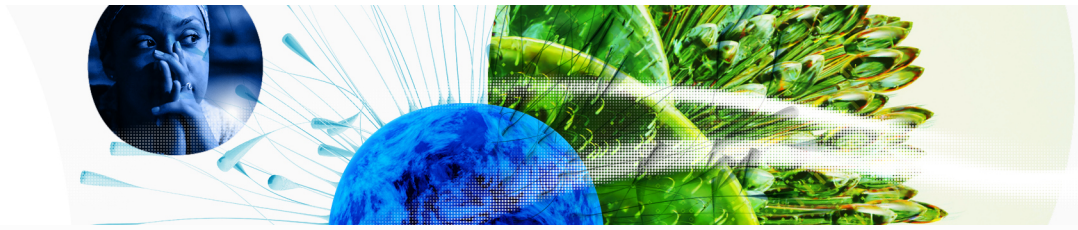
Global Innovation Index 2023



The Global Innovation Index (GII) **ranks world economies according to their innovation capabilities.**

Consisting of **roughly 80 indicators**, grouped into innovation inputs and outputs, the GII **aims to capture the multi-dimensional facets of innovation**.

Germany ranking in the Global Innovation Index 2023

> Germany ranks 8th among the 132 economies featured in the GII 2023.

> Germany ranks 8th among the 50 high-income group economies.

> Germany ranks 6th among the 39 economies in Europe.

> Germany GII Ranking (2020-2023)

The table shows the rankings of Germany over the past four years. Data availability and changes to the GII model framework influence year-on-year comparisons of the GII rankings. The statistical confidence interval for the ranking of Germany in the GII 2023 is between ranks 7 and 10.

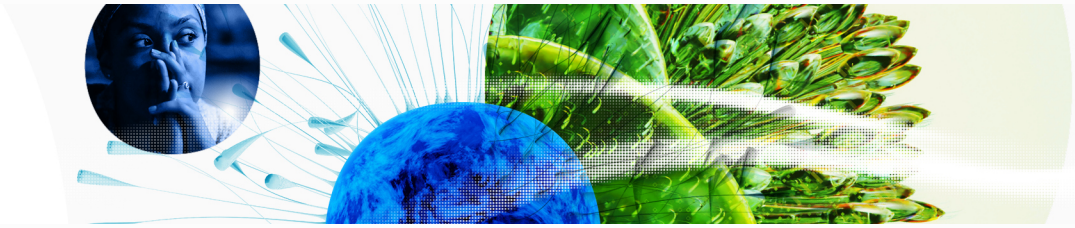
	GII Position	Innovation Inputs	Innovation Outputs
2020	9th	14th	7th
2021	10th	14th	8th
2022	8th	12th	7th
2023	8th	13th	6th

Germany performs better in innovation outputs than innovation inputs in 2023.

This year Germany ranks 13th in innovation inputs. This position is lower than last year.

Germany ranks 6th in innovation outputs. This position is higher than last year.

Global Innovation Index 2023

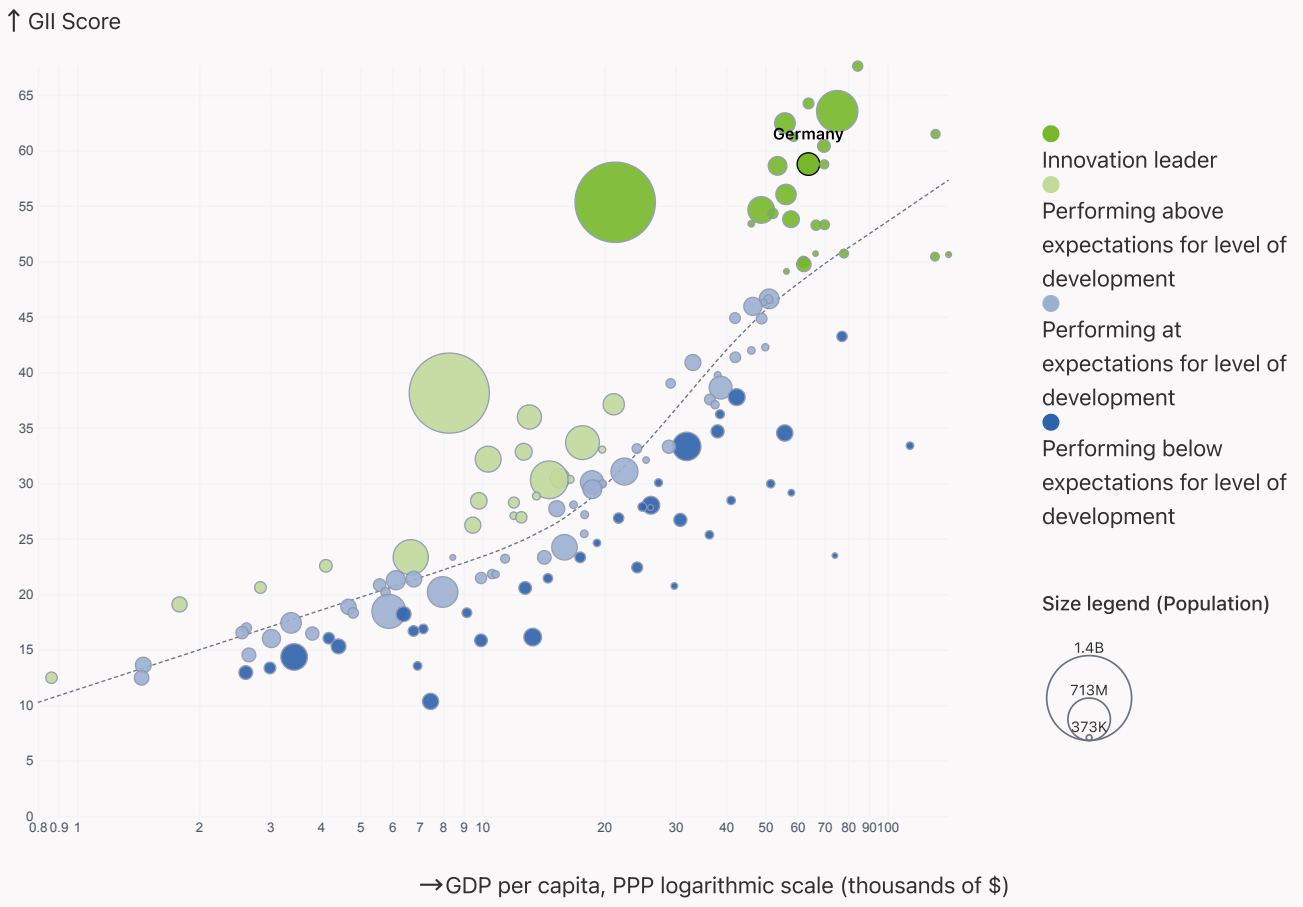


→ Expected vs. observed innovation performance

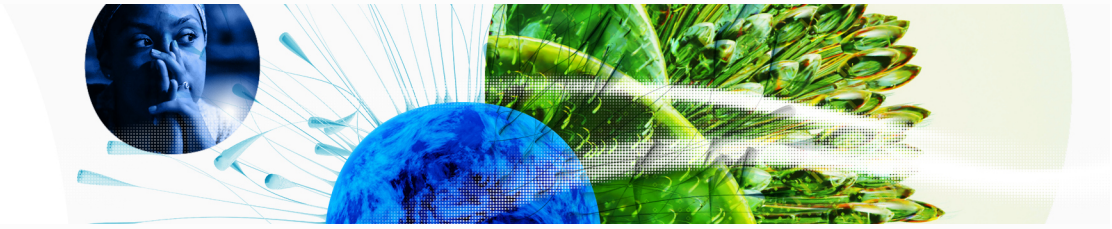
The bubble chart below shows the relationship between income levels (GDP per capita) and innovation performance (GII score). The trend line gives an indication of the expected innovation performance according to income level. Economies appearing above the trend line are performing better than expected and those below are performing below expectations.

