

Challenges for Science and Technology Policy in Developing Countries

Glauco Arbix

Dept. of Sociology

Institute of Advanced Studies

Center for Artificial Intelligence-USP-IBM

Tinker Professor, University of Wisconsin-Madison

University of São Paulo

Class 1



"Os cientistas dizem
que somos feitos de
átomos, mas um
passarinho me contou
que somos feitos de
história"

Eduardo Galeano

What is the Universe?

- **Approximations help to know the universe. And they also suggest that there are several ways to look at developing countries.**

- **I present five that guide my course**

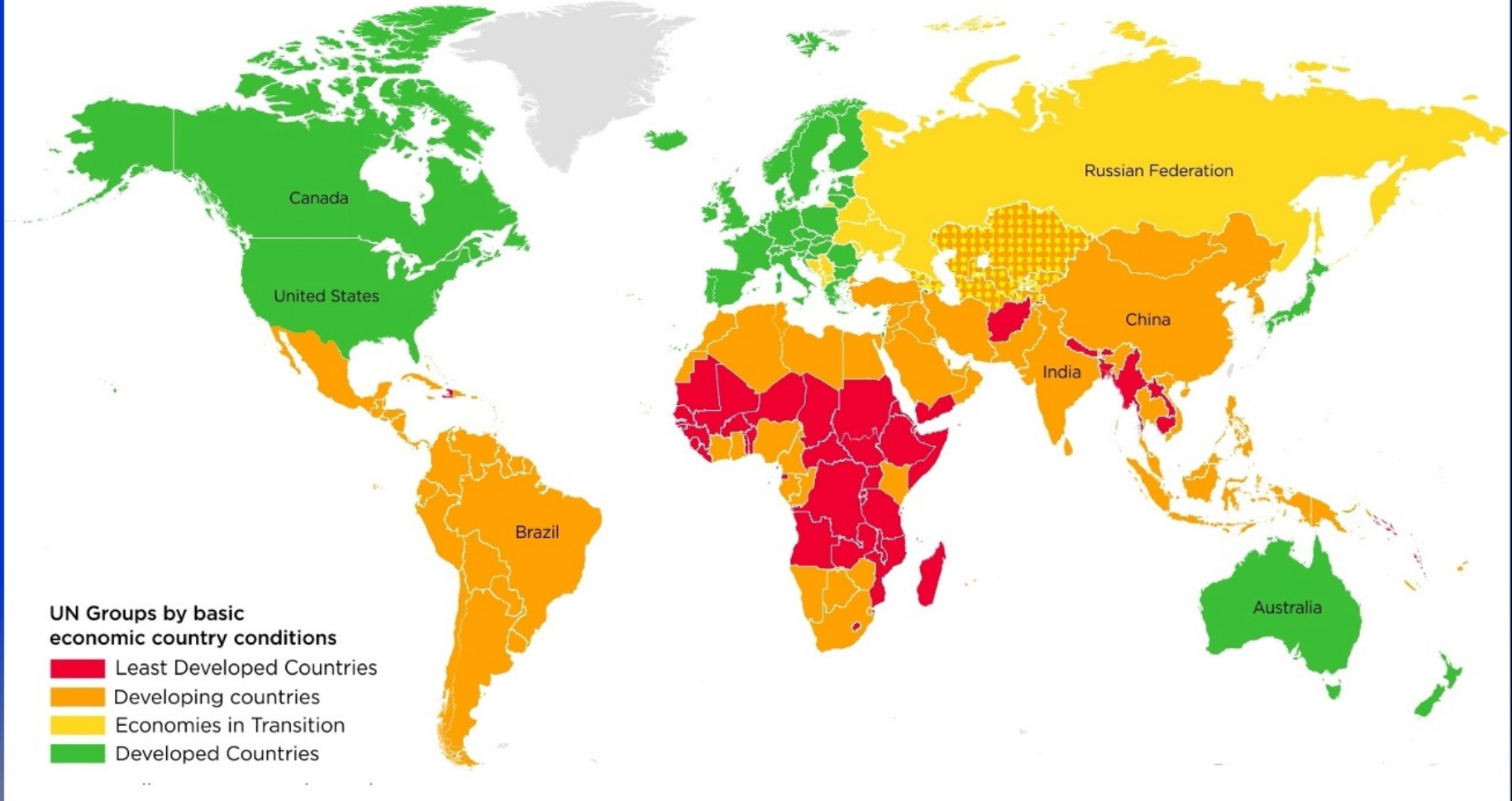


1

Disparities between countries

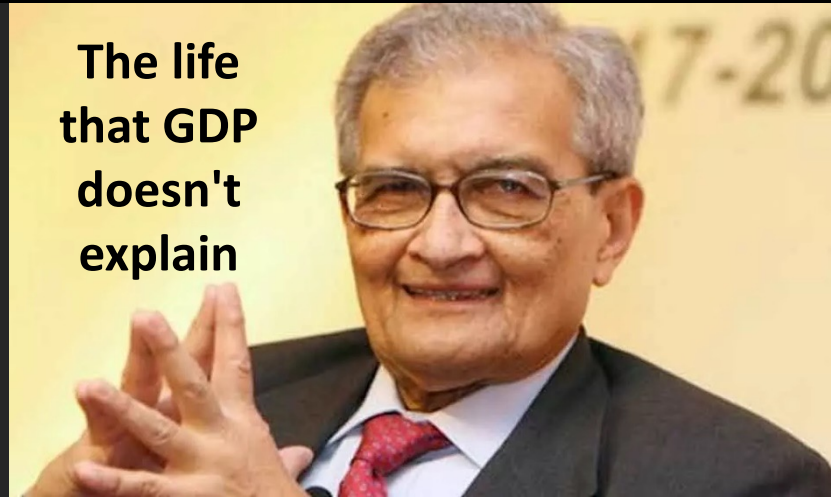
Classification by per capita gross national income (GNI)

Countries Grouped by United Nations



The HDI was developed by the UN to measure human development and is quantified by looking at a country's human development, such as education, health, and life expectancy. HDI is set on a scale from 0 to 1. The most developed countries have a score above 0.80.

