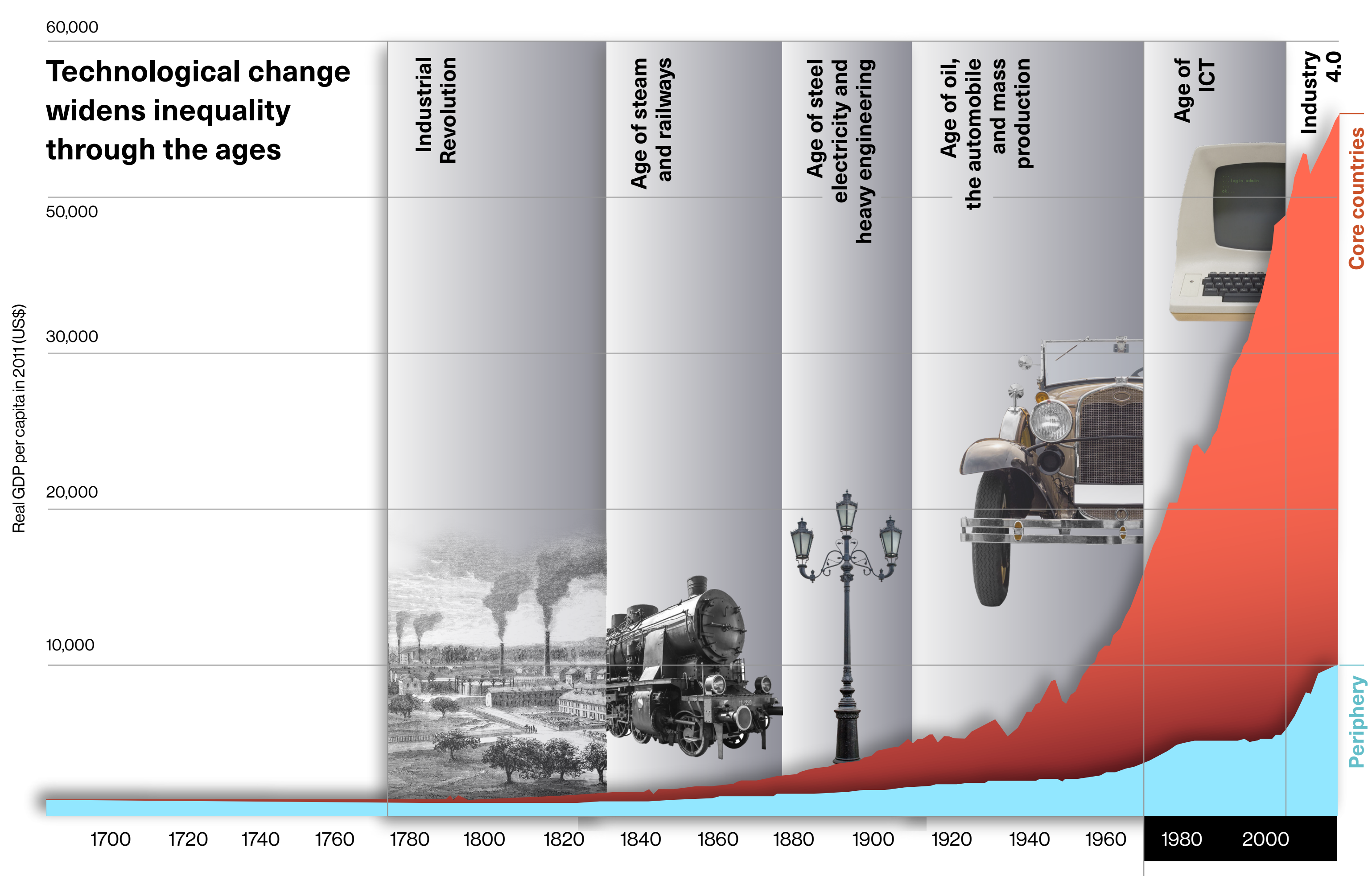
TECHNOLOGY AND INNOVATION REPORT
2021

Catching technological waves

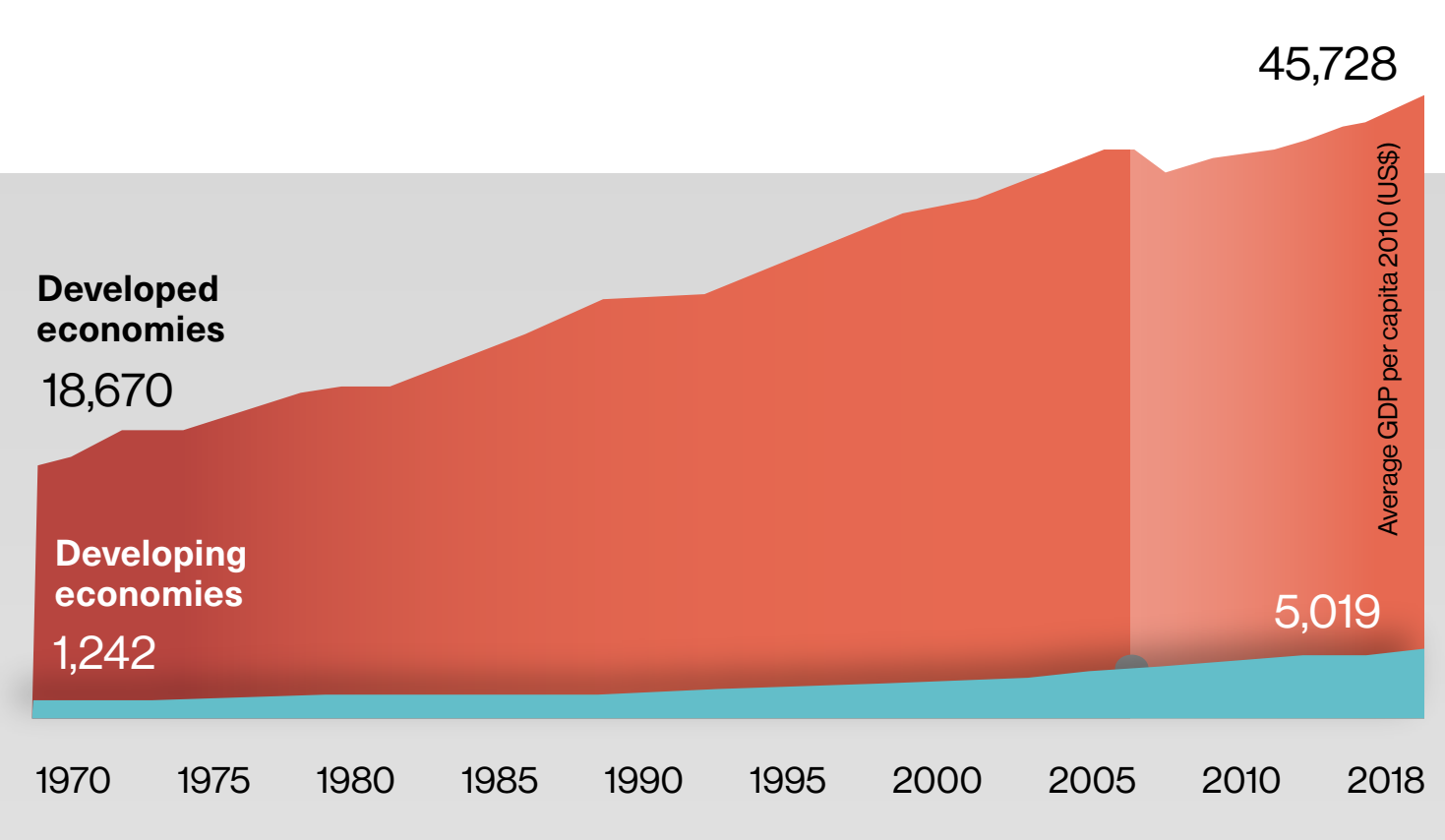
The great divides between countries

During the industrial revolution most people were equally poor and the gaps in per capita income between countries were much smaller. Then with waves of technological change, Western Europe, the United States and few other countries pulled ahead. Most other countries remained on the periphery. Every wave of progress was associated with sharper inequality between countries.

