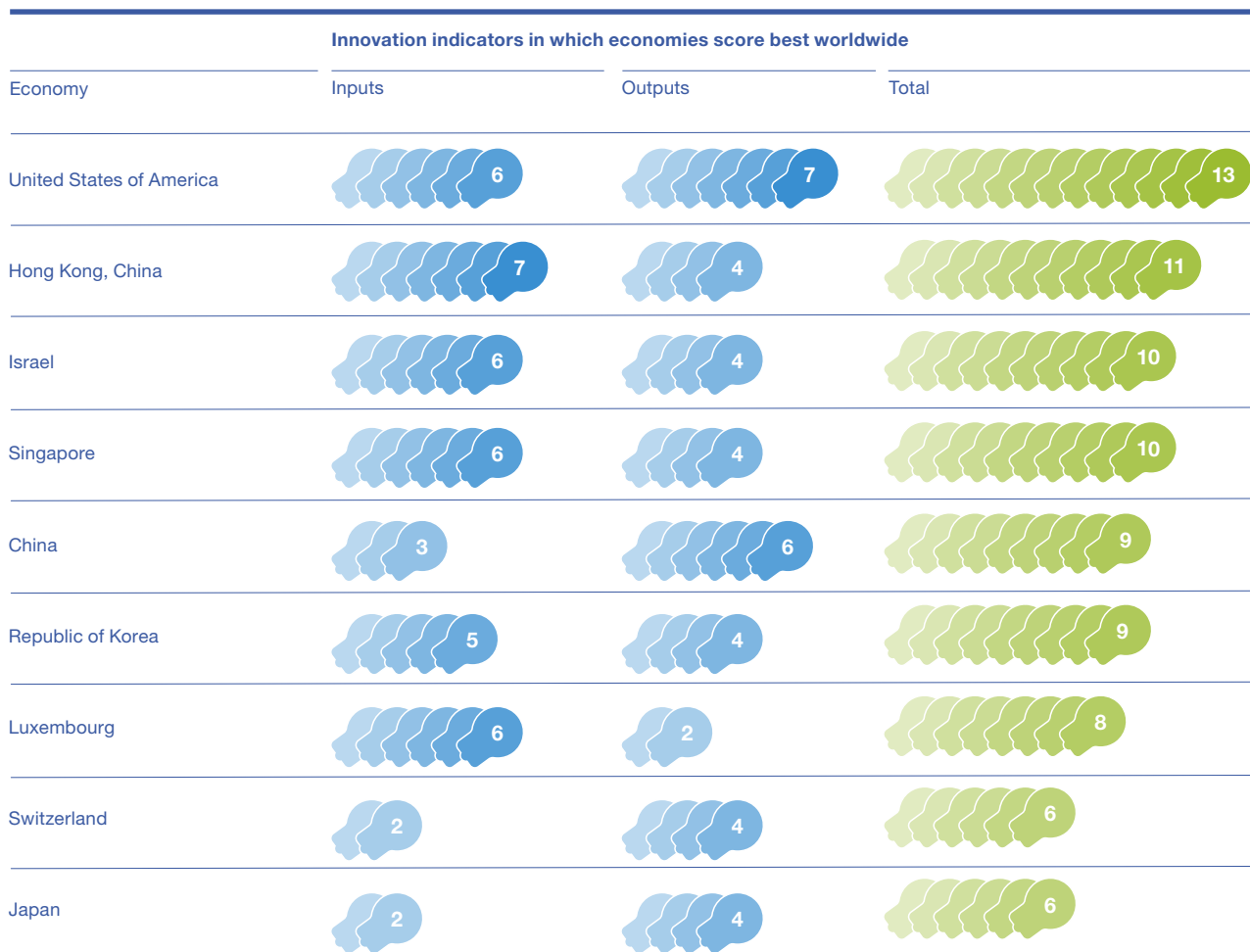
Source: Global Innovation Index Database, WIPO, 2021.

