China broke into the world’s top 20 most-innovative economies this year, ranking 17th in the GII 2018 and being the only middle-income economy in the top 25. China’s rise in the GII rankings is extraordinary: only in 2018 China gains five positions from 2017. China is also moving closer to the top 10 in indicators related to the quality of its institutions, the development of its market and its business sector. These important achievements are reinforced by a strong performance in innovation outputs, where China breaks in the top 10 this year for the first time.

In absolute values, China is among the largest world contributors in terms of many innovation inputs and outputs, including R&D spending, number of researchers, scientific and technological publications, and patent applications. In the GII rankings, China earns top positions in a number of important areas, including patents and utility models, high-tech exports, but also trademarks, industrial designs, and creative goods exports. Other areas of comparative strength include capital investment, firms offering formal training, and high-tech imports (for a complete list, see pages 3 and 4 of this brief).

China is second in the world (after the United States of America) in number of innovative clusters, with 18 clusters identified this year. Shenzhen–Hong Kong and Beijing are in the top 5 world clusters in terms of international patent filings. The country also remains the top middle-income economy for the sixth consecutive year in the GII indicators that capture the quality of innovation. It is the only country closing the gap with the high-income group. In the quality of scientific publications and the quality of its universities, China performs above the high-income group average, and, in the latter indicator, above the score of top-ranked Japan. This reflects the high-quality scores achieved by Tsinghua, Peking, and Fudan Universities this year.

For all the factors mentioned above, China has constantly over-performed in innovation compared to its level of development (see also page 5 of this brief).

The GII indicators are grouped into innovation inputs and outputs. Innovation inputs capture the efforts made by the country to boost innovation. Innovation outputs measure the results of these efforts in terms of scientific publications, patents, trademarks, production, exports and other...
outputs. The table below presents China’s ranking over time in the overall GII, the Innovation Input and Output Sub-Indices – which summarize China’s performance in innovation input and output indicators–, and in the Efficiency Ratio – which captures how well the economy translates innovation inputs into more outputs.¹

<table>
<thead>
<tr>
<th></th>
<th>GII</th>
<th>Input</th>
<th>Output</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>17</td>
<td>27</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>2017</td>
<td>22</td>
<td>31</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>2016</td>
<td>25</td>
<td>29</td>
<td>15</td>
<td>7</td>
</tr>
</tbody>
</table>

- Over the last three years, China has improved its ranking in innovation outputs, entering the top 10 in the Innovation Output Sub-Index where it reaches the 10th global position this year.
- Innovation inputs also improve this year, with the Innovation Input Sub-Index reaching the 27th position, up from the 31st in 2017 and 29th in 2016.
- China’s Innovation Efficiency Ratio is also very strong, demonstrating that China is good at translating its innovation inputs into more outputs. This year, China ranks 3rd globally for the second consecutive year, up from the 7th position in 2016. The Efficiency Ratio is positively influenced by a much higher ranking in Innovation Outputs (10th) than Inputs (27th).

1st China is ranked 1st among the 34 upper-middle-income economies in the GII 2018.

5th China is ranked 5th among the 15 economies in South East Asia and Oceania in the GII 2018.

¹ Note that year-on-year comparisons of the GII ranks are imperfect and influenced by changes in the GII model and data availability.
Benchmarking China to other upper-middle-income countries and the South East Asia and Oceania region

China’s scores by area

Upper-middle-income countries

China has high scores in 6 GII areas – Human Capital and Research, Infrastructure, Market Sophistication, Business Sophistication, Knowledge and Technology Outputs and Creative Outputs, in which it scores above the average of the upper-middle-income group.

Top scores in Education, General infrastructure, Trade, competition & market scale, Knowledge workers, Knowledge creation, and Intangible assets are behind these high rankings.

South East Asia and Oceania region

Compared to other countries in the South East Asia and Oceania region, China performs above average in 5 areas: Human Capital and Research, Infrastructure, Business Sophistication, Knowledge and Technology Outputs, and Creative Outputs.

China’s innovation profile

Strengths

• China’s major strength is the Innovation Efficiency Ratio, in which it ranks number 3 in the world.