Technological change widens inequality through the ages



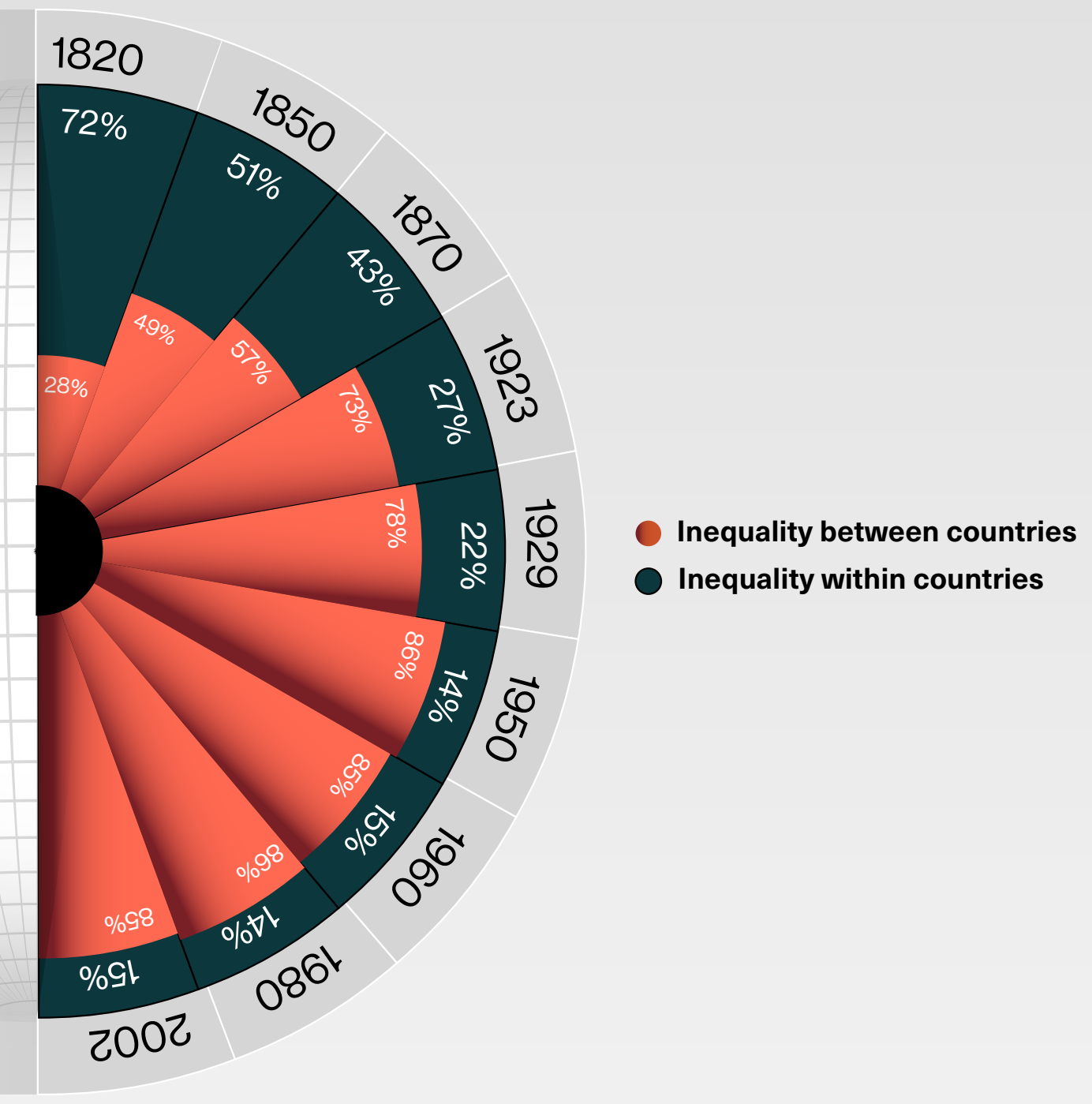
Wealth is highly concentrated, and there are also large disparities in income-earning opportunities, as well as in standards of education and health. These imbalances constrain economic growth and human development while heightening vulnerability, whether to pandemics, economic crises or climate change – and can destabilize societies.



Wide income gaps

In the past 10 to 15 years, global income inequality has decreased, mainly because large developing countries, mostly in Asia and notably China, have grown faster and started to catch up. However, in absolute terms the gap between developed and developing countries has never been higher and continues to increase.

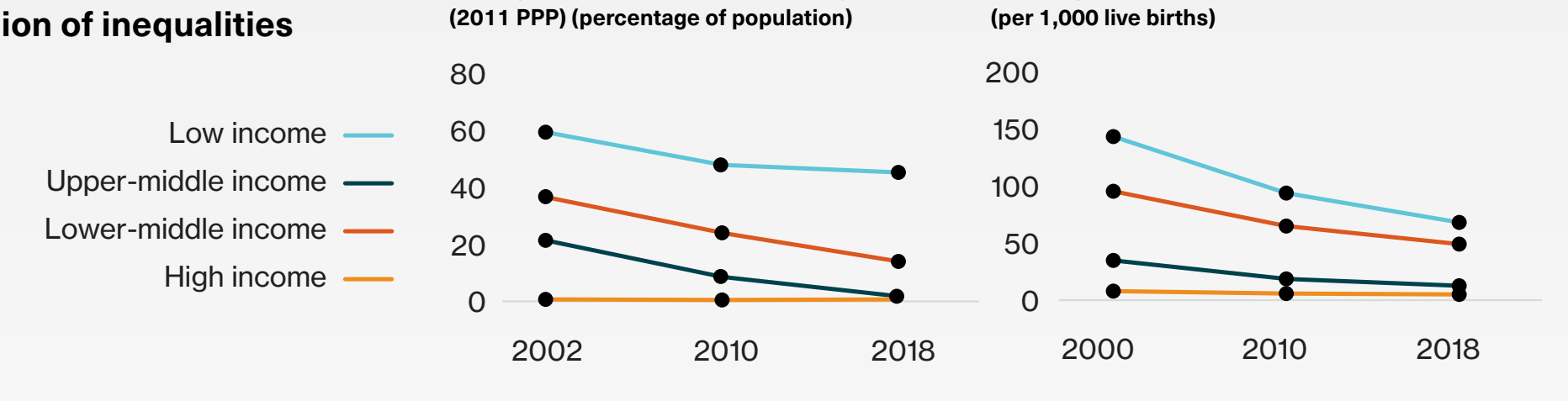
Between 1820 and 2002, the contribution of between-country inequality to global inequality rose from 28% to 85%. In other words, in 1820, global income inequality was driven by class divides within countries. Now it is driven more by the lottery of birthplace: a person born in a poor country suffers a 'citizen penalty'.