The life that GDP doesn't explain



“Development can be seen as a process of expanding the real freedoms that people enjoy... focusing particularly on people’s capability to choose the lives they have reason to value.”

Sen, 1999

HDI Classification

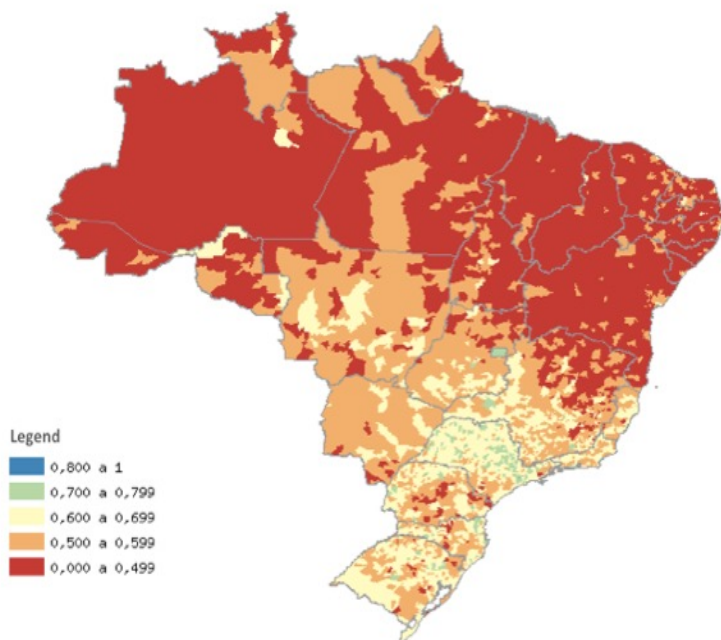
- HDI of less than 0.550: low human development
- From 0.550–0.699: medium human development
- 0.700–0.799 for high human development
- 0.800 or greater for very high human development

<https://hdr.undp.org/data-center/human-development-index - /indicies/HDI>

In 2000, half of the Brazilian cities had an HDI below 0.50

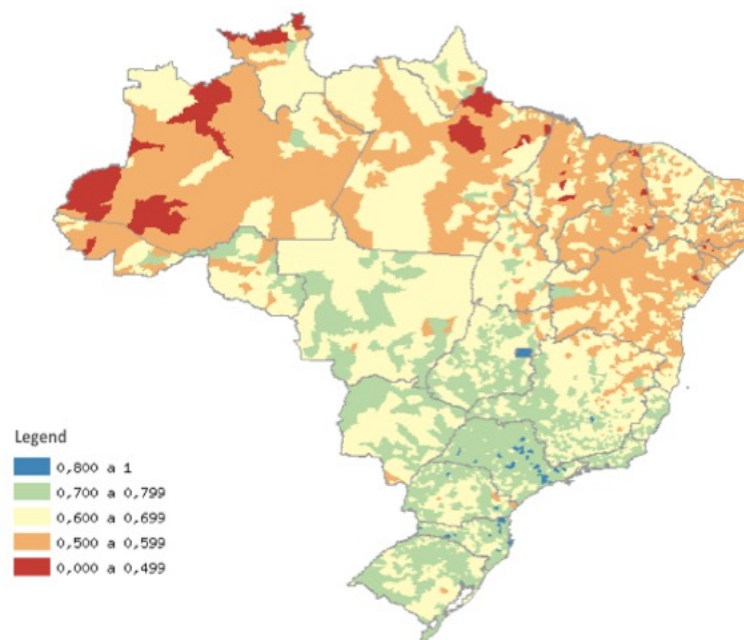
In 2010, only 1% of cities had an HDI lower than 0.50

Brazilian progress: HDI by municipality
Brazil: 2000



Source: SAE/PR, based on Demographic Census of 2000 and 2010 and HDI as calculated by the UNDP, Human Development Report.

Brazilian progress: HDI by municipality
Brazil: 2010



Source: SAE/PR, based on Demographic Census of 2000 and 2010 and HDI as calculated by the UNDP, Human Development Report.