• Most of its relative strengths are in innovation outputs. In Knowledge and Technology Outputs (5th), it present strengths in Knowledge creation (4th) and Knowledge impact (2nd). At the variable level strengths lie in Patent applications by origin, Utility models by origin, and High-tech exports – all ranking number 1 globally, as well as in Productivity growth, ranking 3rd in the world.

• In Creative Outputs (21st), strengths are shown in Intangible assets (1st) as well as in indicators Trademarks by origin (3rd), Industrial designs by origin (1st), and Creative goods exports (1st).

• Among innovation inputs, in Infrastructure (29th), China has strengths in General infrastructure and in indicator in Gross capital formation, ranking 3rd and 4th respectively.
In **Market sophistication** (25th), and due to the size of its economy, strengths lie in *Trade, competition, and market scale* and in the indicator *Domestic market scale*, ranking 2nd and 1st in the world, respectively.

In **Business sophistication** (9th), China shows strong performance in *Knowledge workers* (1st) as well as in indicators *Firms offering formal training* (1st), *R&D financed by business* (2nd), and *High-tech imports* (3rd).

**Weaknesses**

In **Institutions** (70th), China has relative weaknesses in *Regulatory environment* (100th) as well as in indicator *Cost of redundancy dismissal* (103rd).

In **Human capital and research** (23rd), indicator *Tertiary inbound mobility* (97th) is marked as a weakness.

In **Infrastructure** (29th), the indicator *GDP per unit of energy use* (94th) is identified as another relative weakness.

In **Market Sophistication** (25th), relative weaknesses lie in indicators *Microfinance gross loans* (70th) and *Ease of protecting minority investors* (97th).

In **Business Sophistication** (9th), China performs relatively weakly in *R&D financed by abroad* (94th).

In **innovation outputs**, China demonstrates relative weaknesses only in **Creative Outputs** (21st), where weaknesses are found in *Cultural and creative services exports* (67th), *National feature films* (88th), *Printing and other media* (74th), and *Wikipedia edits* (111th).

The following figure presents a summary of China’s ranks in the 7 GII areas, as well as the overall rank in the GII 2018.

**China's rank in the GII 2018 and the 7 GII areas**

*Rank 1 is the highest possible in each pillar
Total number of countries: 126*
Expected vs. Observed Innovation Performance

The GII bubble chart shows the relationship between income levels (GDP per capita) and innovation performance (GII score). The depicted trendline gives an indication of the expected innovation performance at different levels of income. Countries located above the trendline are performing better than what would be expected based on their income level. Countries below the line are Innovation Under-performers relative to GDP.

Relative to GDP, China performs well above its expected level of development.
Missing and Outdated Data

More and better data improve the ability of a country to understand its strengths and weaknesses and give policymakers greater capacity to plan and adapt public policies accordingly. The GII 2018 covers 126 countries that complied with the minimum indicator coverage of 35 indicators in the Innovation Input Sub-Index (66%) and 18 indicators in the Innovation Output Sub-Index (66%).

The following tables show data for China that is not available or that is outdated.

### Missing Data

<table>
<thead>
<tr>
<th>Code</th>
<th>Indicator</th>
<th>Country Year</th>
<th>Model Year</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1</td>
<td>Expenditure on education, % GDP</td>
<td>n/a</td>
<td>2014</td>
<td>UNESCO Institute for Statistics</td>
</tr>
<tr>
<td>2.1.2</td>
<td>Government funding/pupil, secondary, % GDP/cap</td>
<td>n/a</td>
<td>2014</td>
<td>UNESCO Institute for Statistics</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Graduates in science &amp; engineering, %</td>
<td>n/a</td>
<td>2016</td>
<td>UNESCO Institute for Statistics</td>
</tr>
<tr>
<td>5.1.1</td>
<td>Knowledge-intensive employment, %</td>
<td>n/a</td>
<td>2016</td>
<td>ILO, ILOSTAT</td>
</tr>
<tr>
<td>5.1.5</td>
<td>Females employed w/advanced degrees, %</td>
<td>n/a</td>
<td>2016</td>
<td>ILO, ILOSTAT</td>
</tr>
<tr>
<td>6.2.2</td>
<td>New businesses/th pop. 15–64</td>
<td>n/a</td>
<td>2016</td>
<td>World Bank, Doing Business</td>
</tr>
<tr>
<td>7.3.4</td>
<td>Mobile app creation/bn PPP$ GDP</td>
<td>n/a</td>
<td>2017</td>
<td>App Annie Intelligence</td>
</tr>
</tbody>
</table>

