

Technology upgrading



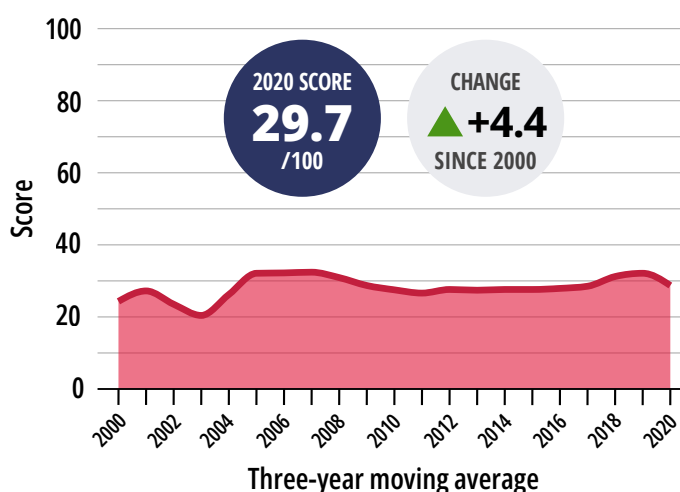
Technology upgrading measures the medium-and high-technology content in total production activities and total exports.

Sustainable productivity growth can only be achieved through the development of new and improved technologies and the ability to master more sophisticated economic activities. The share of medium- and high-technology manufactures in production and exports has increased in Africa, but there is a wide gap between the highest- and lowest-performing countries.

● Technology upgrading scores by country

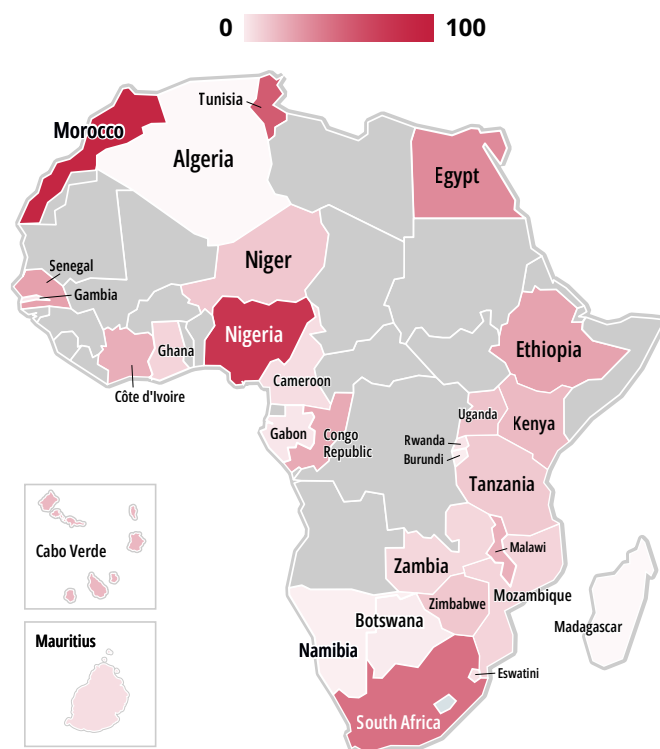
COUNTRY (alphabetical order)	2020 SCORE	CHANGE SINCE 2010	CHANGE SINCE 2000
Algeria	2.9	-5.8 ▼	-9.8 ▼
Botswana	8.8	-3.8 ▼	-0.9 ▼
Burundi	8.0	-16.3 ▼	5.5 ▲
Cameroon	15.4	-5.4 ▼	9.7 ▲
Cabo Verde	32.0	-7.9 ▼	-4.6 ▼
Congo Rep	37.7	-13.2 ▼	23.0 ▲
Côte d'Ivoire	36.2	0.4 ▲	7.3 ▲
Egypt	51.9	2.6 ▲	3.6 ▲
Eswatini	13.7	2.5 ▲	6.3 ▲
Ethiopia	40.5	3.7 ▲	30.6 ▲
Gabon	11.2	-0.2 ▼	2.0 ▲
Gambia	11.1	7.2 ▲	-14.0 ▼
Ghana	18.6	4.7 ▲	13.1 ▲
Kenya	30.8	0.9 ▲	8.8 ▲
Madagascar	3.4	-2.1 ▼	-1.4 ▼
Malawi	28.1	3.1 ▲	14.8 ▲
Mauritius	14.7	9.0 ▲	10.0 ▲
Morocco	97.2	37.2 ▲	57.7 ▲
Mozambique	19.2	-10.8 ▼	-9.4 ▼
Namibia	7.0	-11.2 ▼	-4.4 ▼
Niger	24.8	-5.0 ▼	-26.7 ▼
Nigeria	90.2	30.3 ▲	3.4 ▲
Rwanda	12.1	-9.9 ▼	4.3 ▲
Senegal	42.1	4.6 ▲	-6.8 ▼
South Africa	64.0	3.1 ▲	7.8 ▲
Tanzania	23.6	-0.5 ▼	-5.3 ▼
Tunisia	72.9	29.6 ▲	33.8 ▲
Uganda	26.5	0.0 ●	-4.1 ▼
Zambia	28.2	5.5 ▲	-1.6 ▼
Zimbabwe	18.3	-16.7 ▼	-20.0 ▼