The United States leads in several key innovation indicators. Hong Kong (China), Israel and Singapore follow

The economies at the top of the rankings are world leaders in key innovation indicators. This year, the United States is the absolute leader in this regard; holding first place in 13 indicators out of the 81 used, including metrics such as Global corporate R&D investors, venture capital deals received, the quality of its universities, the quality and impact of its scientific publications (H-index), the number of patents by origin and E-participation.

Hong Kong, China follows the United States in 2nd place, with world-topping performances in indicators such as New businesses, High-tech imports and Global brand value. Israel and Singapore tie in 3rd place, attaining the top rank in R&D expenditures and Regulatory quality, respectively. They are followed by China and the Republic of Korea in joint 5th place, leading on High-tech exports and Researchers, among other indicators. Luxembourg comes 7th with the top performance in Knowledge-intensive employment; and Switzerland and Japan are equal 8th, leading in Patent families, and Production and export complexity.

Economies with the most top-ranked GII indicators, 2021



Source: Global Innovation Index Database, WIPO, 2021.

Note: The GII methodology allows multiple economies to rank first in an indicator; see Economy profiles and Appendix I.

Overall, the region performs best in Market sophistication. In terms of innovation inputs, Kazakhstan leads the region in Institutions (45th rank overall) and Infrastructure (58th), the Islamic Republic of Iran leads in Human capital and research (49th), Uzbekistan in Market sophistication (24th) and India in Business sophistication (52nd). India is also at the top of the region in the Knowledge and technology outputs pillar (29th), while the Islamic Republic of Iran comes top in Creative outputs (46th).

Sub-Saharan Africa

In sub-Saharan Africa, only Mauritius (52nd) and South Africa (61st) rank in the top 65; and only Kenya (85th) and the United Republic of Tanzania (90th) have remained firmly within the top 100 and have improved their performance over the past five years. No economy has steadily improved its rankings over time. A total of 10 economies in the region move up the GII ranks this year, including Kenya (85th), Namibia (100th), Malawi (107th), Madagascar (110th), Zimbabwe (113th) and Burkina Faso (115th). Cabo Verde reaches 89th place this year, a considerable increase from its position at 103rd place in 2013.

On average, the region performs best in Institutions, even ranking above the average of the Central and Southern Asia region. Mauritius ranks highest in the region in Institutions (21st), Infrastructure (65th) and Creative outputs (31st). Namibia comes top in Human capital and research (57th), and South Africa in Market sophistication (23rd), Business sophistication (51st) and Knowledge and technology outputs (61st).

Creating balanced and efficient innovation ecosystems

Innovation leaders have balanced and high-performing innovation systems. However, efficiency in translating innovation inputs into outputs is still eluding several high-income economies

Innovation leaders and the economies that have consistently advanced up the GII ranks over the past decade have dynamic innovation systems and combine efficiency in translating innovation inputs into outputs with a balanced and strong performance across all GII pillars.

Translating an economy's investments in innovation – in the form of R&D, education, and solid infrastructure and institutions supporting innovative activities – into innovation outputs is not an easy feat.

Some economies excel in efficiently converting innovation inputs into outputs. Among the high-income group economies, Switzerland (1st) produces considerably higher levels of outputs than other high-income economies, such as Sweden (2nd), the United States (3rd) and Singapore (8th), at comparable levels of innovation inputs (Figure 4). The Czech Republic (24th) produces the same levels of outputs as Japan (13th) or Singapore (8th) at much lower levels of innovation inputs.

Among the upper middle-income group economies, China (12th) ranks 7th overall in the Innovation Output Sub-Index, and its levels of outputs are comparable to those of high-income economies like the United Kingdom (4th), the Netherlands (6th) and Germany (10th), even though its overall level of innovation inputs is lower. Bulgaria (35th) has outputs comparable to high-income economies, such as Norway (20th) and Italy (29th), with fewer inputs.

