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THE FUTURE OF WORK AND EDUCATION FOR THE DIGITAL AGE

Technological justice: A G20 agenda

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Abstract

Technological justice can play an important role within the international system in resolving global challenges and creating a smart and more egalitarian society. Technological and scientific developments are generating huge opportunities for tackling societal challenges. However, the benefits of technology and innovation are unequally distributed, and they tend to cause economic and political disruptions in our societies that widen inequalities. The authors propose adopting the concept of 'technological justice' within our societies as a new paradigm for the international system to reconcile technological advances with the societal challenges facing our global society, especially poverty and sustainability. They propose a number of policies and measures by which the G-20 could take on a central role in pushing this major contribution onto the global agenda.

Challenge

In the current age of rapid scientific developments, it could be useful to introduce the concept of 'technological justice'. Such a notion aims to reduce social disruptions and inequality within states as well as between developed and developing countries. For the latter, digitalisation and, especially, automation are challenges that must be faced if developing countries are to avoid premature de-industrialisation, expulsion from global value chains of the world economy, and the serious damage to their growth paths that would result.

In this respect, to foster a technological convergence among countries, and to aspire to a smart world society, the G-20 should have a central role connecting the 2030 SDG goals which include innovation, technology, justice and equality. More specifically, the policies to apply in developing countries must pursue aims such as the open diffusion of knowledge, improving digital education, producing innovations for local consumption, the reduction of their energy deficits, and the technological empowerment of women. Implementing such policies in a context of international cooperation would make public-private partnerships a key instrument for funding infrastructures, joint ventures, incubators, start-ups and any other of entity with a significant capacity for technology transfer.

We propose:

- Policies to facilitate global technological convergence
- Develop a societal concept

- Public policies at multiple levels
  - Innovation and technological redistribution
  - Education
  - Technology for local consumption and empowerment of women
  - Energy
  - Taxing rents
  - Protect people's rights and generate new digital ones
- Timeframe and funding of policies

Proposal

1. The concept of technological justice

Major changes and challenges (automation, digitalization, 3D printing, Artificial Intelligence, retail through the web, etc.) are currently underway and, in the years ahead, more change will come from technological and scientific developments. Technology –digital, mechanical and biological (the importance of the latter has grown with the emergence of gene editing)– is creating huge opportunities. The role that the new connectivity (via mobile phones) is currently playing in Africa's development is one example. In Kenya and Tanzania, for instance, "mpesa" is a mobile-money service that people use very widely, by loading literally money in their cell phones, like airtime, and then use it. But technology can also generate major disruptions. It could also lead to greater inequalities –of a new type– within and between societies. If gaps emerge in access to technology –crucial for development and essential for participation in global value chains–, the technology itself and associated opportunities will be highly unequal in their effects. In the case of developing countries, and in particular in Africa, attention should also be paid not only to the digital divide -which feeds in the concept of technological justice- but also of the gender digital divide, that has to be overcome in this sense of justice (Chisiza 2017).

There is a dialectic relationship between technology and society: technology is both part of the solution to societal challenges and part of the problem, and this deepens social inequalities. The concept of technological justice can reconcile these two faces, connecting technology, a critical factor in human development, with our aspirations for social justice and greater equality between economies.

The Sustainable Development Goals (SDG) Agenda mentions inclusive and equitable quality education and lifelong learning (Goal 4), innovation and

technology (Goal 9), but does not link it to justice and equality (Goal 10). They should, however, be connected: in that endeavour, the G20 could have a central role.

We propose to develop the concept of 'technological justice', along with relevant policies. Typically, such concept has been employed to refer to domestic inequalities and internal gaps within societies. We intend to inject the concept with the international dimension and use it to reconcile technological advances and aspirations with greater social justice and equality between societies. We could define it as 'a situation in which technologies don't create new social gaps and deficits, but on the contrary lead to a smart world society, especially as far as the solution of major challenges like poverty and sustainability is concerned', even if such a status quo would be very difficult to attain.