● Average African Technology upgrading score

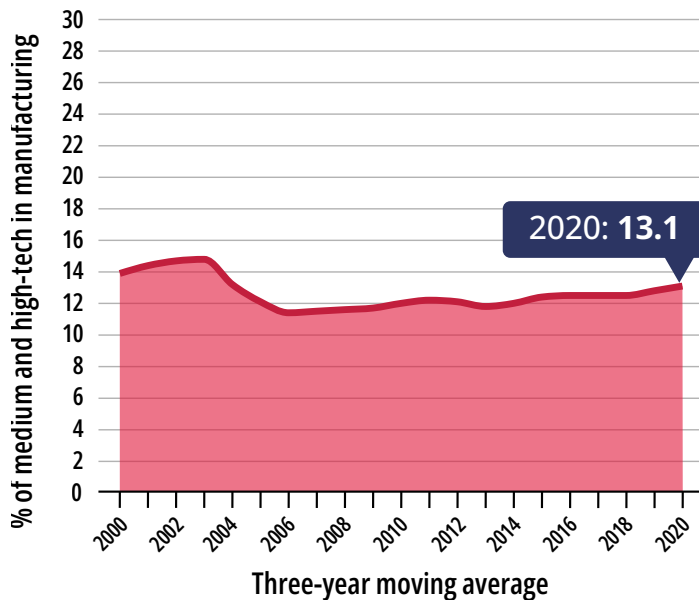


The average African *Technology upgrading* score above is the average of the 30 economies tracked by the ATI. The map below and the table on the left show the individual country scores.

● Technology upgrading scores by country, 2020



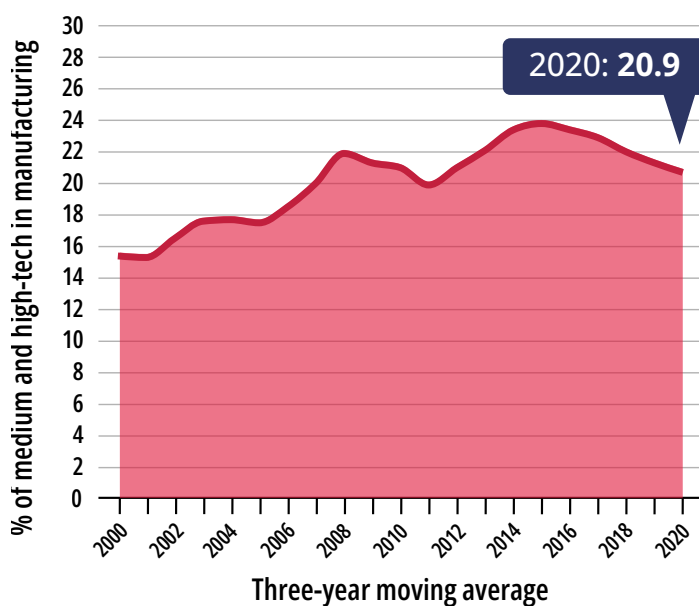
The **Technology upgrading** dimension is measured by two indicators. The charts below show the average indicator scores for the 30 African countries tracked by the ATI for the years 2000–2020.