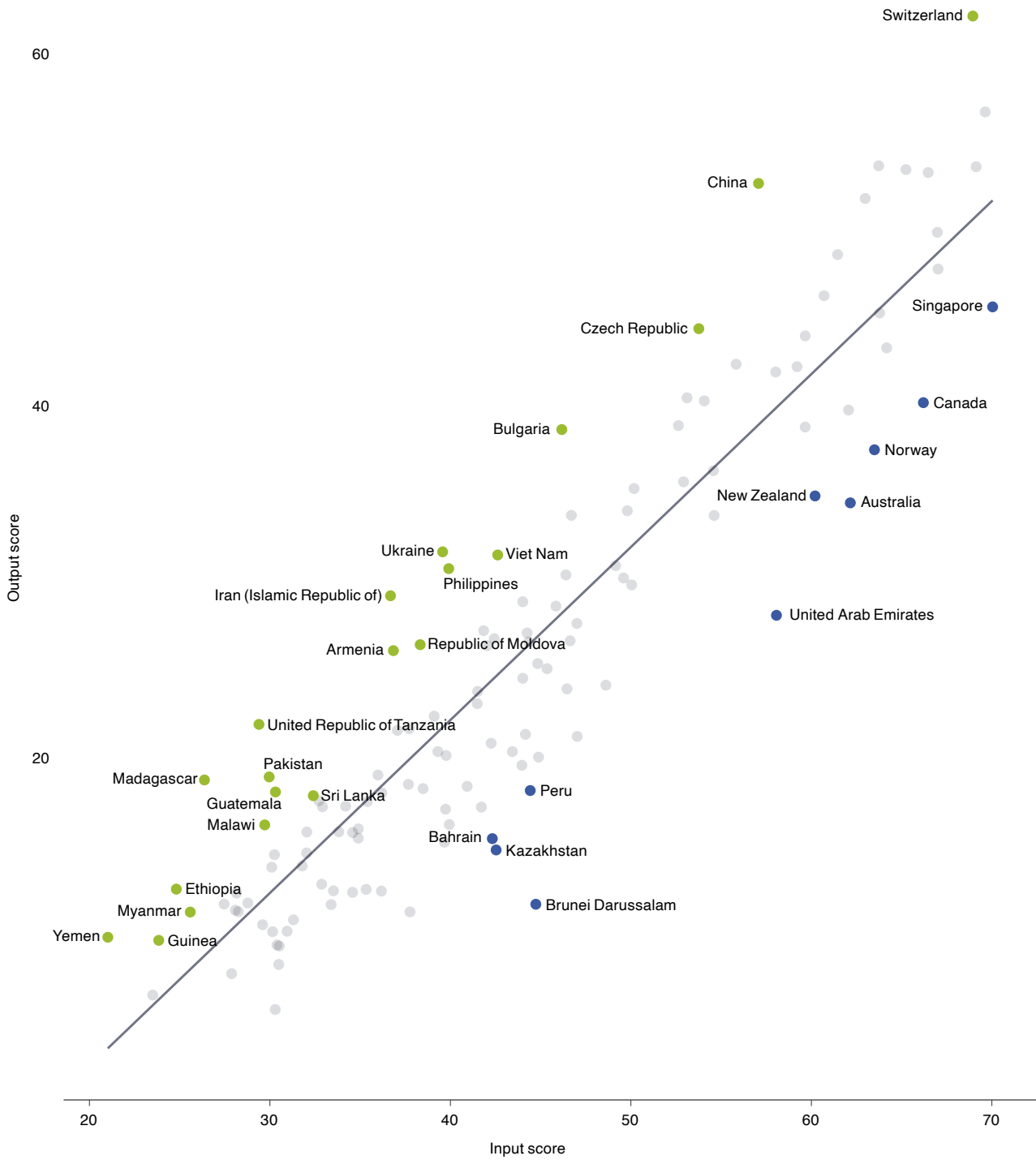
The United Republic of Tanzania (90th), among the lower middle-income group economies, performs on innovation outputs at levels comparable to high-income Latin American economies Chile (53rd) and Uruguay (65th). In addition, Viet Nam (44th) and the Philippines (51st) do the same, relative to other high-income European Union economies, such as Latvia (38th), Lithuania (39th) and Poland (40th), with a lower level of innovation inputs.

Low-income sub-Saharan Africa economies Malawi (107th), Madagascar (110th), Ethiopia (126th) and Guinea (130th) are also efficiently transforming their limited innovation inputs and resources into innovation outputs.