'The concept of technological justice requires a rethinking of how –both in the developing and the developed world– to encourage and nurture technological innovation that has social value and is environmentally sustainable'.[1]

The Hamburg G20 Final Communiqué aimed to 'bridge digital divides along multiple dimensions, including income, age, geography and gender', and to 'ensure that all our citizens are digitally connected by 2025', emphasizing in particular the related 'infrastructure development in low-income countries in that regard'.

Technological justice could be part of the G20 goals; it is closely related to the 2030 Agenda to which the G20 aspires to connect. Even if there is no specific goal for it, as we say, it could connect goals 9 and 10 of the SDGs. The G20 could promote policies that could contribute to the setting of this connection.

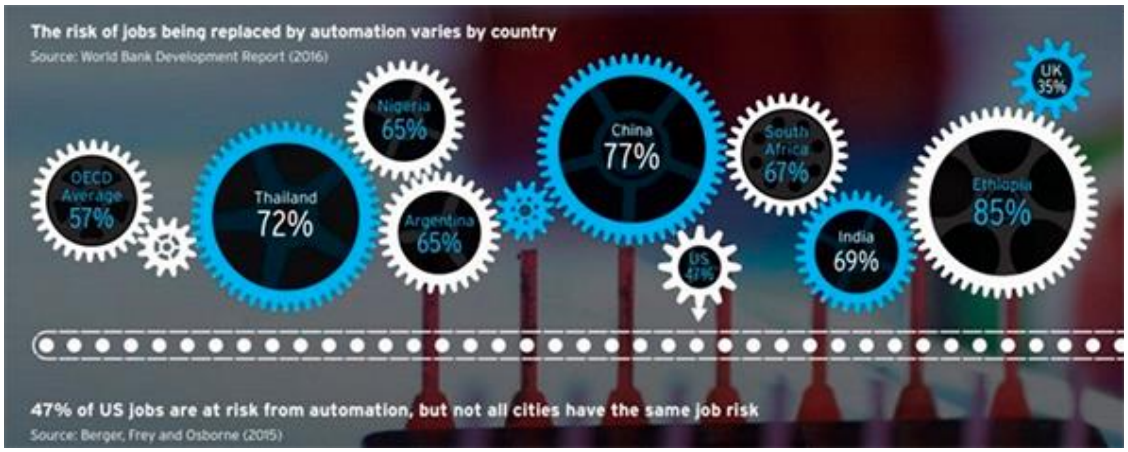
2. To cope with the greater impact of automation on developing economies is the challenge

An UNCTAD study comes to the conclusion that automation could destroy two thirds of the jobs in the developing world. Overall in the world in particular in the following sectors: automotive, electrical and electronics, metal, chemical and plastics and food.[2] But in its report on global investment, UNCTAD recommends that developing countries invest in digital technologies, on the assumption that to fail to do so would leave them further behind.[3] According to the Robotlution report from Intal-IDB,[4] automation could affect 1.1 billion people in the world. With respect to one

key region, the report claims that Latin America is the third region (after China and ASEAN) to lose the most from automation. For example, in Argentina automation may affect 71% of people educated only to the primary or secondary school levels, and 'only' 40% of university graduates (INTAL/BID 2017).

Automation could lead the developing world into a low or middle-income trap, and even, according to economist Dani Rodrik, to a 'premature de-industrialisation' in many of those countries, in favour of the developed world, particularly of its most technologically advanced countries.[5]