Achievements in global equality are threatened by rising disparities within countries. Over the past 40 years, within-country inequality has increased not only in some developed countries such as the United States, and in Europe, but also in developing countries such as China and India.

The outcomes for one generation affect the opportunities for the next – resulting in intergenerational transmission of inequalities

Gaps between country groups, selected SDG indicators



Poverty headcount ratio at $1.90 a day (2011 PPP) (percentage of population)

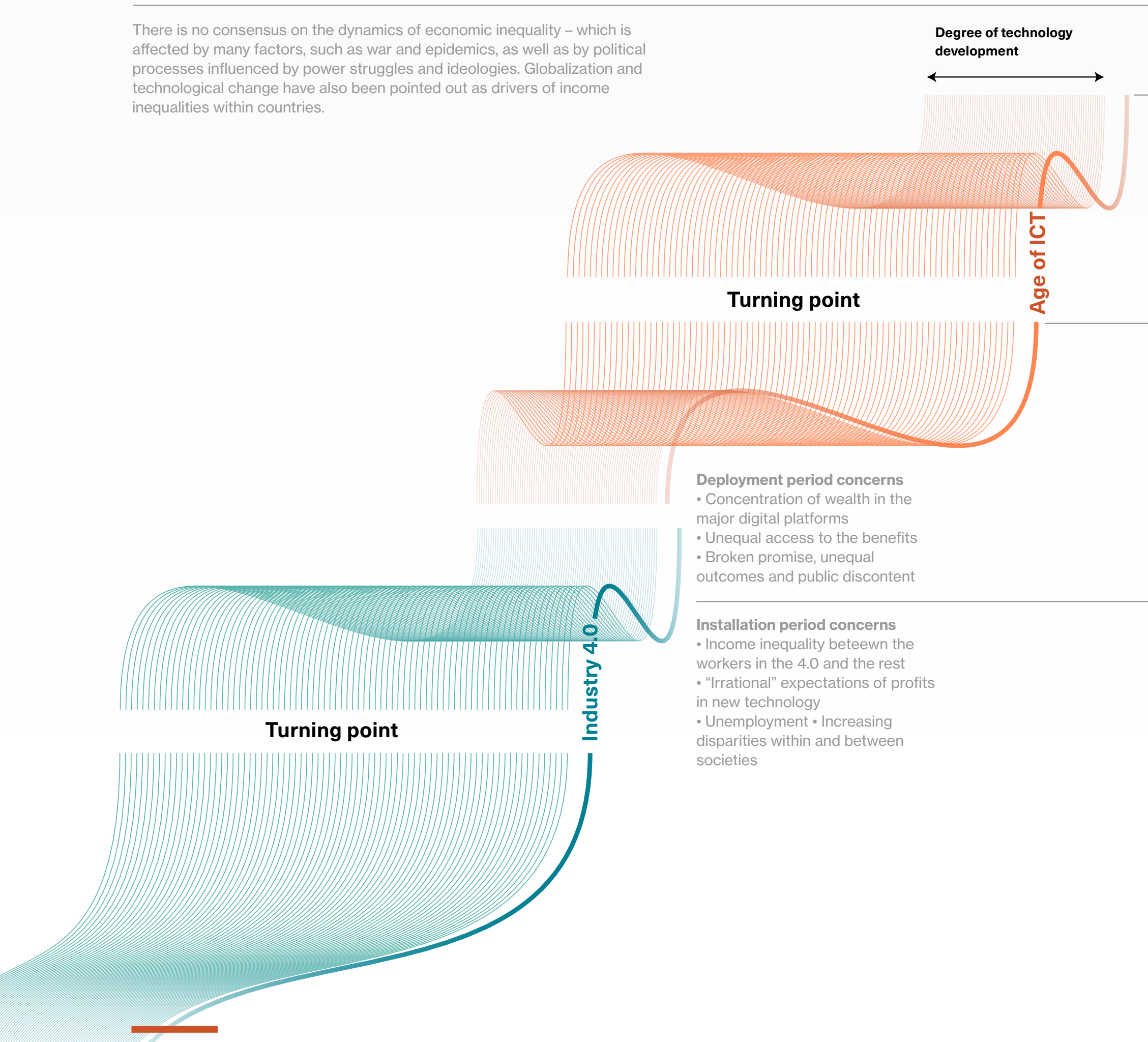
Mortality rate, under-5 (per 1,000 live births)

Two-phase revolutions

Technological changes combined with financial capital create new 'techno-economic paradigms' – the cluster of technologies, products, industries, infrastructure and institutions that characterize a technological revolution.

In the countries at the centre of these new technological waves, the surge can be considered in two phases, both of which affect inequalities.