However, there are also several high-income economies that struggle to obtain a better balance between their level of investments and their level of innovation results, to the detriment of their overall innovation performance and GII ranking. This group includes, notably, oil and natural gas producers and exporters Canada (16th), Norway (20th), the United Arab Emirates (UAE) (33rd), Bahrain (78th) and Brunei Darussalam (82nd). All these economies rank considerably lower in the Innovation Output Sub-Index, relative to their ranking in the Innovation Input Sub-Index. For instance, the UAE ranks 23rd in innovation inputs overall, and 47th in outputs. The economy's ranking in innovation outputs has, however, improved this year relative to 2020, moving in the right direction to achieve greater balance in the innovation system.

Peru (70th), despite being an innovation achiever, it is also struggling to effectively utilize its innovation inputs (ranked 52nd in the Innovation Input Sub-Index) into innovation results (82nd) and more effort is needed to achieve a better balance in the innovation system.

Figure 4
Innovation input to output performance, 2021



- Efficient
- Inefficient
- Not labeled
- Fitted line

Moreover, innovation leaders have complementarity and balance across the different areas of their innovation system. A successful innovation system balances knowledge creation, exploration and investments – the innovation inputs – with the production of ideas and technologies toward application, exploitation and impact – the innovation outputs.

A balanced and strong performance across all seven pillars is most clearly evident among the innovation leaders (top 25). Only 15 economies – including Switzerland, Sweden, the United States, Singapore and France, or 11 percent of all economies ranked this year, have strong performances across all seven GII pillars (Table 5).

However, certain economies that are ranked lower overall in the GII are also leaders in specific areas. Examples include Turkey, highly ranked in Human capital and research (26th); Thailand, Viet Nam and Uzbekistan, with their relatively high ranking in Market sophistication (27th, 22nd and 24th, respectively); and Mongolia, ranked in the top 30 in Creative outputs (28th). These discrepancies in performance within economies also hint at innovation systems that are changing and dynamic with the potential for increased overall performance in the future.

Table 6
Top S&T cluster of each economy or cross-border region, 2021

Rank	Cluster name	Economy	Rank change
1	Tokyo–Yokohama	JP	0
2	Shenzhen–Hong Kong–Guangzhou	CN/HK	0
3	Beijing	CN	1
4	Seoul	KR	–1
5	San Jose–San Francisco, CA	US	0
10	Paris	FR	0
15	London	GB	0
19	Amsterdam–Rotterdam	NL	–1
20	Cologne	DE	–1
27	Tel Aviv–Jerusalem	IL	–3
28	Taipei–Hsinchu	TW	–1
29	Singapore	SG	–1
31	Melbourne	AU	4
32	Moscow	RU	0
35	Stockholm	SE	–2
36	Eindhoven	BE/NL	–2
40	Toronto, ON	CA	–1
41	Tehran	IR	2
43	Brussels	BE	–2
46	Madrid	ES	–1
48	Milan	IT	0
49	Istanbul	TR	2
50	Zürich	CH/DE	–1
56	Copenhagen	DK	–2
62	Bengaluru	IN	–2
66	São Paulo	BR	–5
71	Vienna	AT	–1
74	Helsinki	FI	–6
92	Lausanne	CH/FR	–3
100	Warsaw	PL	–1

Source: WIPO Statistics Database, April 2021.

The GII top science and technology clusters

New science and technology (S&T) clusters are emerging. Clusters in China made the most consistent rank improvements. Delhi, Mumbai and Istanbul also advanced strongly this year.

Divides also exist in the ranking of the global science and technology (S&T) clusters. The top 100 S&T clusters are hosted by 26 economies, of which six – Brazil, China, India, the Islamic Republic of Iran, Turkey and the Russian Federation – are middle-income economies (Table 6).