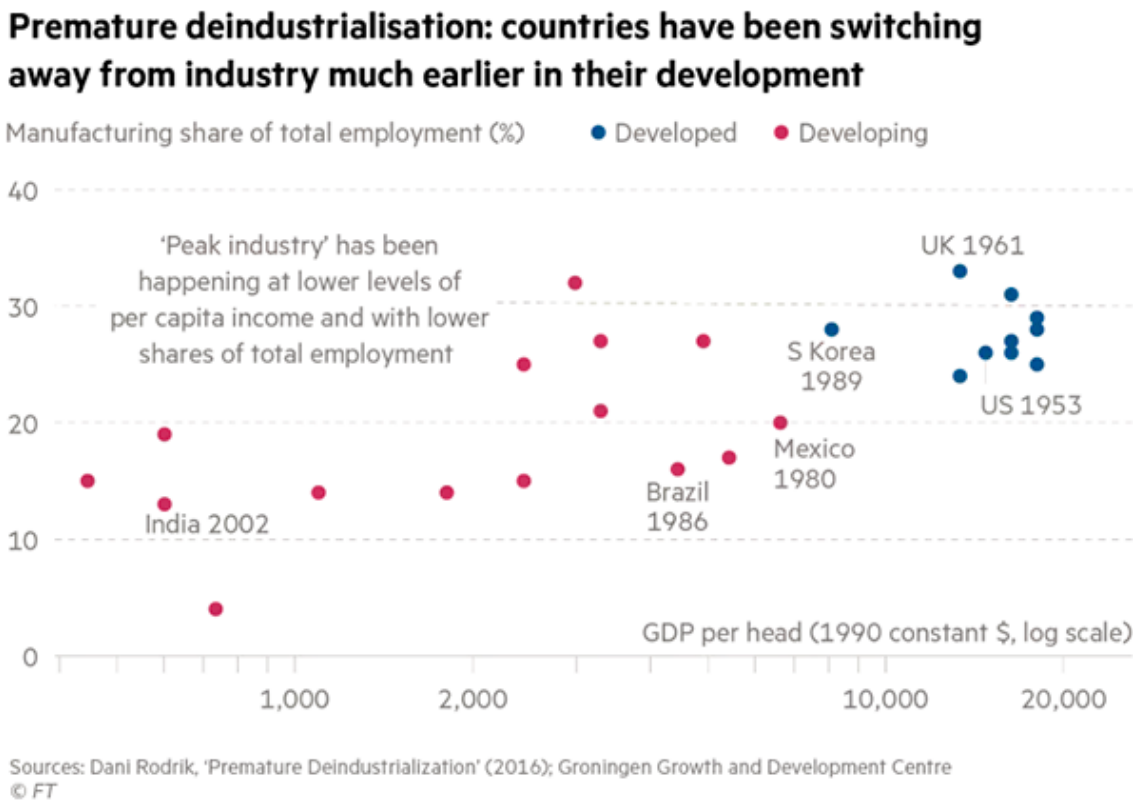
Figure 1. The risk of jobs being replaced by automation varies by country



These forecasts coincide with others –from Holmes & Osborne, 2013– in that the developing world will lose its comparative advantages as jobs are replaced by robots and 3D printing in next 20 years.[6] This is still not fully the case because of the abundance of cheap labour and because automation is still expensive in many aspects beyond the automotive and electronics sectors.

The International Labour Organization (ILO) foresees the need to generate 40 million jobs a year just to cope with population growth, and more than 300 million a year to achieve the UN Sustainable Development Goals by 2030. These goals might be threatened by the impact of digitalisation and automation.

Figure 2. Premature de industrialisation: countries have been switching away from industry much earlier in their development