There is no consensus on the dynamics of economic inequality – which is affected by many factors, such as war and epidemics, as well as by political processes influenced by power struggles and ideologies. Globalization and technological change have also been pointed out as drivers of income inequalities within countries.



Deployment period concerns
- Concentration of wealth in the major digital platforms
- Unequal access to the benefits
- Broken promise, unequal outcomes and public discontent

Installation period concerns
- Income inequality beteewn the workers in the 4.0 and the rest
- "Irrational" expectations of profits in new technology
- Unemployment
- Increasing disparities within and between societies

First is the installation phase as technology is introduced into core industries – widening the gaps between workers in these industries and the rest.

Second is the deployment phase which also tends to be uneven: not everyone gets immediate access to the benefits of progress such as a life-saving treatment, or access to clean water. The result is widening divisions which can lead to public discontent.

At present, the world is reaching the end of the deployment phase of the "Age of ICT" and starting the installation phase of a new paradigm, involving frontier technologies sometimes called, Industry 4.0

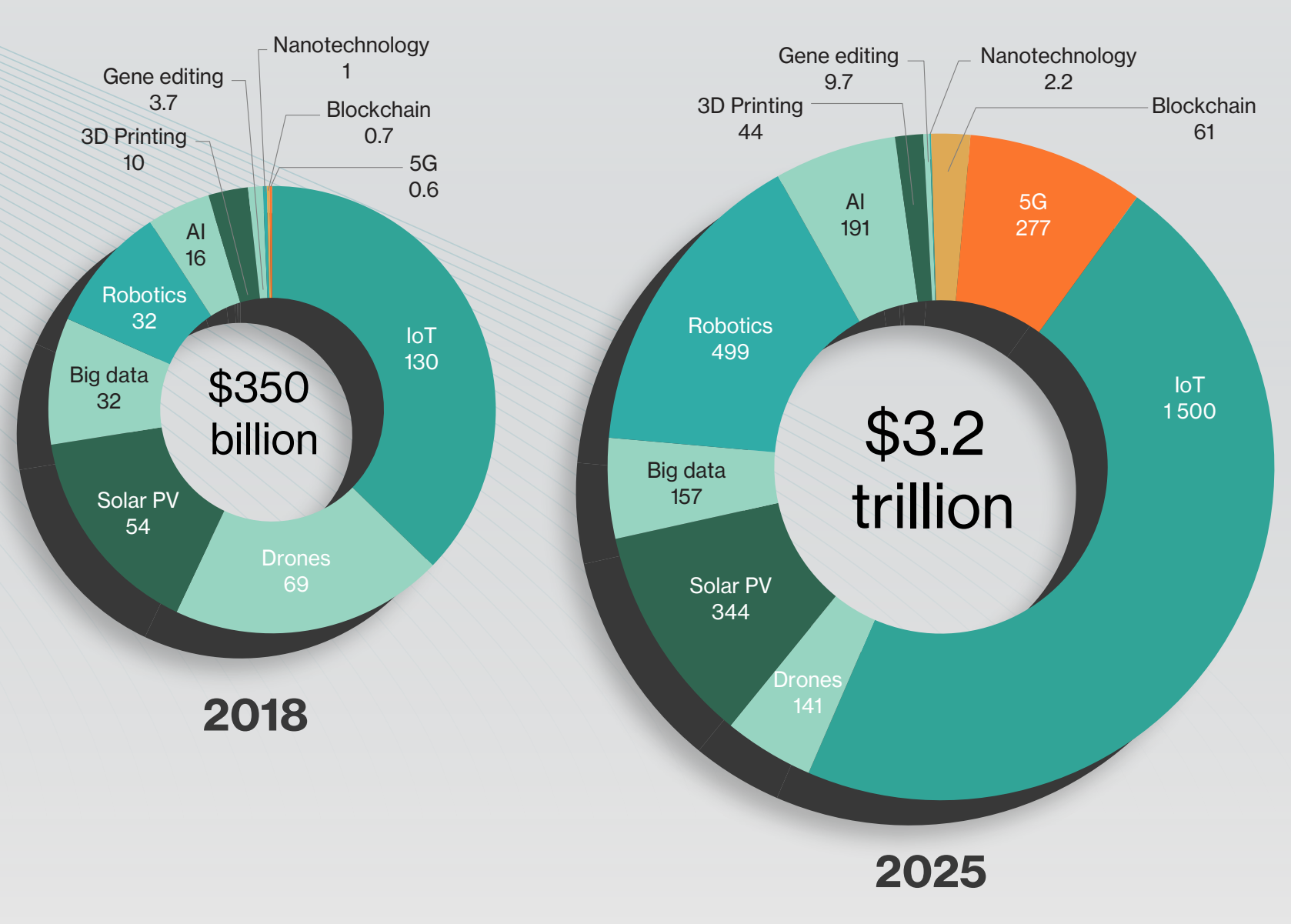
Forging ahead at the digital frontiers

The "frontier technologies" are a group of new technologies that take advantage of digitalization and connectivity which enable them to combine and multiply their impacts. The Technology and Innovation Report 2021 covers 11 such technologies:

AI · IoT · Big data · Blockchain · 3D printing · Robotics · Drones · Gene editing · 5G · Nanotechnology · Solar PV

As a group, these 11 technologies already represent a $350-billion market, which by 2025 could grow to over $3.2 trillion

Many of the major providers of these technologies are from the United States which is home to major cloud computing platforms. China is also a major producer, notably of 5G, drones and solar PV. For each of the technologies, these two countries are also responsible for 30 to 70 per cent of patents and publications.