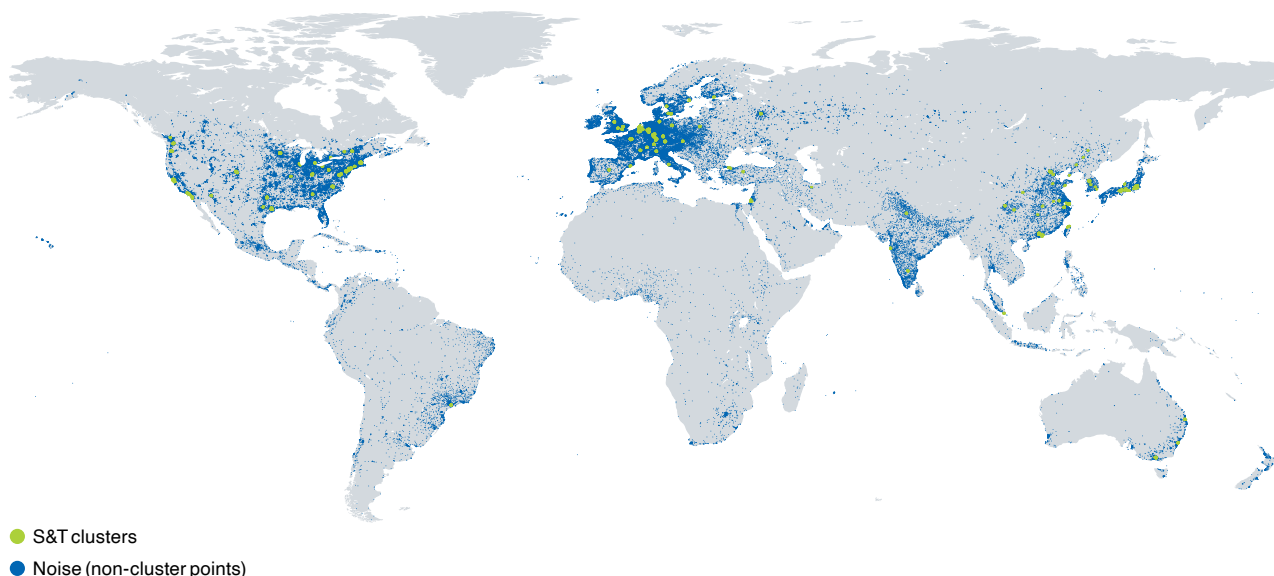
Tokyo-Yokohama is the top-performing cluster again, followed by Shenzhen–Hong Kong–Guangzhou, Beijing, Seoul and San Jose–San Francisco (see Annex Table 3, Top 100 clusters). The top 10 clusters remain the same as last year with only minor shifts. Beijing overtook Seoul to occupy the 3rd spot, and Shanghai switched with New York City, NY in 8th position. The largest increases in rank came from three Chinese clusters – Qingdao (+16 positions), Shenyang (+14) and Dalian (+13). Shenyang and Dalian, along with the Korean cluster Daegu, make up the three new entrants into this year’s top 100 clusters (Map 1).

The United States continues to host the largest number of clusters (24), followed by China (19), Germany (9) and

Japan (5). Chinese clusters experienced the largest increases in S&T output, with the median increase equating to +14.4 percent, and China hosts the fastest growing clusters with Qingdao (+33.1 percent) and Suzhou (+21.7 percent). Other middle-income clusters besides China also experienced strong growth, including Delhi (+6.6 percent), Mumbai (+6.3 percent) and Istanbul (+5.5 percent). High-income economy clusters grew at a slower pace than clusters in middle-income economies. A decline within clusters in the United States accounted for most of this slower growth. There were some notable exceptions, namely Kanazawa (+12.1 percent) in Japan, Daejeon (+9.0 percent) in the Republic of Korea and Melbourne (+7.8 percent) in Australia.

Many European and U.S. clusters show more intense S&T activity than their Asian counterparts do. The United States has nine clusters in the top 25 by S&T intensity, followed by Germany and Sweden (with three each). Cambridge in the United Kingdom and Eindhoven in the Netherlands/Belgium, emerge as the most S&T-intensive clusters. Ann Arbor, Michigan (United States), Oxford (United Kingdom) and San Jose–San Francisco, CA (United States) follow (see Annex Table 4, Ranking of S&T intensity, 2015–2019). As was the case in the previous year’s ranking, S&T intensity was higher if patenting activity drove a cluster’s output, with 15 out of the top 25 clusters deriving the majority of their output from patents.