Technology production

This is the share of medium- and high-technology inputs in manufacturing value added. Manufacturing value added is classified into low technology, medium technology, and high technology, and the shares of medium and high technology are combined to represent the level of technology in the manufacturing sector. The Lall approach is used for the technology decomposition of manufacturing value added.

Source: World Development Indicators (2022 update)



Technology in exports

This is the share of medium- and high-technology products in total exports. The Lall approach is used for the technology decomposition of manufactured exports.

As these graphs illustrate, the increasing overall *Technology upgrading* score for Africa has been driven primarily by an increase in medium- and high-technology exports. The adoption of advanced technology in production in manufacturing has stalled.

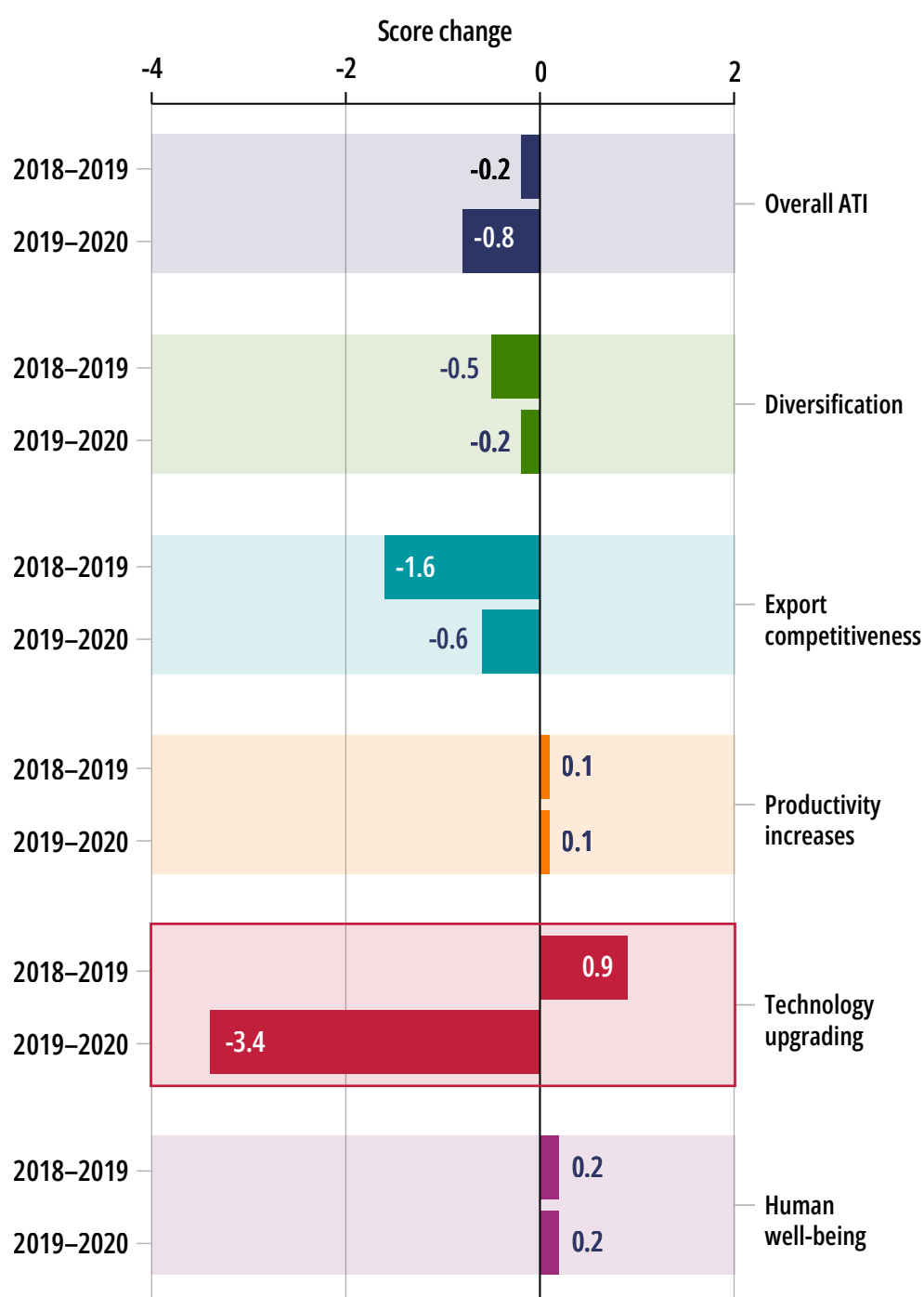
Source: World Development Indicators (2022 update)