> Germany is an innovation leader, ranking in the top 25 of the GII.

> Innovation overperformers relative to their economic development



Global Innovation Index 2023

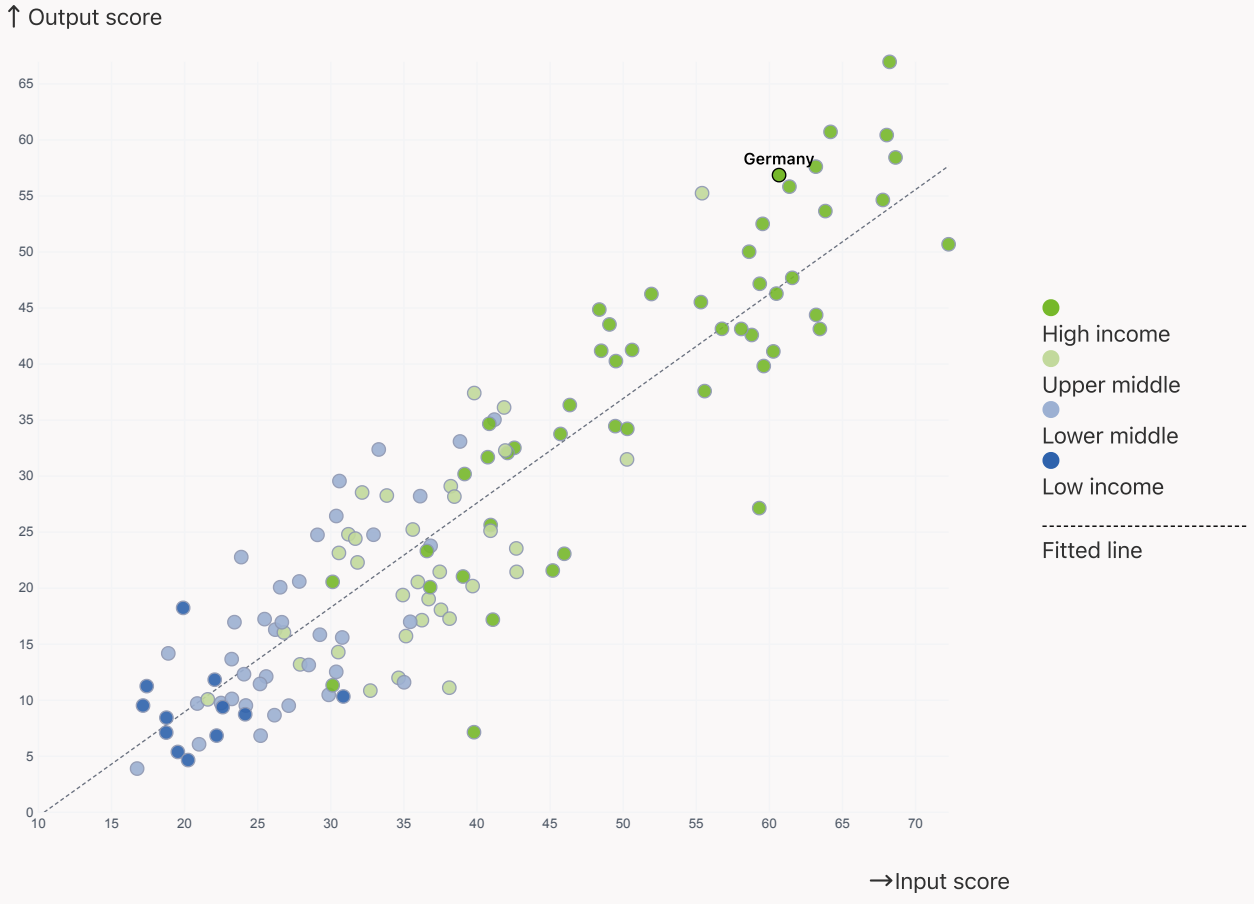


→ Effectively translating innovation investments into innovation outputs

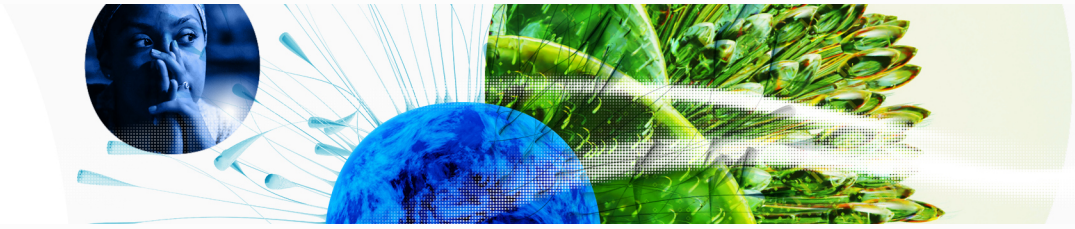
The chart below shows the relationship between innovation inputs and innovation outputs. Economies above the line are effectively translating costly innovation investments into more and higher-quality outputs.

> Germany produces more innovation outputs relative to its level of innovation investments.