2

Poverty & Inequality

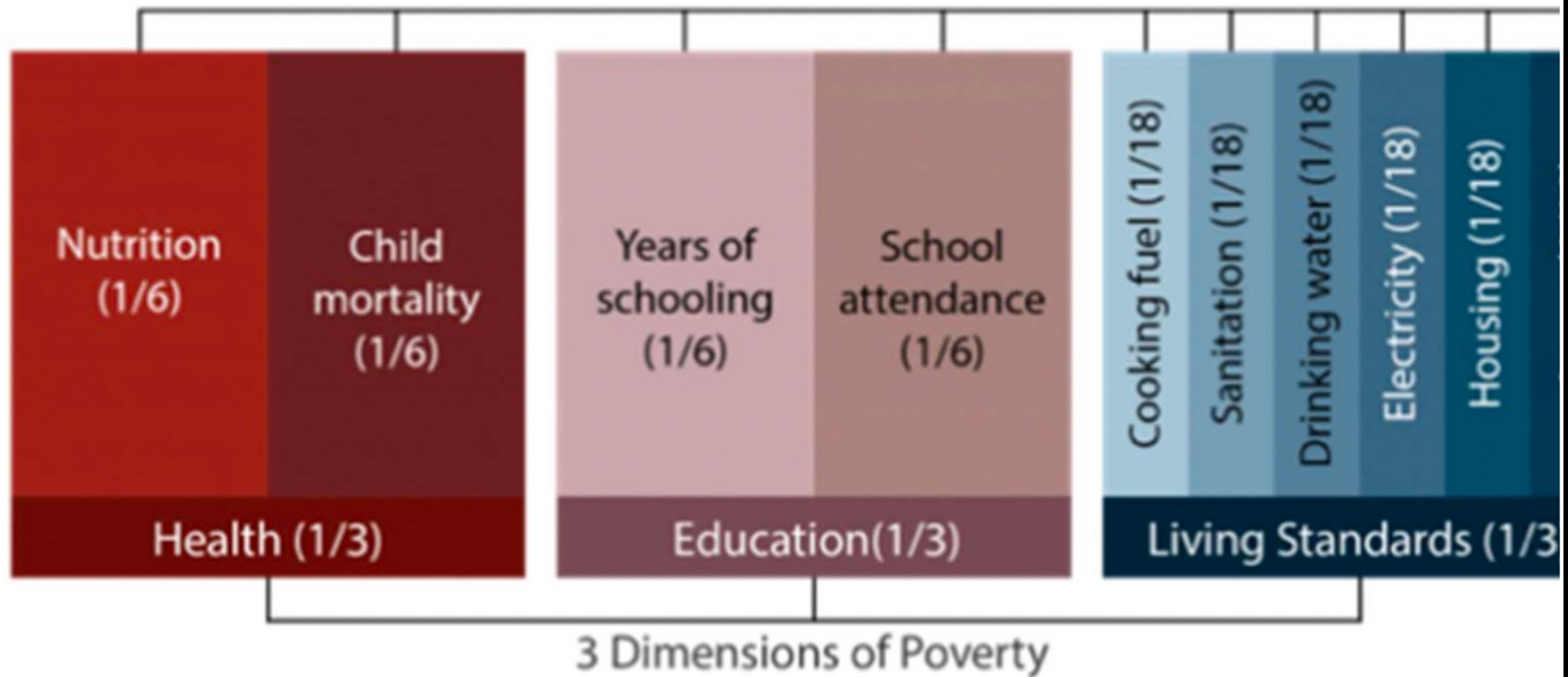
Political Economy of Inequality

- Inequality affects developed (US, UK and Germany), late developed (Korea), middle-income (Brazil and South Africa) and poor countries (Bolivia, Botswana) as well
- Inequality is a multidimensional problem. Distributive policy instruments vary among nations, but the majority of developing countries does not have the fiscal space to insist on permanent compensatory poverty-alleviation type measures such as targeted cash transfers or basic income benefits

To avoid ups and downs and master inequality, it takes more politics than economics