Resilience and transformation

COVID-19 and the sharp decline of *Technology upgrading* in Africa

While the specific transmission mechanisms are complex and merit further research, the overall immediate impact of the COVID-19 pandemic on African economic transformation outcomes is clear: the pandemic made a bad situation worse for Africa's transformation. Between 2018 and 2019, *Diversification* and *Export competitiveness* were already weakening. Only *Technology upgrading* was improving, while *Human well-being* and *Productivity increases* were stagnant. As the pandemic hit the continent, *Technology upgrading* was hit harder than any other dimension as a result of a collapse in global production and exports.

● Changes in DEPTH scores before and during the COVID-19 pandemic

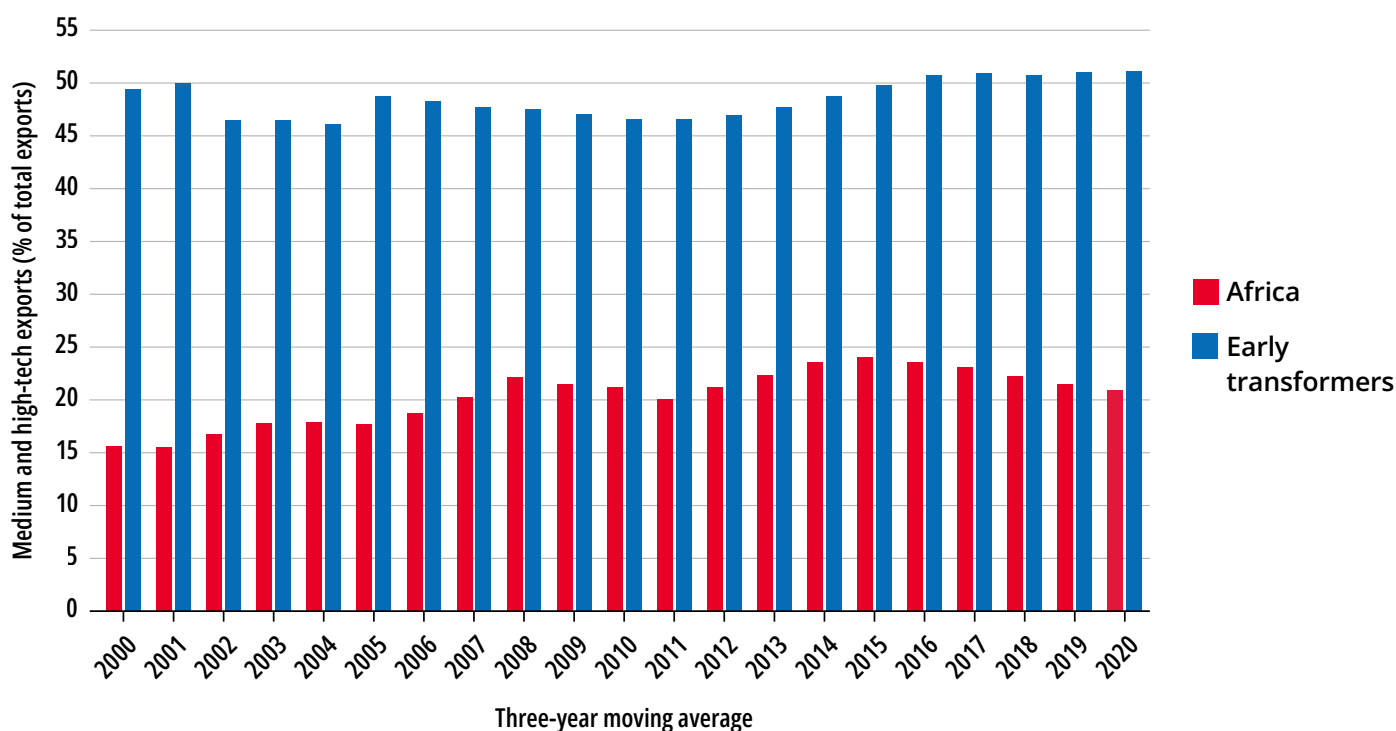


Global context

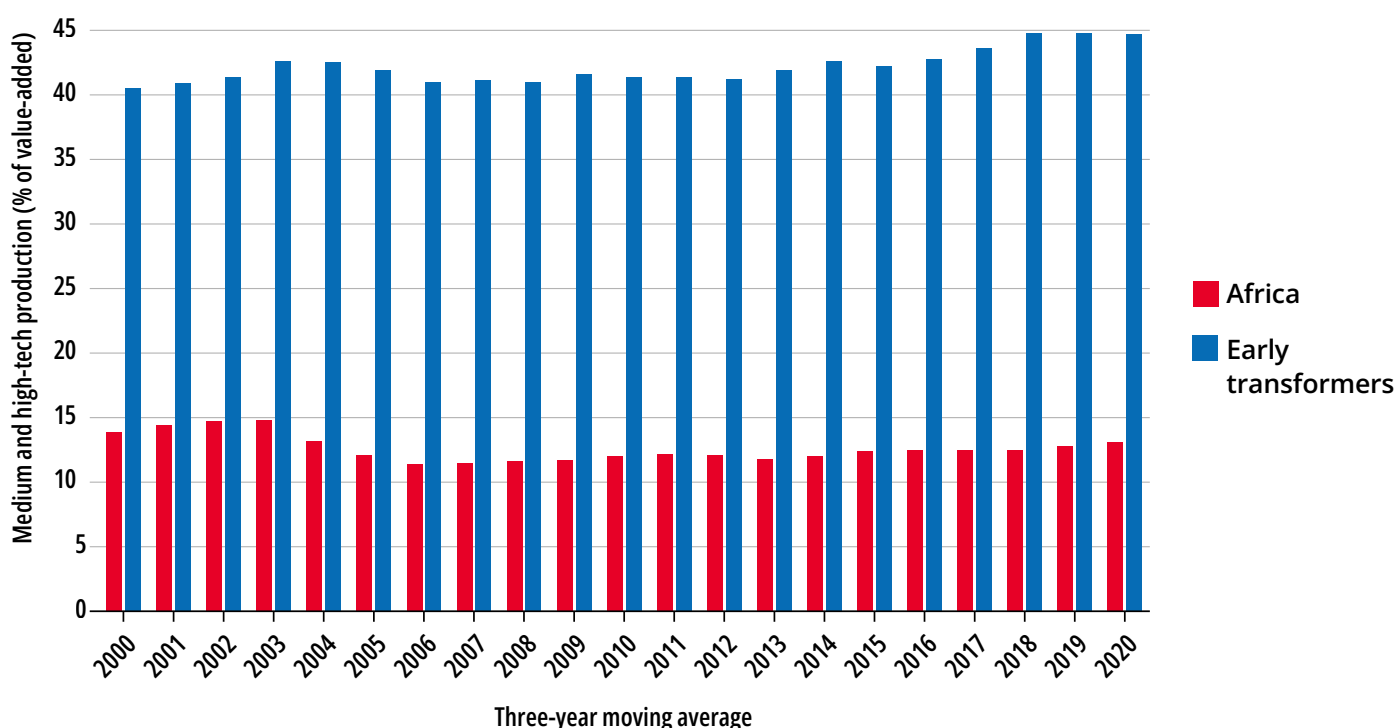
The technology content challenge for Africa's exports and production