> Relationship between innovation inputs and outputs

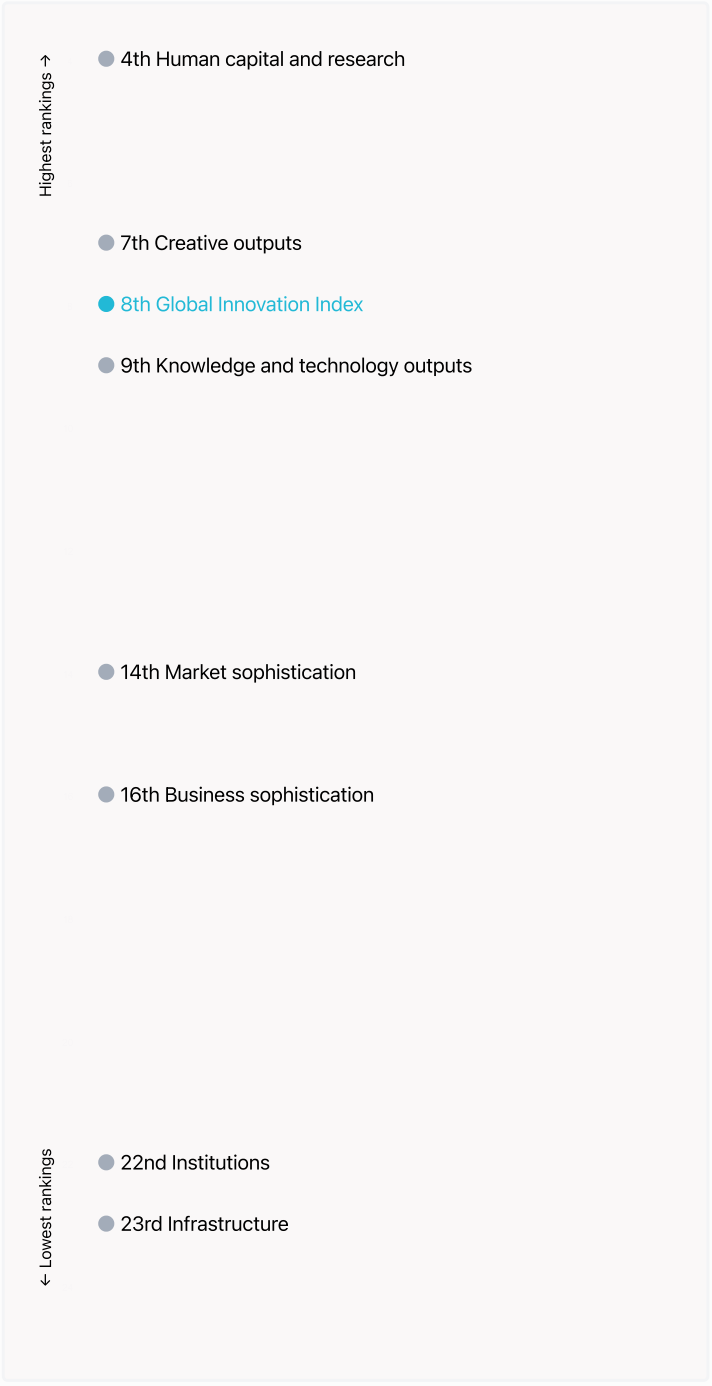


Global Innovation Index 2023



→ Overview of Germany's rankings in the seven areas of the GII in 2023

The chart shows the ranking for each of the seven areas that the GII comprises. The strongest areas for Germany are those that rank above the GII (shown in blue) and the weakest are those that rank below.



> Highest rankings

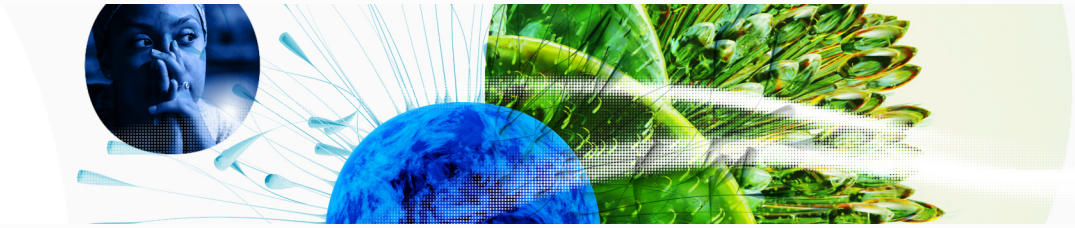
Germany ranks highest in Human capital and research (4th) and Creative outputs (7th).

> Lowest rankings

Germany ranks lowest in Infrastructure (23rd), Institutions (22nd) and Business sophistication (16th).

The full WIPO Intellectual Property Statistics profile for Germany can be found on this link.

Global Innovation Index 2023



→ Benchmark of Germany against other country groupings for each of the seven areas of the GII Index

The charts shows the relative position of Germany (blue bar) against other country groupings (grey bars), for each of the seven areas of the GII Index.

> High-Income economies

Germany performs above the high-income group average in all the pillars.

> Europe

Germany performs above the regional average in all the pillars.

Knowledge and technology outputs

- Top 10 | Score: 58.96
- Germany | Score: 55.43
- Europe | Score: 38.80
- High income | Score: 38.62

Creative outputs

- Germany | 58.18
- Top 10 | 56.09
- High income | 40.27
- Europe | 39.87

Business sophistication

- Top 10 | 64.39
- Germany | 56.89
- High income | 46.38
- Europe | 44.61

Market sophistication

- Top 10 | 61.93
- Germany | 56.46
- High income | 46.42
- Europe | 43.65

Human capital and research

- Germany | 61.10
- Top 10 | 60.28
- High income | 46.30
- Europe | 44.05

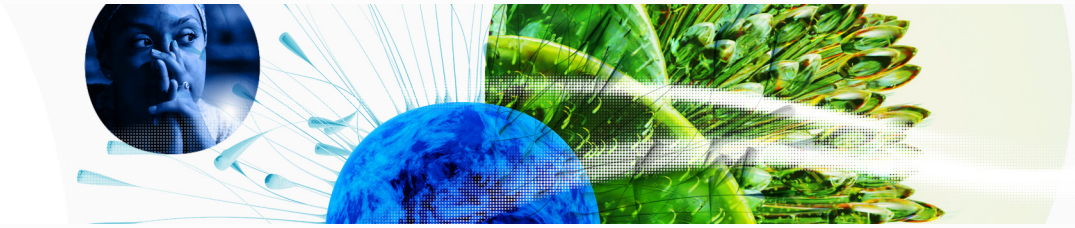
Infrastructure

- Top 10 | 62.83
- Germany | 57.14
- High income | 55.85
- Europe | 54.69

Institutions

- Top 10 | 79.85
- Germany | 71.94
- High income | 68.16
- Europe | 61.69

Global Innovation Index 2023



→ Innovation strengths and weaknesses in Germany

The table below gives an overview of the indicator strengths and weaknesses of Germany in the GII 2023.

> Germany's main innovation strengths are **Domestic market scale, bn PPP$** (rank 1), **Patent families/bn PPP$ GDP** (rank 1) and **Citable documents H-index** (rank 3).

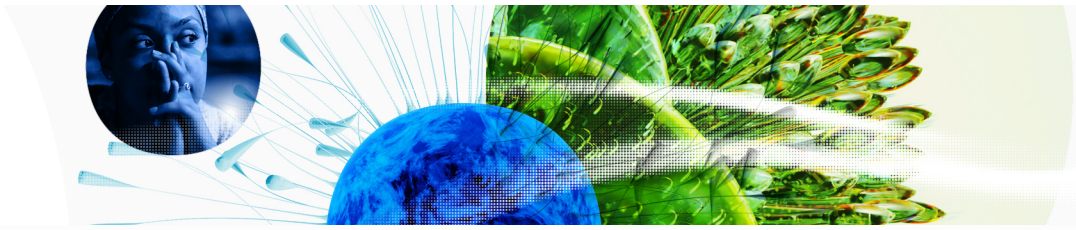
Strengths

Rank	Code	Indicator name
1	4.3.3	Domestic market scale, bn PPP$
1	5.2.5	Patent families/bn PPP$ GDP
3	6.1.5	Citable documents H-index
3	6.3.2	Production and export complexity
3	3.2.2	Logistics performance
3	2.3.3	Global corporate R&D investors, top 3, mn US$
5	6.1.1	Patents by origin/bn PPP$ GDP
6	7.3.2	Country-code TLDs/th pop. 15-69
8	7.1.3	Global brand value, top 5,000
9	5.2.2	State of cluster development

Weaknesses

Rank	Code	Indicator name
98	6.2.1	Labor productivity growth, %
93	1.2.3	Cost of redundancy dismissal
76	3.2.3	Gross capital formation, % GDP
63	5.3.4	FDI net inflows, % GDP
56	6.3.4	ICT services exports, % total trade
50	3.3.3	ISO 14001 environment/bn PPP$ GDP
48	5.1.5	Females employed w/advanced degrees, %
47	7.3.4	Mobile app creation/bn PPP$ GDP
47	2.1.5	Pupil-teacher ratio, secondary
33	4.2.1	Market capitalization, % GDP

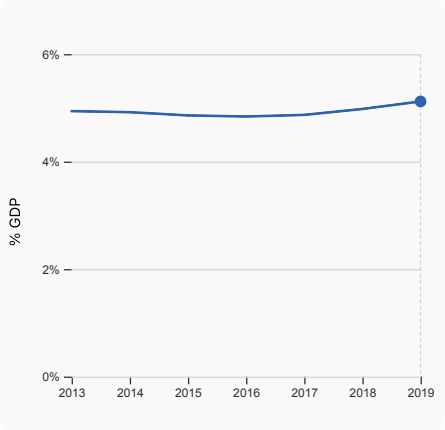
Global Innovation Index 2023



→ Germany's innovation system

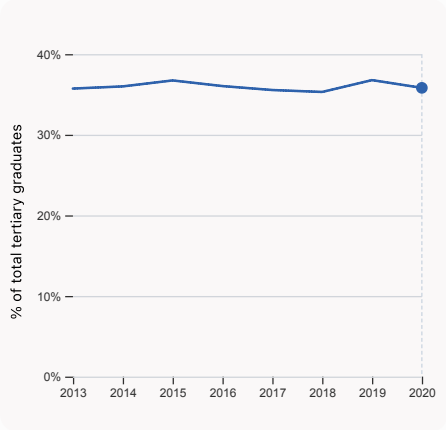
As far as practicable, the plots below present unscaled indicator data.