Multidimensional poverty and inequality Index

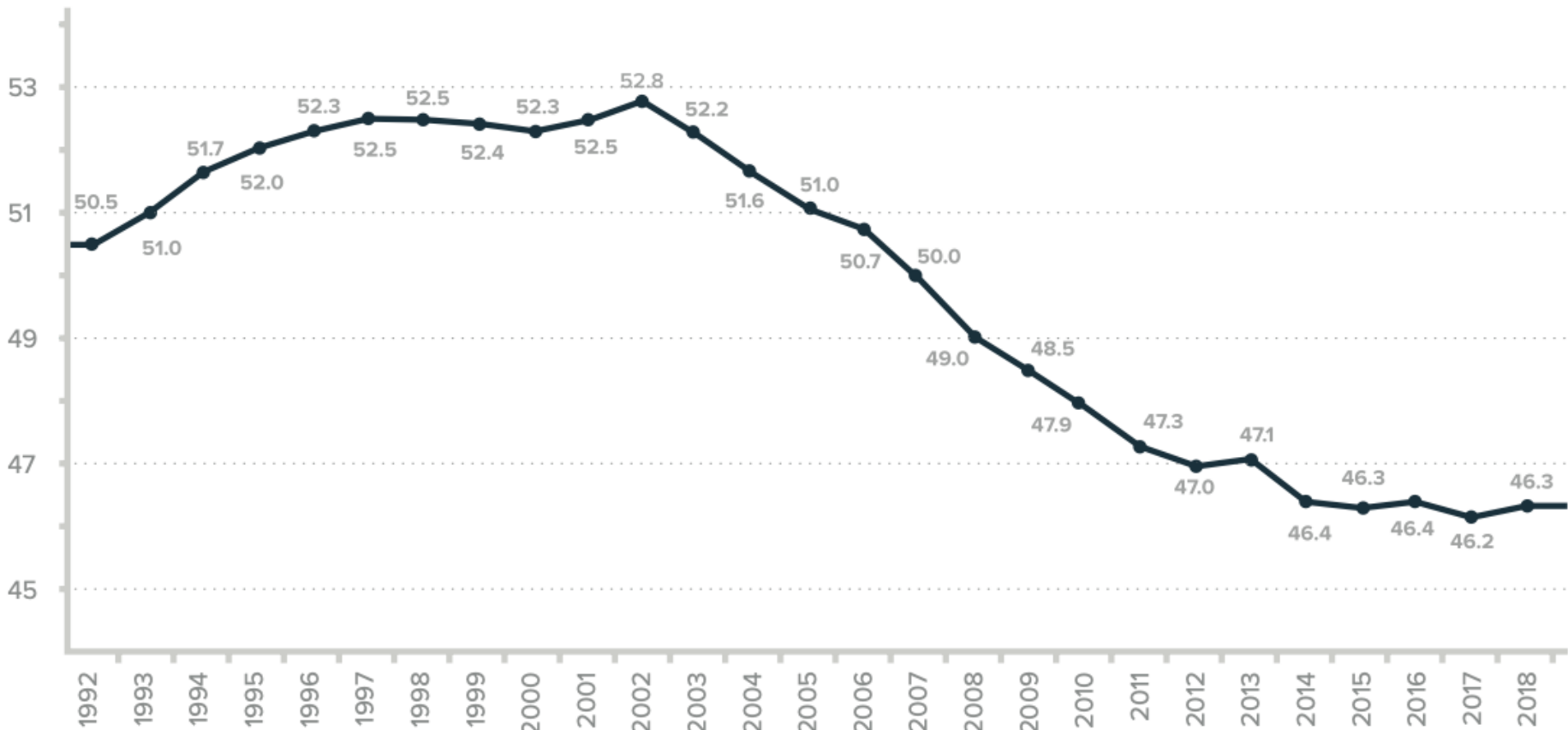
Basic dimensions



© Oxford Poverty and Human Development Initiative (OPHI)

Taming inequality requires a broader agenda, including measures in other policy domains, such as human rights, household living conditions and open governance

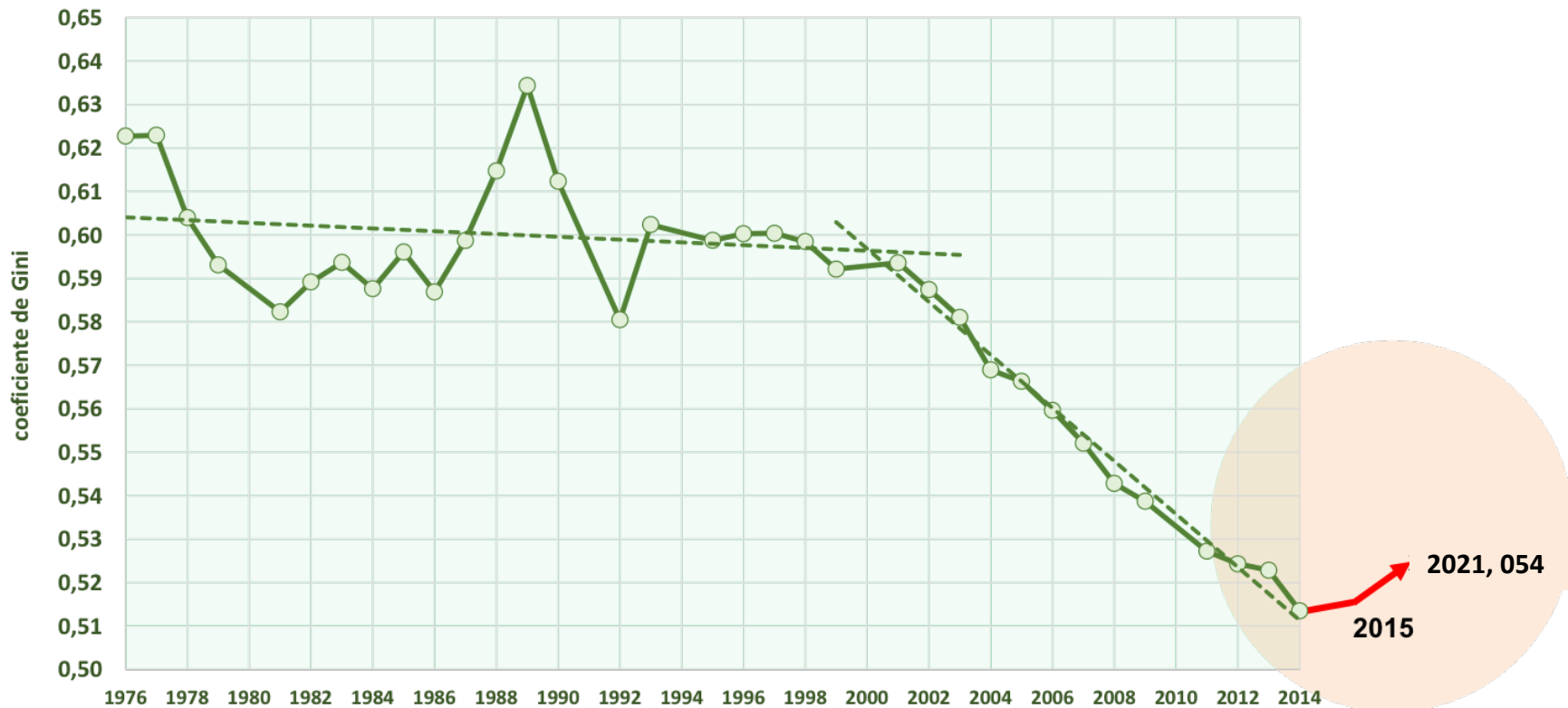
Income inequality in Latin America. Gini coefficient, 1992-2018