### Outdated Data

<table>
<thead>
<tr>
<th>Code</th>
<th>Indicator</th>
<th>Country Year</th>
<th>Model Year</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.3</td>
<td>School life expectancy, years</td>
<td>2013</td>
<td>2016</td>
<td>UNESCO Institute for Statistics</td>
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<td>5.1.2</td>
<td>Firms offering formal training, % firms</td>
<td>2012</td>
<td>2013</td>
<td>World Bank, Enterprise Surveys</td>
</tr>
<tr>
<td>7.2.1</td>
<td>Cultural &amp; creative services exports, % total trade</td>
<td>2015</td>
<td>2016</td>
<td>WTO, Trade in Commercial Services</td>
</tr>
</tbody>
</table>
CHINA

Output rank 17
Input rank 22
Income Upper-middle
Region SEAO
Efficiency ratio 3
Population (mn) 1,409.5
GDP, PPP$ 23,122.0
GDP per capita, PPP$ 16,660.3
GII 2017 rank 5
GII 2018 rank 17

Human capital & research................................. 47.8 23

2.1 Education........................................ 63.9 13
2.1.1 Expenditure on education, % GDP........ n/a n/a
2.1.2 Government funding/pupil, secondary, % GDP/cap... n/a n/a
2.1.3 School life expectancy, years............... 13.9 25
2.1.4 PISA scales in reading, maths & science.. 514.3 8
2.1.5 Pupil-teacher ratio, secondary .............. 13.5 57
2.2 Tertiary education.............................. 20.4 94
2.2.1 Tertiary enrolment, % gross.................. 48.4 55
2.2.2 Graduates in science & engineering, %...... n/a n/a
2.2.3 Tertiary inbound mobility, %.............. 0.3 97
2.3 Research & development (R&D)............. 59.1 17
2.3.1 Researchers, FTE/mn pop.................. 1,205.7 47
2.3.2 Gross expenditure on R&D, % GDP......... 21 14
2.3.3 Global R&D companies, top 3, mn US$........ 901 6
2.3.4 QS university ranking, average score top 3" 82.3 5

Infrastructure ............................................. 56.8 29

3.1 Information & communication technologies (ICTs) 66.7 45
3.1.1 ICT access*................................. 55.8 75
3.1.2 ICT use*.................................... 52.7 63
3.1.3 Government’s online service*............. 76.8 31
3.1.4 E-participation*............................. 814 22
3.2 General infrastructure............................ 68.0 3
3.2.1 Electricity output, kWh/cap................ 4,262.0 50
3.2.2 Logistics performance*..................... 73.9 26
3.2.3 Core road network, km.................... 4,163 9
3.3 Ecological sustainability........................ 35.9 71
3.3.1 GDP/unit of energy use.................... 61 94
3.3.2 Environmental performance*.............. 50.7 96
3.3.3 ISO 14001 environmental certificates/bn PPP$ GDP........ 64 15

Market sophistication.................................... 55.6 25

4.1 Credit.............................................. 42.8 48
4.1.1 Ease of getting credit*...................... 60.0 61
4.1.2 Domestic credit to private sector, % GDP.... 156.7 7
4.1.3 Microfinance gross loans, % GDP........... 0.0 70
4.2 Investment........................................ 36.3 84
4.2.1 Ease of protecting minority investors*.... 48.3 97
4.2.2 Market capitalization, % GDP............. 65.6 25
4.2.3 Venture capital deals/bn PPP$ GDP......... 0.1
4.3 Trade, competition, & market scale........ 87.8 2
4.3.1 Applied tariff rate, weighted mean........... 3.5 72
4.3.2 Intensity of local competition*............ 74.4 30
4.3.3 Domestic market scale, bn PPP$............ 23,122.0 1