> Innovation inputs in Germany



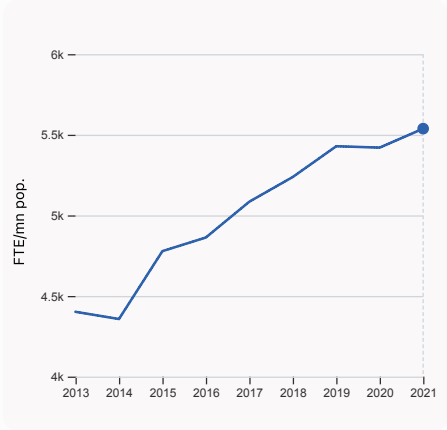
2.1.1 Expenditure on education, % GDP

was equal to 5.12% GDP in 2019, up by 0.14 percentage points from the year prior – and equivalent to an indicator rank of 36.



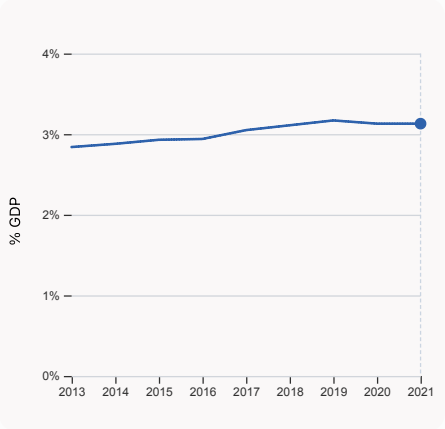
2.2.2 Graduates in science and engineering, %

was equal to 35.82% of total tertiary graduates in 2020, down by 0.96 percentage points from the year prior – and equivalent to an indicator rank of 8.



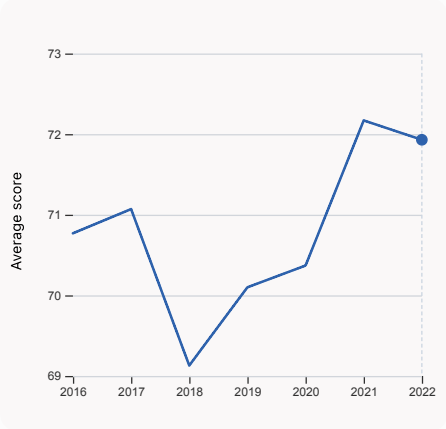
2.3.1 Researchers, FTE/mn pop.

was equal to 5,537.98 FTE/mn pop. in 2021, up by 2.17% from the year prior – and equivalent to an indicator rank of 14.



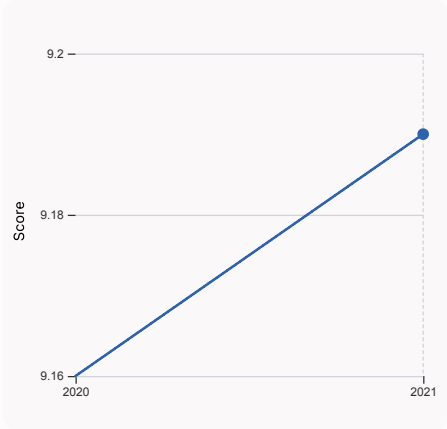
2.3.2 Gross expenditure on R&D, % GDP

was equal to 3.13% GDP in 2021, with no change from the year prior – and equivalent to an indicator rank of 9.



2.3.4 QS university ranking, top 3

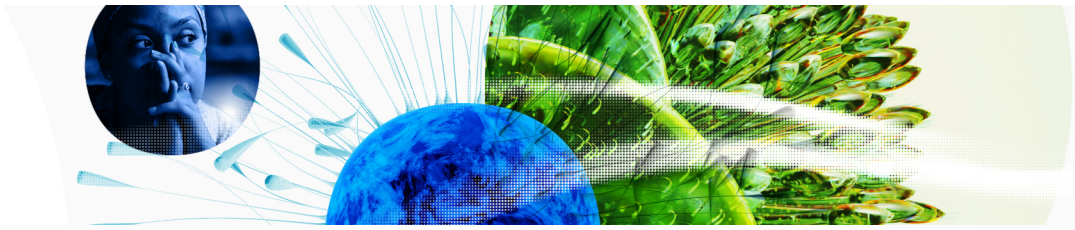
was equal to an average score of 71.93 for the top 3 universities in 2022, down by 0.33% from the year prior – and equivalent to an indicator rank of 11.

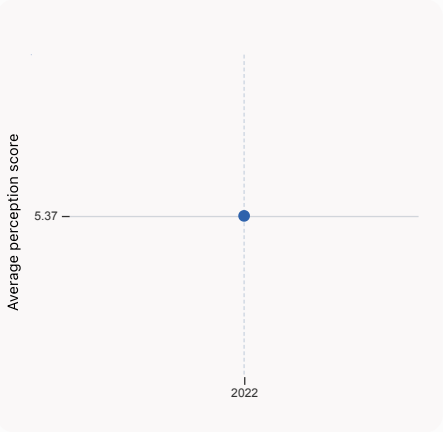


3.1.1 ICT access

was equal to a score of 9.19 in 2021, up by 0.33% from the year prior – and equivalent to an indicator rank of 34.

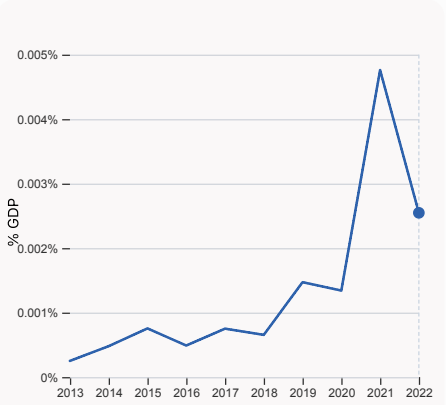
Global Innovation Index 2023





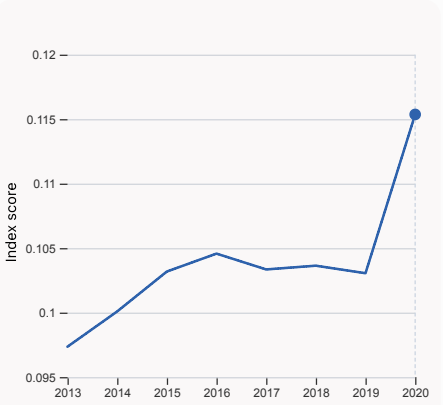
4.1.1 Finance for startups and scaleups

was equal to an average perception score of 5.37 in 2022, equivalent to an indicator rank of 21.