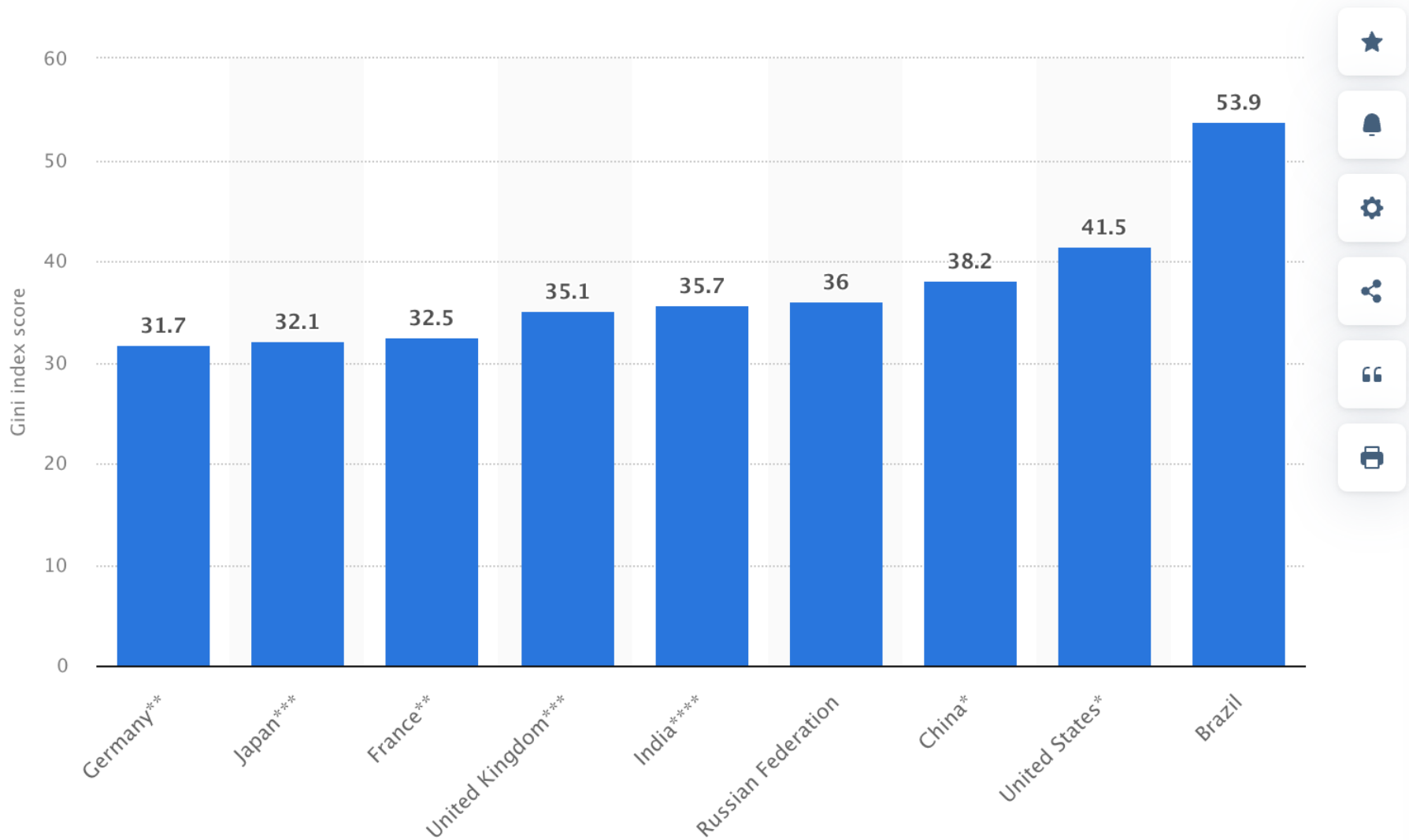
01 UNDP LAC, Working Paper Series. The Changing Picture of Inequality in LA. March 2021

Brazil: a Seesaw Again?