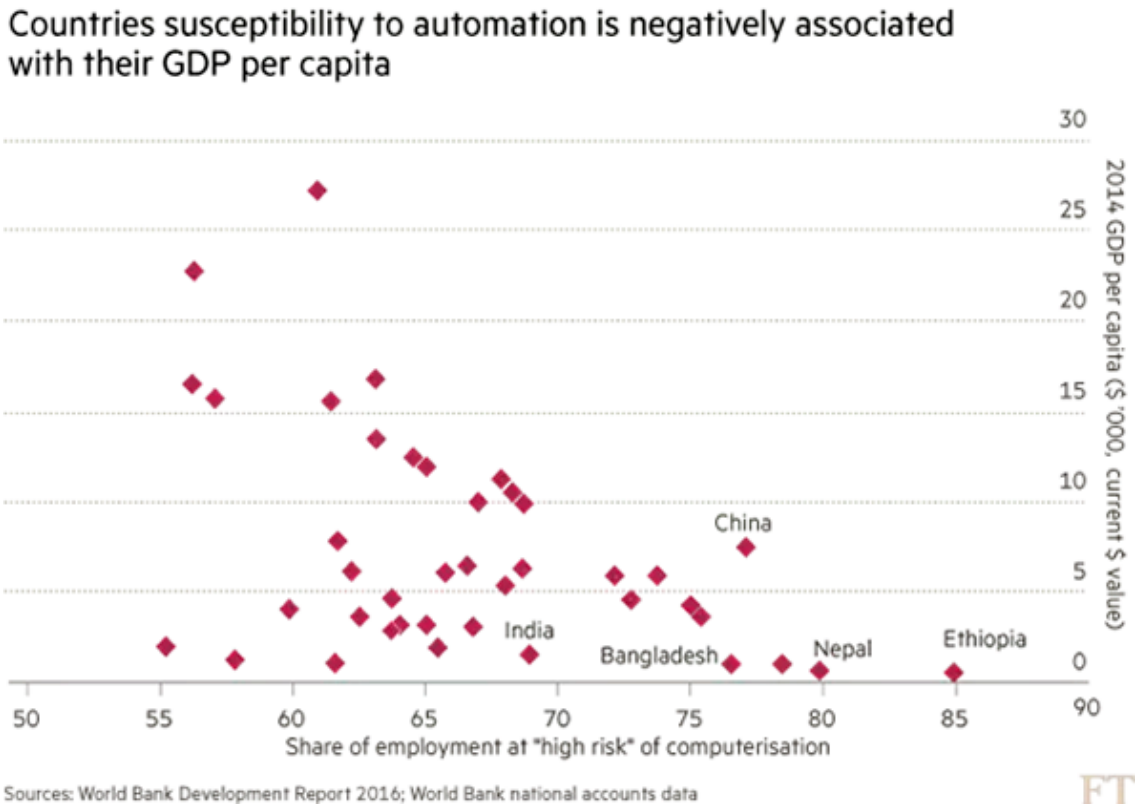


Research by the United Nations Industrial Development Organization (UNIDO) confirms that the share of manufacturing and manufacturing jobs in the average developing economy has fallen.[8] But for developing economies as a whole, the share of manufacturing and manufacturing jobs is at a record high level. Nonetheless, this statistical reality is caused mainly by China. Without China, the problem stands. And China will be greatly affected by technological automation, a trend which it is indeed fostering with strategies like 'Made in China 2025'.[9]

While the debate on whether services can become a new growth-enhancing sector continues, research indicates that premature deindustrialization is prevalent in developing countries and that 'manufacturing no longer plays the role of the engine of growth in developing countries'.

Furthermore, developing economies could suffer from technological backwardness, also derived from a brain drain towards the developed world..

Figure 3. Countries' susceptibility to automation is negatively associated with their GDP per capita



Other studies challenge these conclusions.[10] For instance, in the case of Africa (and in comparison with previous industrial revolutions),,[11] 11 it is argued that African economies are now well positioned to take advantage of the numerous opportunities to drive inclusive prosperity that the 4th industrial revolution presents. In the 1st Industrial revolution, Africa was dealing with slavery; the 2nd Industrial revolution coincided with colonization; and during the 3rd Industrial revolution, Africa was focused on decolonization and nation building. The Internet could add US$300 billion to Africa's GDP by 2025 if it continues to grow at the same pace as has mobile telephony.[12] There is a need to invest more in R&D: today, Africa spends only 0.1% of its GDP on R&D, with the more technologically advanced countries like Kenya spending only 1% (compared with 3%-4% in most developed economies).

The size of cities also matters, as far as technology is concerned.[13] Small cities in the developed world are at risk of job displacement from automation. This conclusion, based on the case of the US, could also apply to the developing world, particularly in Africa, where societies are experiencing simultaneous industrial and urban revolutions. The growth in the size of the cities favours 'technologization'.

It could also favour the important task of insertion into the global value chains of the economy. This requires productive and export capacity to be expanded by improving national supply networks, human capital and available infrastructures.[14]

According to the McKinsey Global Institute analysis of the 'haves and have-mores' in digital America, industries that adopt more technology quickly are more profitable. Sectors that create the most jobs –such as care, education and government– are slower than the tech and financial sectors in terms of incorporating digital technology into their business models. If that applies to the US, then even more so within the context of developing economies.