Map 1
Top 100 clusters worldwide



Source: WIPO Statistic Database, April 2021.

Note: Noise refers to all inventor/author locations not classified as being in a cluster.

Conclusion

In conclusion, the GII continues to support and foster innovation through changing times. The aim of the GII is to provide insightful data on innovation and, in turn, to assist policymakers in evaluating their innovation performance and making informed innovation policy decisions. The 2021 edition of the GII – with its informed conclusions on innovation developments both generally and in the context of the COVID-19 pandemic – makes a significant contribution to this end.

Two key insights emerge from this year's report.

- The global innovation landscape is changing too slowly. The GII has been warning of this for several years now, as high-income economies, notably from Northern America and Europe, continue to lead the GII ranks and have the strongest and most balanced innovation systems. There is an urgent need for this to change, particularly in the context of the COVID-19 crisis. Confronted with an unprecedented crisis, it is important to fully leverage the power of innovation to collectively build a cohesive, dynamic and sustainable recovery. The short-term and longer term impacts of the pandemic on science and innovation systems have to be monitored and findings acted up on.
- There are a few middle-income economies, notably the TVIPs, that are catching up with the leaders. However, the pandemic's effects on R&D investment – the uneven reduction of R&D expenditures in some sectors and the fact that governments have not made innovation and R&D a priority in current stimulus packages – will hamper convergence. It is therefore crucial that support for innovation becomes broader and that it is conducted in a countercyclical way (i.e., as business innovation expenditures slump, governments strive to counteract that effect with their own expenditure boosts to innovation, even in the face of higher public debt).

Future editions of the GII will track these developments closely and continue the journey toward enabling policy and business leaders by fostering a better understanding and measurement of innovation.

Notes

- 1 It is important to remember that various factors, including changes to the methodology for the calculation of indicators, data availability and changes to the GII model and measurement framework, influence the year-on-year comparisons of GII ranking. See Appendix I for more details.
- 2 Nine economies are no longer innovation achievers in 2021, relative to 2020: three economies from Europe (North Macedonia, Montenegro and Serbia); two from Latin America and the Caribbean (Costa Rica and Jamaica); two from Northern Africa and Western Asia (Armenia and Georgia); and two from sub-Saharan Africa (Mozambique and Niger).
- 3 Angola (132nd) rejoins the innovation ranking in 2021, thanks to improved availability of innovation data. The last time Angola was included in the GII was in 2015.
- 4 S&T output growth refers to the net S&T output over time, which is the difference in total patents and publications for each cluster, for all points that were located inside the same cluster compared to the previous year.

Reference

Aghion P., C. Antonin and S. Bunel (2021). *The Power of Creative Destruction: Economic Upheaval and the Wealth of Nations*. Cambridge, MA: The Belknap Press of Harvard University Press.

The Global Innovation Index 2021

The Global Innovation Index 2021 (GII) takes the pulse of the most recent global innovation trends and ranks the innovation ecosystem performance of 132 economies, while highlighting innovation strengths and weaknesses and particular gaps in innovation metrics.

As this report goes to press, the world is struggling to cope with the COVID-19 pandemic. In its new Global Innovation Tracker section, the report draws on a select set of indicators, including the effects on research and development expenditures or access to innovation finance, to provide a perspective on the pandemic's impact on global innovation performance.

Since its inception in 2007, the GI has shaped the innovation measurement agenda and become a cornerstone of economic policymaking, with an increasing number of governments systematically analyzing their annual GI results and designing policy responses to improve their performance. The GI has also been recognized by the UN Economic and Social Council in its 2019 resolution on Science, Technology and Innovation for Development as an authoritative benchmark for measuring innovation in relation to the Sustainable Development Goals (SDGs).

The GI is published in partnership with the Portulans Institute, the Confederation of Indian Industry (CII), the Brazilian National Confederation of Industry (CNI), Ecopetrol and the Turkish Exporters Assembly (TIM) and is supported by its GI Advisory Board and Academic Network.

The full report and the GI mobile apps – Android and iOS – can be downloaded at <https://globalinnovationindex.org>.

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