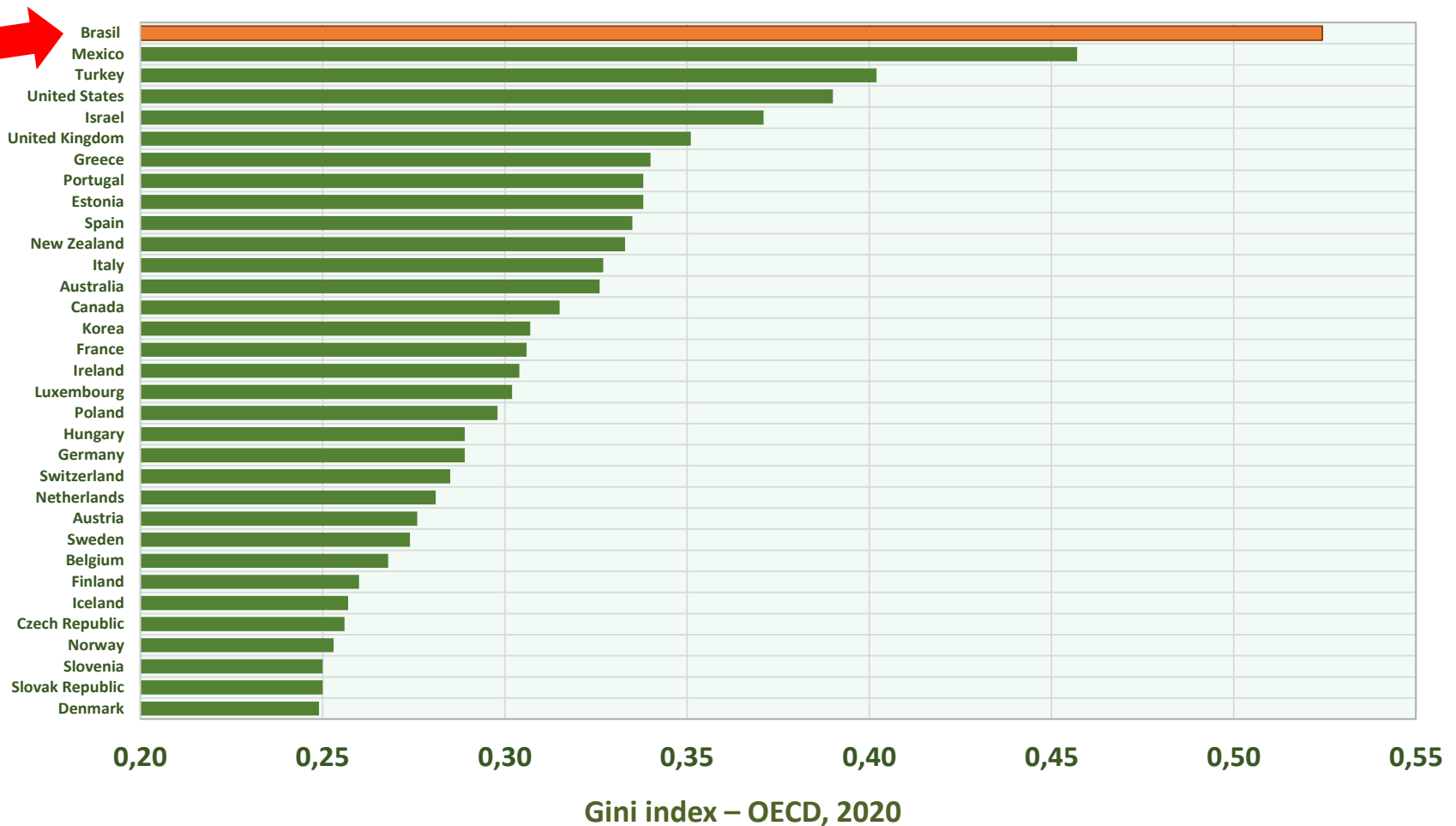
1976 - 2021



Gini index in key developed and emerging economies in 2020



Income Inequality: OECD countries and Brazil (2020)



The pandemic has disorganized the labor market and widened LA inequalities.