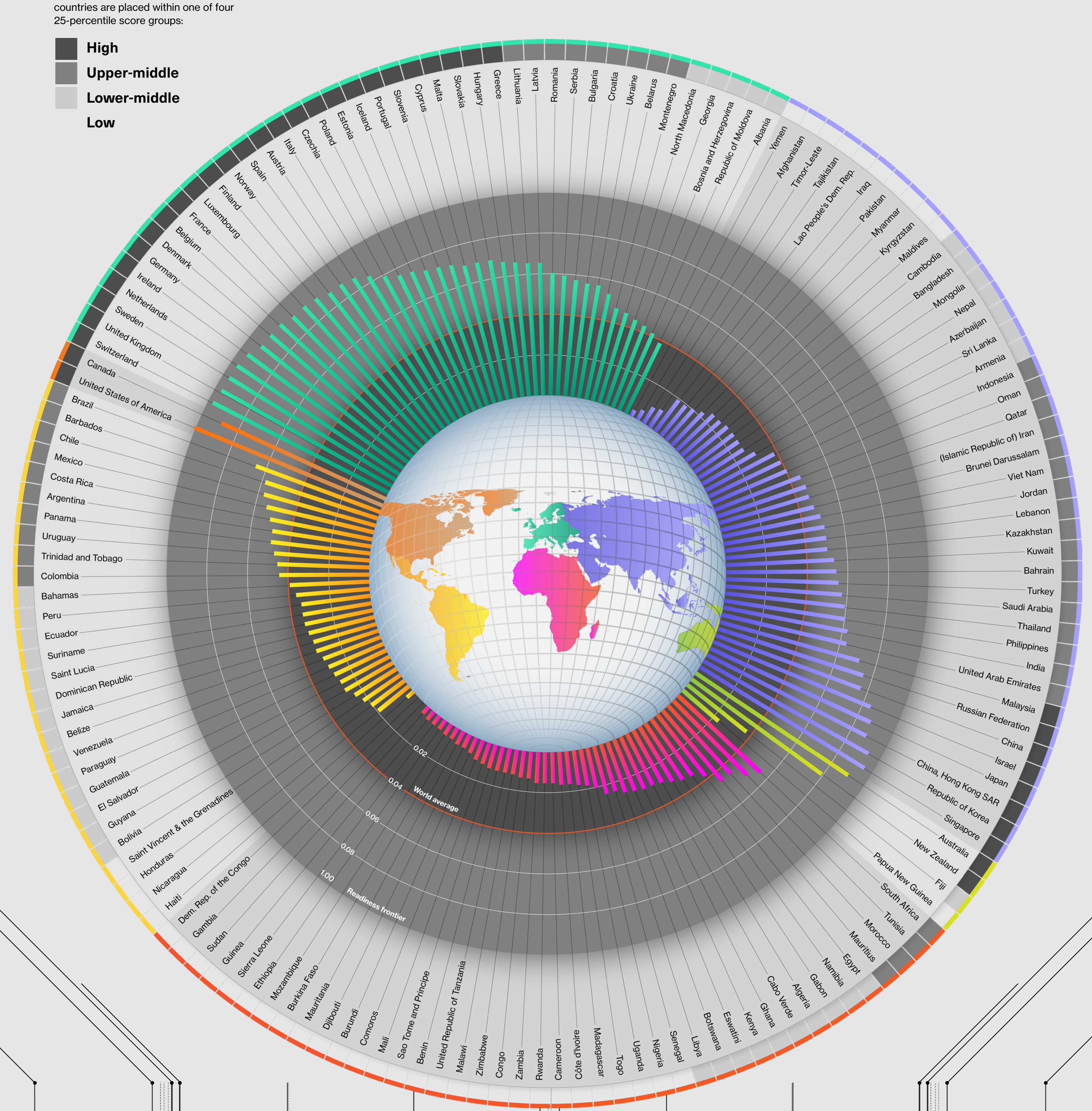
A country readiness index

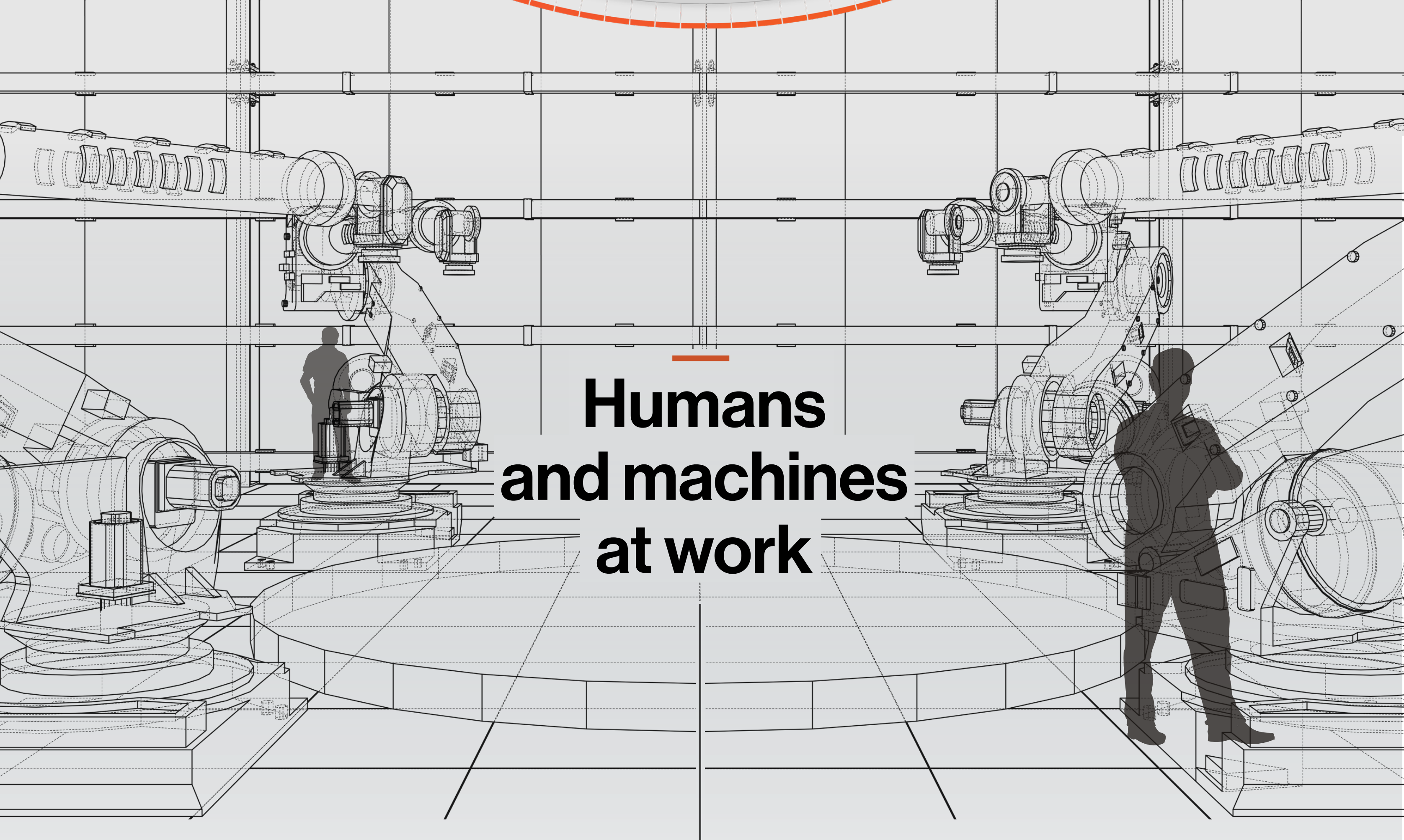
- 🟧 Northern America
- 🟩 Europe
- 🟨 Oceania
- 🟦 Asia
- 🟨 Latin America and the Caribbean
- 🟥 Africa

The index yielded results for 158 countries on a scale of 0 to 1. Based on their rankings, countries are placed within one of four 25-percentile score groups:

- ■ **High**
- ■ **Upper-middle**
- ■ **Lower-middle**
- **Low**

The countries best prepared to equitably use, adopt and adapt these technologies are the United States, Switzerland, the United Kingdom, Sweden, Singapore, the Netherlands and the Republic of Korea.
In general, the economies most ready are in Northern America and Europe while those least ready are in sub-Saharan Africa, and in the developing economies. Developing countries need to work towards universal internet access and ensure that all their citizens have opportunities to learn the skills to be more ready for frontier technologies.





Humans and machines at work

Technological change impacts inequalities through its effect on jobs, wages and profits.

To benefit from frontier technologies, countries need to promote their use, adoption and adaptation, while addressing their potential adverse effects.