3. Policies to facilitate global technological convergence

As explained above, the SDGs include innovation and technology (goal 9) but do not connect them with justice and equality (goal 10). The Hamburg G20 Summit agreed to:[15]

- Promote digital literacy and digital skills in all forms of education and life-long learning.
- Push for the role of SMEs in this area.
- Promote effective cooperation of all stakeholders and encourage the development and use of market- and industry-led international standards for digitalised production, products and services that are based on the principles of openness, transparency and consensus, so that standards do not act as barriers to trade, competition or innovation.

4. Public policies at multiple levels

What would the consequences be -in terms of public policies- of advancing technological justice? (1) Social policies: to raise efficiency and inclusiveness in the welfare system through technology; (2) fiscal policies: to give incentives to technologies that, while not profitable in competitive market conditions, can provide redistributive benefits (education, health, work, etc.); (3) development aid policies that incorporate technology; and (4)

R&D policies. Below is a list of potentially useful public policy directions to consider.
Develop a societal concept

- A concept of a Global Society 5.0 should be developed for a super-smart global society. Solving social issues will 'create future'. This concept should include the overcoming of the digital divide and especially of the gender digital divide.

Innovation and technological redistribution:

- There is a need for a renewed focus on reform of national and international innovation systems and R&D policies, in an attempt to create a new consensus on how public-private partnerships can contribute to a more open and sustainable use of technology.
- More 'open source' access for technologies should be sought. It is essential to assure an open diffusion of knowledge, innovations and technologies in the design of development policies.
- Development policies should support redistributive systems and incentives for successful application of new technologies.
- Competition must be ensured to push for innovation.
- Research and development should aspire to cover the basic needs of humanity.
- More attention should be paid to possible major advances (like CRISPR) in biotechnology and genetic manipulation (which will both fight diseases and generate new inequalities).
- Legal frameworks should be promoted to enable innovation and the use of new technologies.

Education:

- Improve the education of the left-behind countries through global schemes (a global technological Erasmus?). Promote STEM studies and critical thinking in developing counties and expose their school children at an early age to digital education. This could be a way to link technological justice to SGG 4 on Education.
- Invest in education to 'upskill' and 'reskill' the workforces to benefit from the rise of robots, rather than being a victim of this trend.
- Implement the Africa 2.0 Manifesto (endorsed by 43 Ministers of Education) that embraces creative and innovative approaches to education.[17]

- However, education cannot be the solution to everything; job creation policies must also be pursued.

Technology for local consumption and empowerment of women:

- Produce technology for local consumption in developing countries (especially in Africa).

- Design policies for the technological empowerment of women (a T20 Policy Brief was released on this subject).[18]

Energy:

- Close the energy deficit through exploitation of on-grid, off-grid and mini-grid technologies.

Taxing rents:

- Proposals like taxes on robots or universal basic income are not workable at a global level. Taxing rents seems more appropriate.
- Study new ways of securing tax incomes.

Protect people:

- The aim should be 'to protect people, not jobs' (Emmanuel Macron). That is to protect their livelihoods, even if the concept of work and employment changes.

All those policies with a holistic approach would constitute an agenda for technological justice.

5. Timeframe and funding of policies

As we have argued, technological justice should be linked to the SDG Agenda. As a result, the timeframe for proposals should coincide with the 2030 horizon. Strategic funding instruments for the diffusion of technology improvements are essential. Funding instruments should be based on public-private partnerships with different purposes and clustered by their priorities in strategic sectors for achieving justice goals, especially for those areas with an impact on welfare (Health and Education) or with a significant weight in production patterns (Industry, Agriculture, Transport and Energy).

Investments in technology and research infrastructure with effects on capacity building should be supported by international cooperation to foster developments in specific fields (material science, ICT, nanotechnology) or in a specific area of generic research (bio-technology, computational genomics). Another alternative is to develop national infrastructures open to an international research area.

Joint ventures between public agencies, technology centers and industries should contribute to address societal priorities promoting specific technologies. The public sector could act as the risk taker or entrepreneurial innovator as it has been with respect to the recent developments in ICT (Internet, GPS, mobile, etc). A scheme like the EU's D4D program should also be tried at a more global level.

Finally, funding should target support for entities involved in technology transfer (incubators, start-ups, university technology centres, etc), reducing the constraints on access to the elicitation of knowledge and technology diffusion. Again, clusterisation and smart specialization are necessary for an efficient distribution of talent and resources.

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