But the pandemic only exacerbated a reality that was no longer good

3

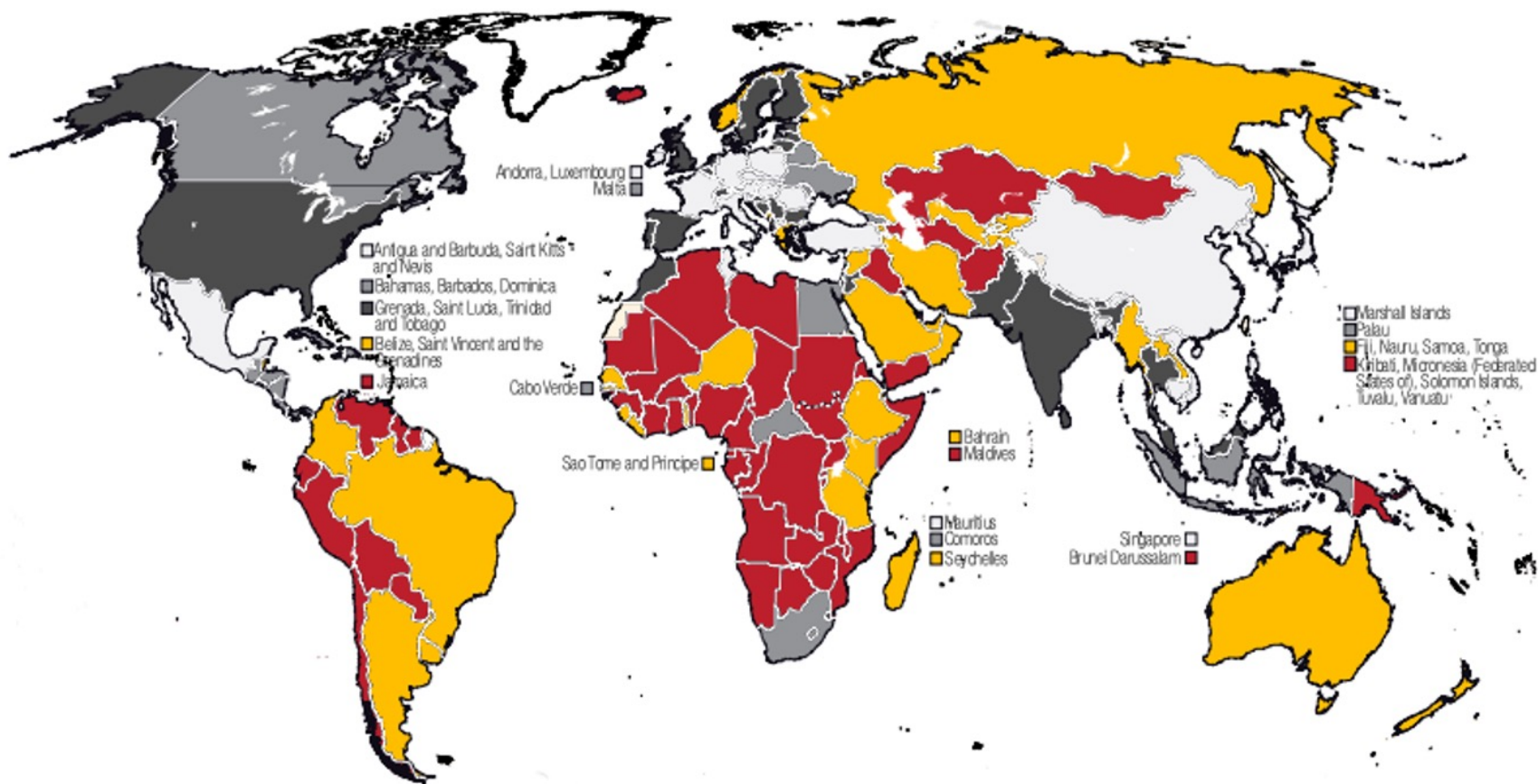
Productivity

Productivity lies at the root of the economy's underperformance

Understanding the drivers and barriers to the adoption and development of technology is critical to designing policies that facilitate productivity growth

Level of commodity export dependence 2018-2019

Source: UNCTAD, based on UNCTADstat database



Commodity exports as share of merchandise exports (percentage), 2018-2019

0-20
 20-40
 40-60
 60-80
 80-100
 Not member State of UNCTAD

Table 1.**Countries that were commodity dependent in both 2008–2009 and 2018–2019**

Algeria	Guinea-Bissau	Paraguay
Angola	Guyana	Peru
Argentina	Iceland	Qatar
Armenia	Iran (Islamic Republic of)	Russian Federation
Australia	Iraq	Rwanda
Azerbaijan	Jamaica	Sao Tome and Principe
Bahrain	Kazakhstan	Saudi Arabia
Benin	Kenya	Senegal
Bolivia (Plurinational State of)	Kiribati	Seychelles
Botswana	Kuwait	Sierra Leone
Brunei Darussalam	Lao People's Democratic Republic	Solomon Islands
Burkina Faso	Libya	Somalia
Burundi	Malawi	Suriname
Cameroon	Maldives	Syrian Arab Republic
Chad	Mali	Tajikistan
Chile	Mauritania	Timor-Leste
Colombia	Micronesia (Federated States of)	Tonga

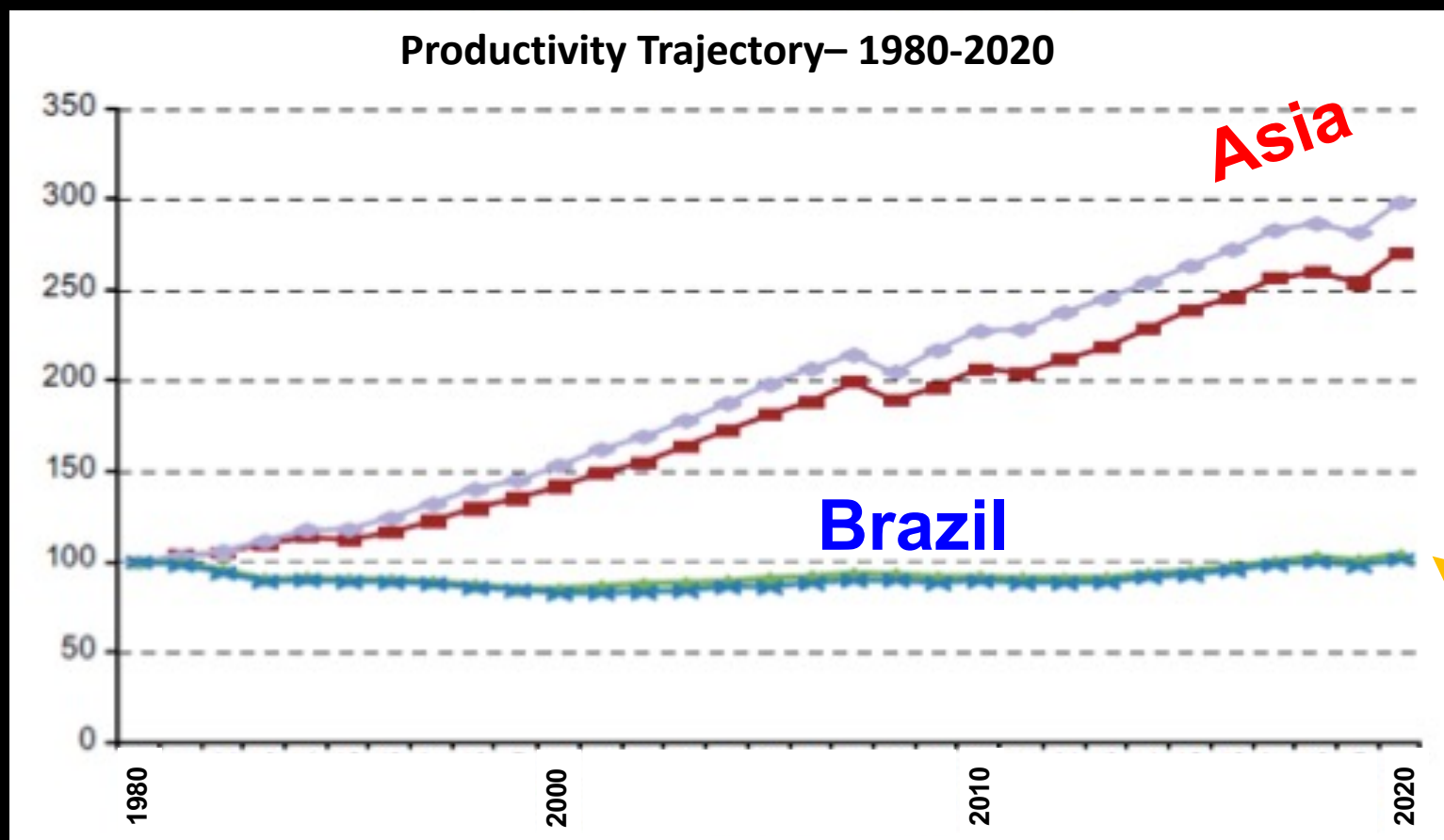
Changes in commodity dependence between 2008–2009 and 2018–2019