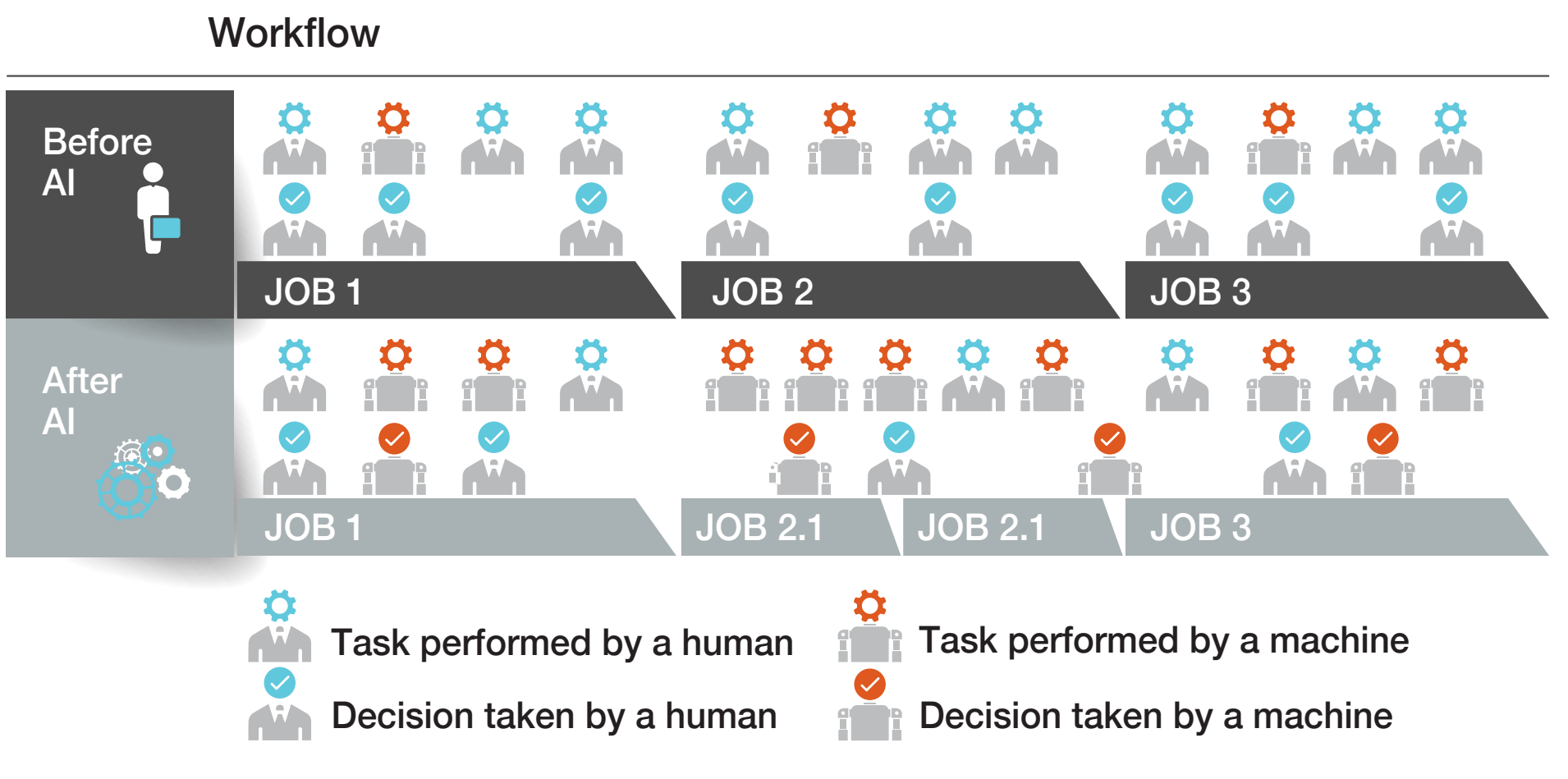
Developing countries face particular challenges:

- **Demographic changes**
- **Existing technological gaps**
- **Low economic diversification**
- **Weak financing mechanism**
- **Stringent intellectual property rights**

Today, major concerns are related to risks of:

- Automation taking jobs in large scale
- Job polarization
- The gig economy and the reduction of labour rights
- The inequalities created by market and profit concentration
- Increase of inequality driven by AI
- Widening technological gaps

Workflow



Innovation with equity

Technological progress is essential for sustainable development but can also perpetuate inequalities or create new ones.

The task for governments is to maximize the potential benefits, while mitigating harmful outcomes.

The basic requirements are effective national governance to guide technological change, international cooperation for strengthening a global framework for STI for development, and vigorous citizen activism to keep the SDGs as central guiding principles.

Key policy areas need special attention:

1) Policymakers should direct technological change towards meeting societal needs and reducing inequalities.
2) Developing countries should adopt frontier technologies while continuing to diversify their production bases by mastering existing technologies.
3) Strengthening social protection systems to provide safety nets to workers who may lose their livelihoods.

International cooperation should:

1) Build stronger national capacities in STI
2) Smooth technology transfer
3) Increase women's participation
4) Improve foresight and technological assessment
5) Promote inclusive debate.

UNITED NATIONS
Geneva, 2021

Source: UNCTAD Technology and Innovation Report 2021