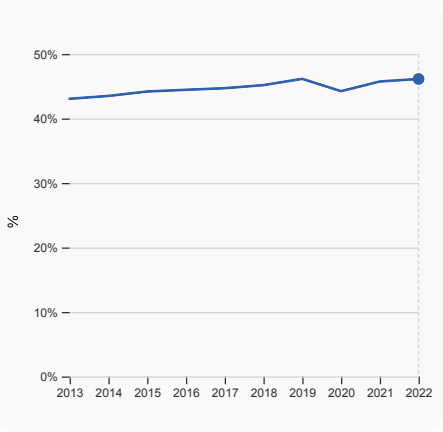
4.2.4 VC received, value, % GDP

was equal to 0.00255% GDP in 2022, down by 0.0022 percentage points from the year prior – and equivalent to an indicator rank of 25.



4.3.2 Domestic industry diversification

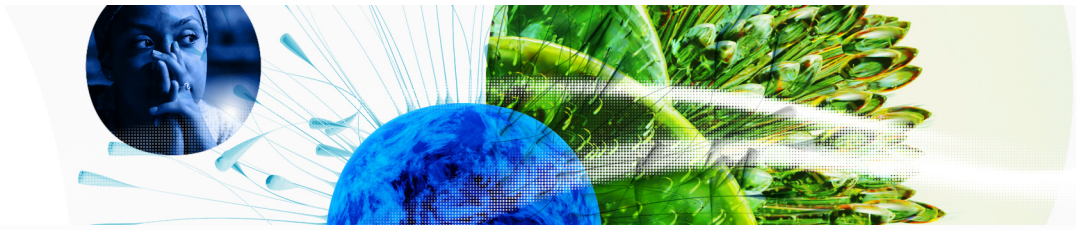
was equal to an index score of 0.115 in 2020, up by 11.95% from the year prior – and equivalent to an indicator rank of 29.



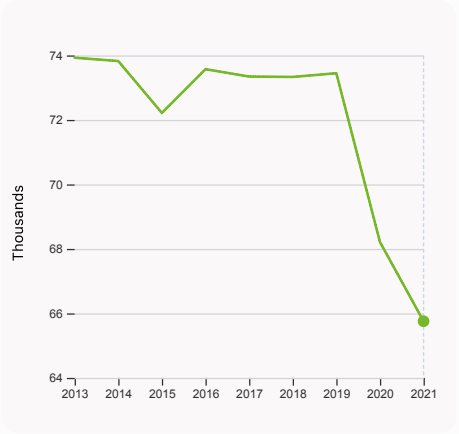
5.1.1 Knowledge-intensive employment, %

was equal to 46.13% in 2022, up by 0.39 percentage points from the year prior – and equivalent to an indicator rank of 20.

Global Innovation Index 2023

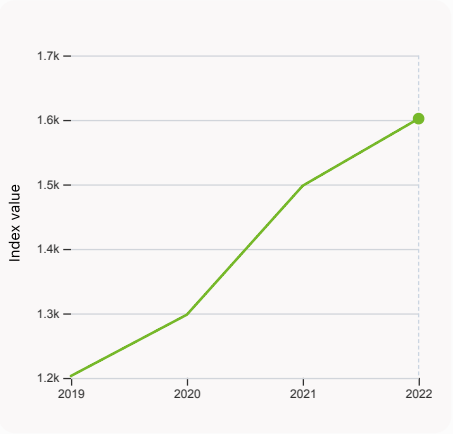


> Innovation outputs in Germany



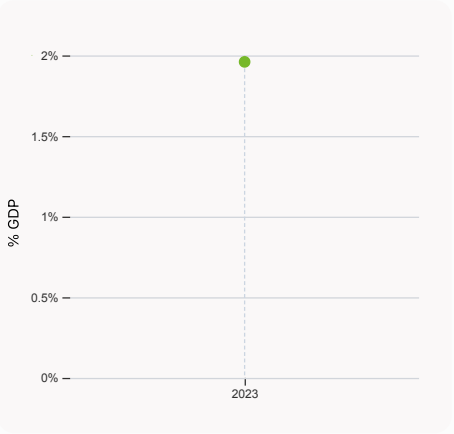
6.1.1 Patents by origin

was equal to 65.76 Thousands in 2021, down by 3.6% from the year prior – and equivalent to an indicator rank of 5.



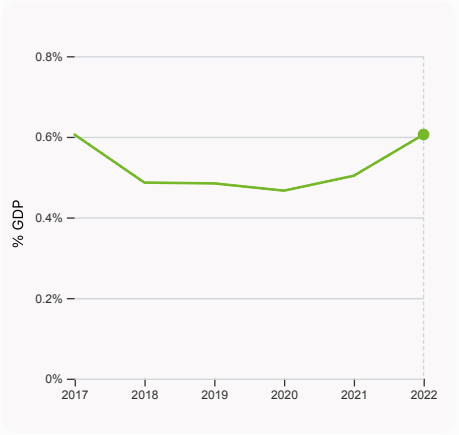
6.1.5 Citable documents H-index

was equal to an index value of 1,602 in 2022, up by 6.94% from the year prior – and equivalent to an indicator rank of 3.



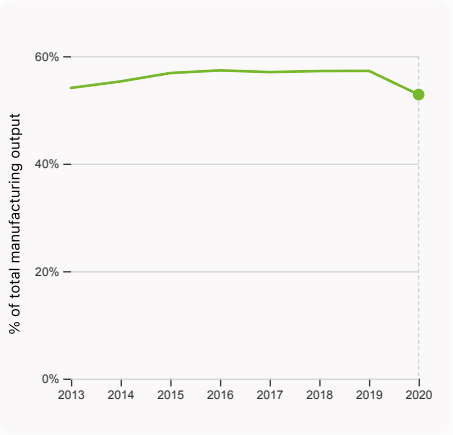
6.2.2 Unicorn valuation, % GDP

was equal to 1.96 % GDP in 2023 – and equivalent to an indicator rank of 21.



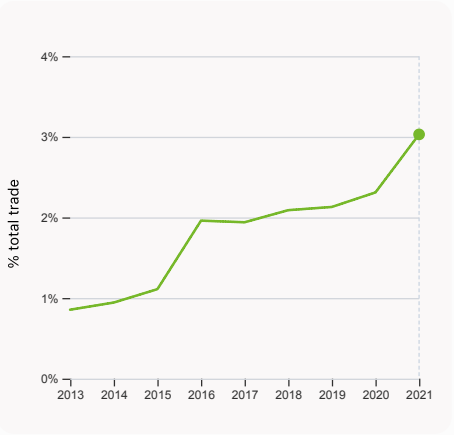
6.2.3 Software spending, % GDP

was equal to 0.606% GDP in 2022, up by 0.1 percentage points from the year prior – and equivalent to an indicator rank of 15.



6.2.4 High-tech manufacturing, %

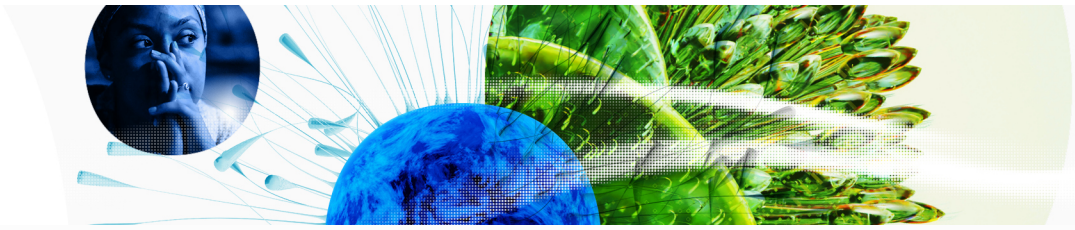
was equal to 52.86% of total manufacturing output in 2020, down by 4.41 percentage points from the year prior – and equivalent to an indicator rank of 9.