Despite slow but sustained improvements in technology content in Africa's exports between 2000 and 2020, countries still have a long way to go to catch up to early transformers. Africa has fallen even further behind when it comes to medium- and high-tech production, where progress has been notably absent.

● Technology in exports: Africa and early transformers



● Production technology: Africa and early transformers



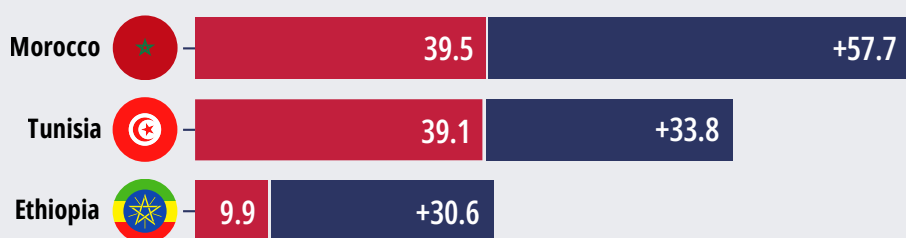
Pathways for improved *Technology upgrading*

Closing knowledge, skills, and technology gaps

Successful technology transfers often result from industrial policies that encourage partnerships between foreign and domestic investors in manufacturing. These policies include attracting FDI with advanced technology, acquiring strategic foreign firms, promoting joint ventures, and encouraging collaboration in routines and teamwork between domestic and foreign enterprises. However, not every partnership yields the same results. For example, ACET research has shown that African countries that partner with OECD member countries see more investment in equity partnerships than those that partner with non-OECD members. Such partnerships also have more direct technology transfer clauses, worker training programs, research and development activities, and international quality certifications.

Three most improved countries (2000-2020)

■ 2000 score ■ Change 2000-2020



Highest score

★ **Morocco**

2020 SCORE
97.2
/100

CHANGE
+57.7
SINCE 2000

Lessons from early transformers

South Korea incentivized corporations to develop new technology and upgrade productive efficiency to compete in the global market for high-tech manufacturing and high-value services. The government supported innovation through the Research, Innovation and Enterprise Plan, which promoted greater collaboration between industry and research institutes. The country also invested heavily in education, especially in STEM fields.

Thailand had a major influx of FDI in electronics and automobiles but limited technological transfer. To seize the opportunity, the country established the Thailand Automotive Institute, a partnership between the automotives sector and the Ministry of Industry, to improve human resource development and technology transfer for Thai-owned suppliers.

Chile's transformation has benefited significantly from technology transfer and investment financing through high FDI inflows. Chile is a good example of a commodity exporter that has experienced robust productivity growth despite an economy less concentrated in manufacturing production.

Examples from Africa

Tunisia launched two major programs that boosted its industrialization and openness to international markets: the Programme de Mise à Niveau upgrading program and the Priority Technological Investment program. These initiatives encouraged the modernization of the industrial sector and the participation of firms in high-tech value chain sectors. The country also reformed its higher education system to support a modern economy, prioritizing technical and vocational skills.