		Countries that were commodity dependent in 2008–2009 but not in 2018–2019	Countries that were commodity dependent in 2018–2019 but not in 2008–2009
Congo	M		
Côte d'Ivoire	M		
Democratic Republic of the Congo	M		
Djibouti	M		
Ecuador	Ni	Bhutan	Afghanistan
Equatorial Guinea	Ni	Central African Republic	Belize
Ethiopia	Ni	Egypt	Brazil
Fiji	Ni	Indonesia	Cabo Verde
Gabon	Ni	Nicaragua	Eritrea
Gambia	Ni	Palau	Greece
Ghana	Oi	Trinidad and Tobago	Kyrgyzstan
Guinea	Pi		Liberia
			Madagascar
			Saint Vincent and the Grenadines
			Samoa
			South Sudan
			Sudan
			Togo
			Tuvalu

Source: UNCTAD, based on UNCTADstat data

Source: UNCTAD, based on UNCTADstat database.

Brazil: since 1980, the productivity of the economy has been practically stagnant



- Asian Productivity (Simple average)
- Asian Productivity (Weighted average)
- Brazilian Productivity (Simple average)
- Brazilian Productivity (Weighted average)

(Source: BID – ECLAC, 2021. Index 1980=100)

4

Technology

The advance of digital puts pressure on developing countries

- But the new technological cycle opens up opportunities for development. And it poses new challenges for countries
- The digital divide and precarious access to ICTs in low-income households represent strong limitations to the advancement of digitalization
- New challenges: the current technological cycle also generates new ethical, bias, privacy, inequalities in the labor market and the erosion of democracy

It is essential that the public and private sectors act strongly to participate in this new technological cycle

**The advance of digital puts pressure on
developing countries**

**It is essential that the public and private
sectors strive to participate in this new
technological cycle**

The new wave increasingly consolidates Artificial Intelligence as a set of essential Technologies



Preparing the economy and society to reduce inequalities, make efforts to catch up with the most advanced economies and stimulate sustainable growth, with respect for the environment, form the tripod that commands current development.

5

Values

Democracy

Inequality

Digital

Sustainability

ST&I

Education

**The course will address questions about
development and technology**

**To reduce the huge technological
dependence**

Classes

- 1. Course Presentation (07.08)**
- 2. Technology is the Key to Transforming Developing Countries (14.08)**
- 3. What's Actually New about Current Technology Changes (21.08)**
- 4. Artificial Intelligence (28.08)**
- 5. Introduction to Digital Sociology (04.09)**
- 6. New Approaches to Development(11.09)**
- 7. Impacts of New Technologies on Scientific Research(18.09)**
- 8. AI and the New Generation of Innovation Systems (25.09)**
- 9. Ethical Dilemmas (09.10)**
- 10. Automation and Jobs(23.10)**
- 11. New Engines of the Economy and the Return of China (30.10)**
- 12. Final Work submission (20.11)**
- 13. Final Grades (27.11)**

O uso *Large Language Models* somente será permitido com a devida e precisa indicação do parágrafo ou seção inspiradas nesses recursos .

Class Requirements

- Tolerance and appreciation of dissenting views
- Patience to listen and debate
- Willingness to learn
- It is essential to have time and dedication to read and prepare the texts indicated for the class
- Plagiarism is unacceptable

Evaluation

Students will be evaluated on a combination of four grades:

- **Participation in class debates: 10%**
- **Presentation of at least four in-class texts (20%)**
- **Two reaction papers 10% each (Total 20%). One paper until class 6**
- **10-page-Final work (50%)**
- **10-page-final work (60%). Final submission: 20.11. The work must be delivered in digital form, in Word (or similar), written with double spacing, size 12, and cannot exceed 15 pages**

1. Ajay Agrawal, J Gans and A Goldfarb (2022). Power and prediction. The disruptive economics of AI. Boston (MA): Harvard Business Review Press
2. Cathy O'Neil (2016). Weapons of Math Destruction. How Big Data Increases Inequality and Threatens Democracy
3. Deborah Lupton (2015) *Digital Sociology*. New York: Routledge
4. K. Crawford (2021). Atlas of AI. Power, politics, and planetary costs of AI. Yale Un Press
5. Michael Wooldridge (2021). A brief history of AI: what it is, where we are, and where we are going. Flatiron Books. ISBN: 1250770742
6. Paul Daugherty & J. Wilson (2018). Human + Machine. Reimagining Work in the Age of AI

The final grade of the course will be released on November 27th.

Dynamics

- After presentations and discussion in class, I make my presentation on the topic
- All papers are digital (Moodle)
- All slides will be available to students

Next steps:

- Definition of presentation for the next class
- General schedule of student presentations up to 3rd class

Thanks

garbix@usp.br