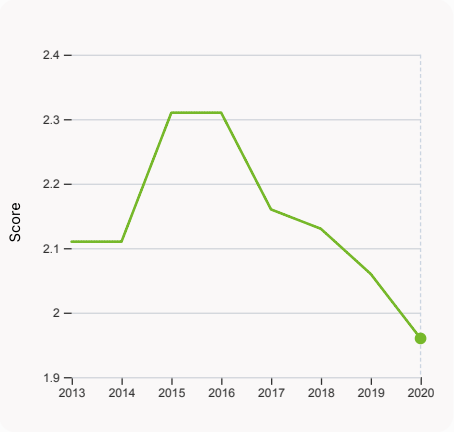


6.3.1 Intellectual property receipts, % total trade

was equal to 3.03% total trade in 2021, up by 0.72 percentage points from the year prior – and equivalent to an indicator rank of 11.

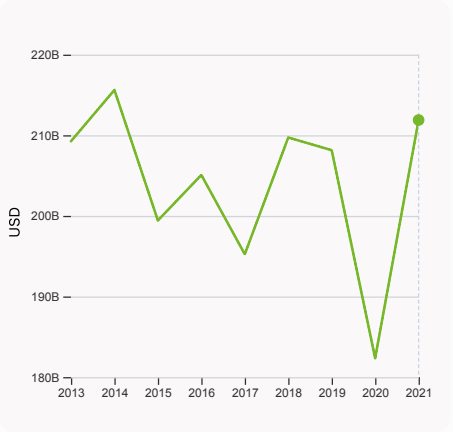
Global Innovation Index 2023





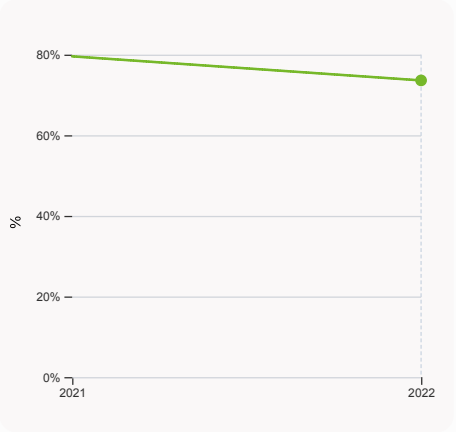
6.3.2 Production and export complexity

was equal to a score of 1.96 in 2020, down by 4.85% from the year prior – and equivalent to an indicator rank of 3.



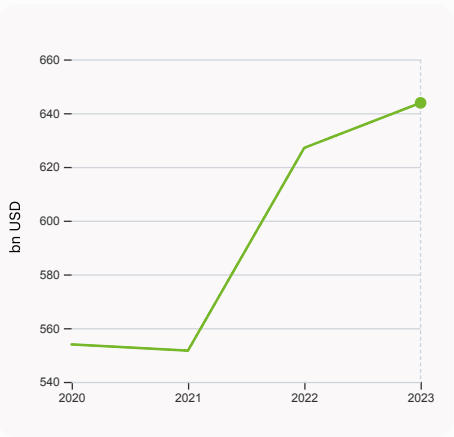
6.3.3 High-tech exports

was equal to 211,891,202,304 USD in 2021, up by 16.2% from the year prior – and equivalent to an indicator rank of 15.



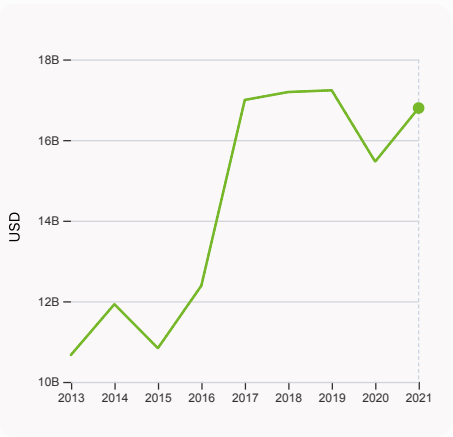
7.1.1 Intangible asset intensity, top 15, %

was equal to 73.61% in 2022, down by 5.97 percentage points from the year prior – and equivalent to an indicator rank of 13.



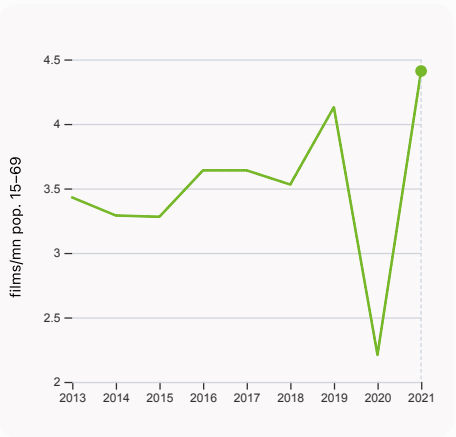
7.1.3 Global brand value, top 5,000

was equal to 643.835 bn USD in 2023, up by 2.67% from the year prior – and equivalent to an indicator rank of 8.



7.2.1 Cultural and creative services exports

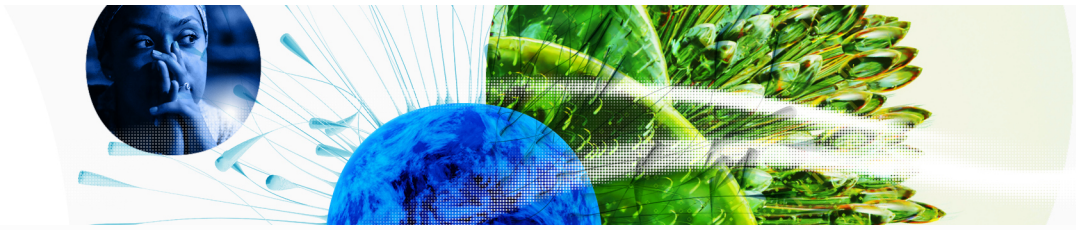
was equal to 16,794,075,000 USD in 2021, up by 8.59% from the year prior – and equivalent to an indicator rank of 37.

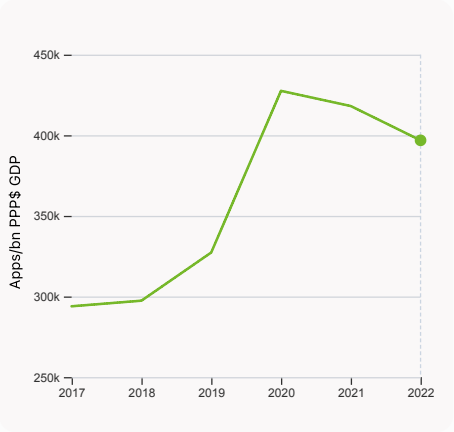


7.2.2 National feature films/mn pop. 15-69

was equal to 4.41 films/mn pop. 15–69 in 2021, up by 99.55% from the year prior – and equivalent to an indicator rank of 27.

Global Innovation Index 2023

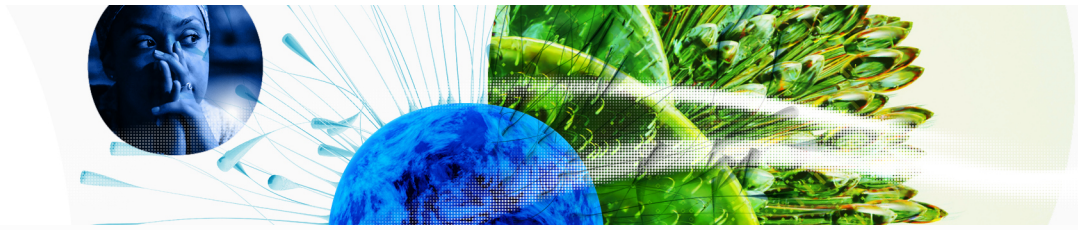




7.3.4 Mobile app creation/bn PPP$ GDP

was equal to 396,857.29 Apps/bn PPP$ GDP in 2022, down by 5.087% from the year prior – and equivalent to an indicator rank of 47.