Business sophistication.................................. 56.0 9

5.1 Knowledge workers............................. 85.6 1
5.1.1 Knowledge-intensive employment, %...... n/a n/a
5.1.2 Firms offering formal training, % firms*.. 79.2 1
5.1.3 GERD performed by business, % GDP.... 16 12
5.1.4 GERD financed by business, %............. 76.1 12
5.1.5 Females employed w/advanced degrees, % n/a n/a
5.2 Innovation linkages.............................. 30.7 58
5.2.1 University/industry research collaboration 56.5 27
5.2.2 State of cluster development*............. 59.6 26
5.2.3 GERD financed by abroad, %.............. 0.7 94
5.2.4 JV–strategic alliance deals/bn PPP$ GDP.... 0.0 28
5.2.5 Patent families 2+ offices/bn PPP$ GDP.... 0.8 29
5.3 Knowledge absorption.......................... 51.7 12
5.3.1 Intellectual property payments, % total trade 12 26
5.3.2 High-tech net imports, % total trade........ 24.3 3
5.3.3 ICT services imports, % total trade........ 0.6 90
5.3.4 FDI net inflows, % GDP..................... 21 77
5.3.5 Research talent, % in business enterprise 61.9 9

Knowledge & technology outputs...................... 56.5 5

6.1 Knowledge creation............................. 69.1 4
6.1.1 Patents by origin/bn PPP$ GDP............ 56.6 1
6.1.2 PCT patents by origin/bn PPP$ GDP........ 21.8 18
6.1.3 Utility models by origin/bn PPP$ GDP....... 69.0 1
6.1.4 Scientific & technical articles/bn PPP$ GDP 17.2 42
6.1.5 Citable documents H index.................. 52.7 14
6.2 Knowledge impact............................... 63.5 2
6.2.1 Growth rate of PPP$ GDP/worker, %...... 6.5 3
6.2.2 New businesses/ht pop 15–64, %........... n/a n/a
6.2.3 Computer software spending, % GDP........ 0.4 23
6.2.4 ISO 9001 quality certificates/bn PPP$ GDP........ 16.5 22
6.2.5 High- & medium-high-tech manufactures, % 0.5 12
6.3 Knowledge diffusion............................ 37.0 22
6.3.1 Intellectual property receipts, % total trade 0.1 66
6.3.2 High-tech net exports, % total trade.... 28.7 1
6.3.3 ICT services exports, % total trade........ 12 78
6.3.4 FDI net outflows, % GDP.................... 16 41

Creative outputs.......................................... 45.4 21

7.1 Intangible assets................................. 71.9 1
7.1.1 Trademarks by origin/bn PPP$ GDP........ 165.7 3
7.1.2 Industrial designs by origin/bn PPP$ GDP.... 29.7 1
7.1.3 ICTS & business model creation*........... 61.7 55
7.1.4 ICTS & organizational model creation*..... 59.7 43
7.2 Creative goods & services...................... 35.1 28
7.2.1 Cultural & creative services exports, % total trade...... 0.0 67
7.2.2 National feature films/mt pop 15–69........ 0.6 88
7.2.3 Entertainment & Media market/ht pop 15–69 6.4 41
7.2.4 Printing & other media, % manufacturing.... 0.8 74
7.2.5 Creative goods exports, % total trade.... 12.5 1
7.3 Online creativity................................... 2.8 84
7.3.1 Generic top-level domains (TLDs)/ht pop 15–69 2.5 69
7.3.2 Country-code TLDs/ht pop 15–69............ 5.6 46
7.3.3 Wikipedia edits/mt pop 15–69................ 0.3 111
7.3.4 Mobile app creation/bn PPP$ GDP........ n/a n/a

NOTES: * indicates a strength;  indicates a weakness;  an income group strength;  an income group weakness;  an index;  a survey question.  indicates that the country’s data are older than the base year; see Appendix II for details, including the year of the data, at http://globalinnovationindex.org. Square brackets indicate that the data minimum coverage (DMC) requirements were not met at the sub-pillar or pillar level; see page 75 of this appendix for details.

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