Global Innovation Index 2023



→ Germany's innovation top performers

> 2.3.3 Global corporate R&D investors from Germany

Rank	Firm	Industry	R&D	R&D Growth	R&D Intensity
			[mn EUR]	[%]	[%]
7	VOLKSWAGEN	Automobiles & Parts	15,583	12	6
14	MERCEDES-BENZ	Automobiles & Parts	8,973	6	5
21	BMW	Automobiles & Parts	6,870	9	6
26	ROBERT BOSCH	Automobiles & Parts	6,328	5	8

Source: European Commission's Joint Research Centre (https://iri.jrc.ec.europa.eu/scoreboard/2022-eu-industrial-rd-investment-scoreboard).
Note: European Commission's Joint Research Centre ranks the top 2,500 firms by R&D investment annually.

> 2.3.4 QS university ranking of Germany's top universities

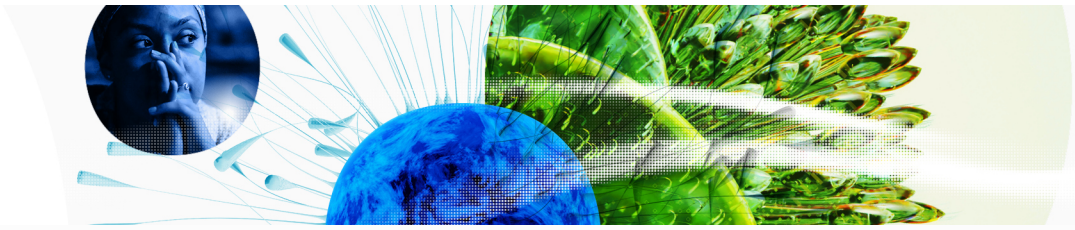
Rank	University	Score
49	TECHNISCHE UNIVERSITAT MUNCHEN	76.40
59	LUDWIG-MAXIMILIANS-UNIVERSITAT MUNCHEN	70.40
65	RUPRECHT-KARLS-UNIVERSITAT HEIDELBERG	69.00

Source: QS Quacquarelli Symonds Ltd (https://www.topuniversities.com/university-rankings/world-university-rankings/2023).
Note: QS Quacquarelli Symonds Ltd annually assesses over 1,200 universities across the globe and scores them between [0,100]. Ranks can represent a single value "x", a tie "x=" or a range "x-y".

> 6.2.2 Top Unicorn Companies in Germany

Rank	Unicorn Company	Industry	City	Valuation, bn USD
1	CELONIS	Data management & analytics	Munich	13
2	N26	Fintech	Berlin	9
3	PERSONIO	Internet software & services	Munich	9

Source: CBInsights, Tracker – The Complete List of Unicorn Companies: https://www.cbinsights.com/research-unicorn-companies



> 7.1.1 Top 15 intangible-asset intensive companies in Germany

Rank	Firm	Intensity, %
1	DEUTSCHE TELEKOM AG	70.81
2	SAP SE	87.23
3	BAYER AG	101.94

Source: Brand Finance (https://brandirectory.com/reports/gift-2022).
Note: Brand Finance only provides within economy ranks.

> 7.1.3 Top 5,000 companies in Germany with highest global brand value

Rank	Brand	Industry	Brand Value, mn USD
1	DEUTSCHE TELEKOM	Telecoms	62,927.8
2	MERCEDES-BENZ	Automobiles	58,796.7
3	ALLIANZ GROUP	Insurance	48,351.4

Source: Brand Finance (https://brandirectory.com).
Note: Rank corresponds to within economy ranks.

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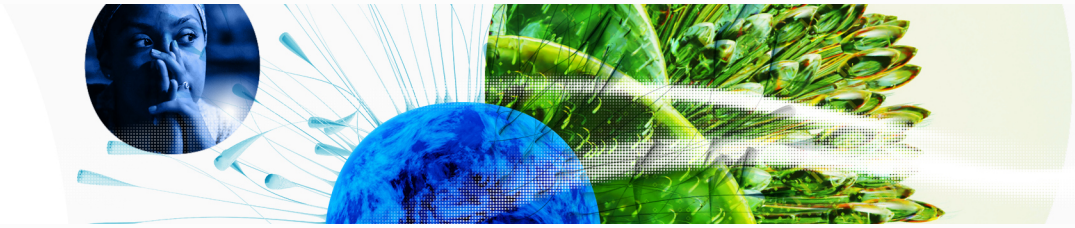

Germany

GII 2023 rank **8**

Output rank	Input rank	Income	Region	Population (mn)	GDP, PPP$ (bn)	GDP per capita, PPP$
6	13	High	EUR	83.4	5,316.9	63,834.9

	Score / Value	Rank
Institutions	**71.9**	**22**
1.1 Institutional environment	**71.8**	**20**
1.1.1 Operational stability for businesses*	70.1	28
1.1.2 Government effectiveness*	73.5	22
1.2 Regulatory environment	**79.4**	**29**
1.2.1 Regulatory quality*	84.4	11
1.2.2 Rule of law*	86.8	14
1.2.3 Cost of redundancy dismissal	21.6	93 ○ ◇
1.3 Business environment	**64.6**	**29**
1.3.1 Policies for doing business†	75.8	15
1.3.2 Entrepreneurship policies and culture†	53.5	29
Human capital and research	**61.1**	**4**
2.1 Education	**62.2**	**23**
2.1.1 Expenditure on education, % GDP	5.1	36
2.1.2 Government funding/pupil, secondary, % GDP/cap	24.3	23
2.1.3 School life expectancy, years	16.9	20
2.1.4 PISA scales in reading, maths and science	500.4	18
2.1.5 Pupil-teacher ratio, secondary	11.5	47 ○
2.2 Tertiary education	**51.4**	**8**
2.2.1 Tertiary enrolment, % gross	73.0	29
2.2.2 Graduates in science and engineering, %	35.8	8
2.2.3 Tertiary inbound mobility, %	11.2	23
2.3 Research and development (R&D)	**69.6**	**7**
2.3.1 Researchers, FTE/mn pop.	5,538.0	14
2.3.2 Gross expenditure on R&D, % GDP	3.1	9
2.3.3 Global corporate R&D investors, top 3, mn US$	92.0	3 ●
2.3.4 QS university ranking, top 3*	72.9	11
Infrastructure	**57.1**	**23**
3.1 Information and communication technologies (ICTs)	**82.0**	**32**
3.1.1 ICT access*	88.0	34
3.1.2 ICT use*	91.2	19
3.1.3 Government's online service*	76.8	44 ◇
3.1.4 E-participation*	72.1	32
3.2 General infrastructure	**48.3**	**21**
3.2.1 Electricity output, GWh/mn pop.	7,102.1	27
3.2.2 Logistics performance*	90.9	3 ●
3.2.3 Gross capital formation, % GDP	22.7	76 ○
3.3 Ecological sustainability	**41.2**	**30**
3.3.1 GDP/unit of energy use	14.2	30
3.3.2 Environmental performance*	73.7	13
3.3.3 ISO 14001 environment/bn PPP$ GDP	1.9	50 ○
Market sophistication	**56.5**	**14**
4.1 Credit	**49.3**	**30**
4.1.1 Finance for startups and scaleups†	67.3	21
4.1.2 Domestic credit to private sector, % GDP	84.8	37
4.1.3 Loans from microfinance institutions, % GDP	n/a	n/a
4.2 Investment	**24.9**	**28**
4.2.1 Market capitalization, % GDP	52.3	33 ○
4.2.2 Venture capital (VC) investors, deals/bn PPP$ GDP	0.2	25
4.2.3 VC recipients, deals/bn PPP$ GDP	0.1	22
4.2.4 VC received, value, % GDP	0.0	25
4.3 Trade, diversification, and market scale	**95.2**	**2**
4.3.1 Applied tariff rate, weighted avg., %	1.5	20
4.3.2 Domestic industry diversification	95.1	29
4.3.3 Domestic market scale, bn PPP$	5,316.9	1 ●

	Score / Value	Rank
Business sophistication	**56.9**	**16**
5.1 Knowledge workers	**59.0**	**21**
5.1.1 Knowledge-intensive employment, %	46.1	20
5.1.2 Firms offering formal training, %	44.1	25
5.1.3 GERD performed by business, % GDP	2.1	9
5.1.4 GERD financed by business, %	62.6	11
5.1.5 Females employed w/advanced degrees, %	15.6	48 ○ ◇
5.2 Innovation linkages	**63.1**	**10**
5.2.1 University-industry R&D collaboration†	76.2	17
5.2.2 State of cluster development†	82.6	9 ●
5.2.3 GERD financed by abroad, % GDP	0.2	16
5.2.4 Joint venture/strategic alliance deals/bn PPP$ GDP	0.1	26 ◇
5.2.5 Patent families/bn PPP$ GDP	5.0	1 ●
5.3 Knowledge absorption	**48.6**	**26**
5.3.1 Intellectual property payments, % total trade	1.0	37
5.3.2 High-tech imports, % total trade	10.3	33
5.3.3 ICT services imports, % total trade	2.6	27
5.3.4 FDI net inflows, % GDP	2.4	63 ○
5.3.5 Research talent, % in businesses	60.1	15
Knowledge and technology outputs	**55.4**	**9**
6.1 Knowledge creation	**61.5**	**6**
6.1.1 Patents by origin/bn PPP$ GDP	13.5	5 ●
6.1.2 PCT patents by origin/bn PPP$ GDP	3.3	10
6.1.3 Utility models by origin/bn PPP$ GDP	1.4	15
6.1.4 Scientific and technical articles/bn PPP$ GDP	n/a	n/a
6.1.5 Citable documents H-index	86.8	3 ●
6.2 Knowledge impact	**50.7**	**15**
6.2.1 Labor productivity growth, %	-0.0	98 ○
6.2.2 Unicorn valuation, % GDP	2.0	21
6.2.3 Software spending, % GDP	0.6	15
6.2.4 High-tech manufacturing, %	52.9	9
6.3 Knowledge diffusion	**54.1**	**10**
6.3.1 Intellectual property receipts, % total trade	2.5	11
6.3.2 Production and export complexity	93.6	3 ●
6.3.3 High-tech exports, % total trade	11.3	15
6.3.4 ICT services exports, % total trade	2.1	56 ○
6.3.5 ISO 9001 quality/bn PPP$ GDP	10.1	28
Creative outputs	**58.2**	**7**
7.1 Intangible assets	**65.5**	**7**
7.1.1 Intangible asset intensity, top 15, %	73.6	13
7.1.2 Trademarks by origin/bn PPP$ GDP	69.1	24
7.1.3 Global brand value, top 5,000	15.6	8 ●
7.1.4 Industrial designs by origin/bn PPP$ GDP	10.5	9
7.2 Creative goods and services	**32.2**	**24**
7.2.1 Cultural and creative services exports, % total trade	0.9	37
7.2.2 National feature films/mn pop. 15-69	4.4	27
7.2.3 Entertainment and media market/th pop. 15-69	56.4	11
7.2.4 Creative goods exports, % total trade	2.2	24
7.3 Online creativity	**69.4**	**8**
7.3.1 Generic top-level domains (TLDs)/th pop. 15-69	60.9	12
7.3.2 Country-code TLDs/th pop. 15-69	88.6	6 ●
7.3.3 GitHub commits/mn pop. 15-69	57.0	16
7.3.4 Mobile app creation/bn PPP$ GDP	71.1	47 ○

NOTES: ● indicates a strength; ○ a weakness; ◆ an income group strength; ◇ an income group weakness; * an index; † a survey question, ◔ indicates that the economy's data are older than the base year; see appendices for details, including the year of the data, at https://www.wipo.int/gii-ranking. Square brackets [ ] indicate that the data minimum coverage (DMC) requirements were not met at the sub-pillar or pillar level.

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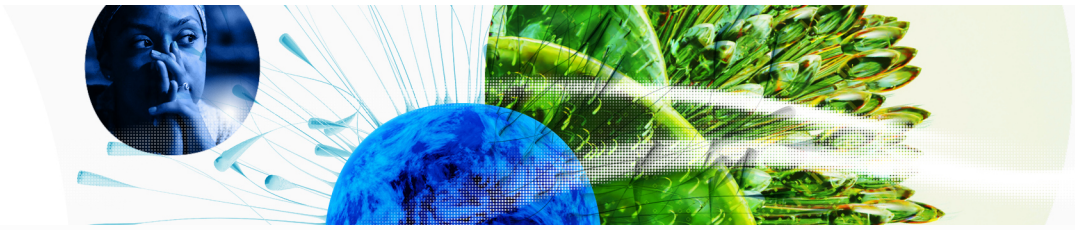

→ Data availability

The following tables list indicators that are either missing or outdated for Germany.

> Germany has missing data for one indicator and outdated data for one indicator.

> Missing data for Germany

Code	Indicator name	Economy Year	Model Year	Source
4.1.3	Loans from microfinance institutions, % GDP	n/a	2021	International Monetary Fund, Financial Access Survey (FAS)

> Outdated data for Germany

Code	Indicator name	Economy Year	Model Year	Source
2.1.1	Expenditure on education, % GDP	2019	2021	UNESCO Institute for Statistics

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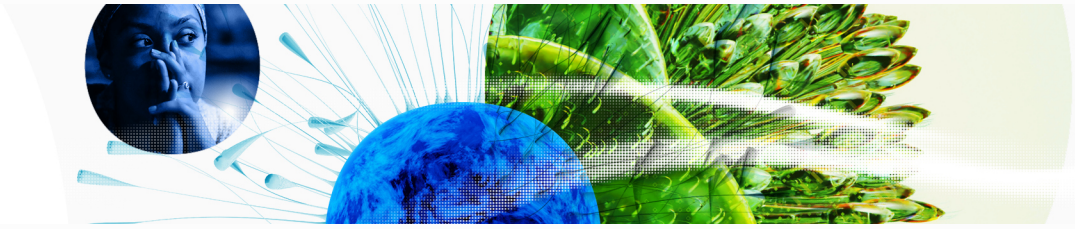

About the Global Innovation Index

- The Global Innovation Index (GII) is published by the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations.
- Recognizing that innovation is a key driver of economic development, the GII aims to provide an innovation ranking and rich analysis referencing around 130 economies. Over the last decade, the GII has established itself as both a leading reference on innovation and a "tool for action" for economies that incorporate the GII into their innovation agendas.

Source: Global Innovation Index Database, WIPO, 2023.

The Index is a ranking of the innovation capabilities and results of world economies. It measures innovation based on criteria that include institutions, human capital and research, infrastructure, credit, investment, linkages; the creation, absorption and diffusion of knowledge; and creative outputs.

The GII has two sub-indices: the Innovation Input Sub-Index and the Innovation Output Sub-Index, and seven pillars, each consisting of three sub-pillars.