7th German-Brazilian Dialogue on Science, Research and Innovation

Working and Learning in the Digital World

New Technologies and the Changing Nature of the Work

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Fears

1. Since the Industrial Revolution, mechanization has been controversial. Machines pushed up productivity, raising incomes per capita. But they put people out of work, reduced their wages and diverted the gains from growth to businesses
2. Now, robots are threatening work, wages and equality
3. Are the gains of technological progress destined to benefit only the top 1% of earners?

Based on history, the answer is: No

Despite mechanization, people have found jobs. Innovation has transformed living standards. Life expectancy has gone up. Basic health and education are widespread

Remarks

As researchers, we must recognize that there have been long periods of economic history in which things did not work out well. And we have to wonder whether we are in another era

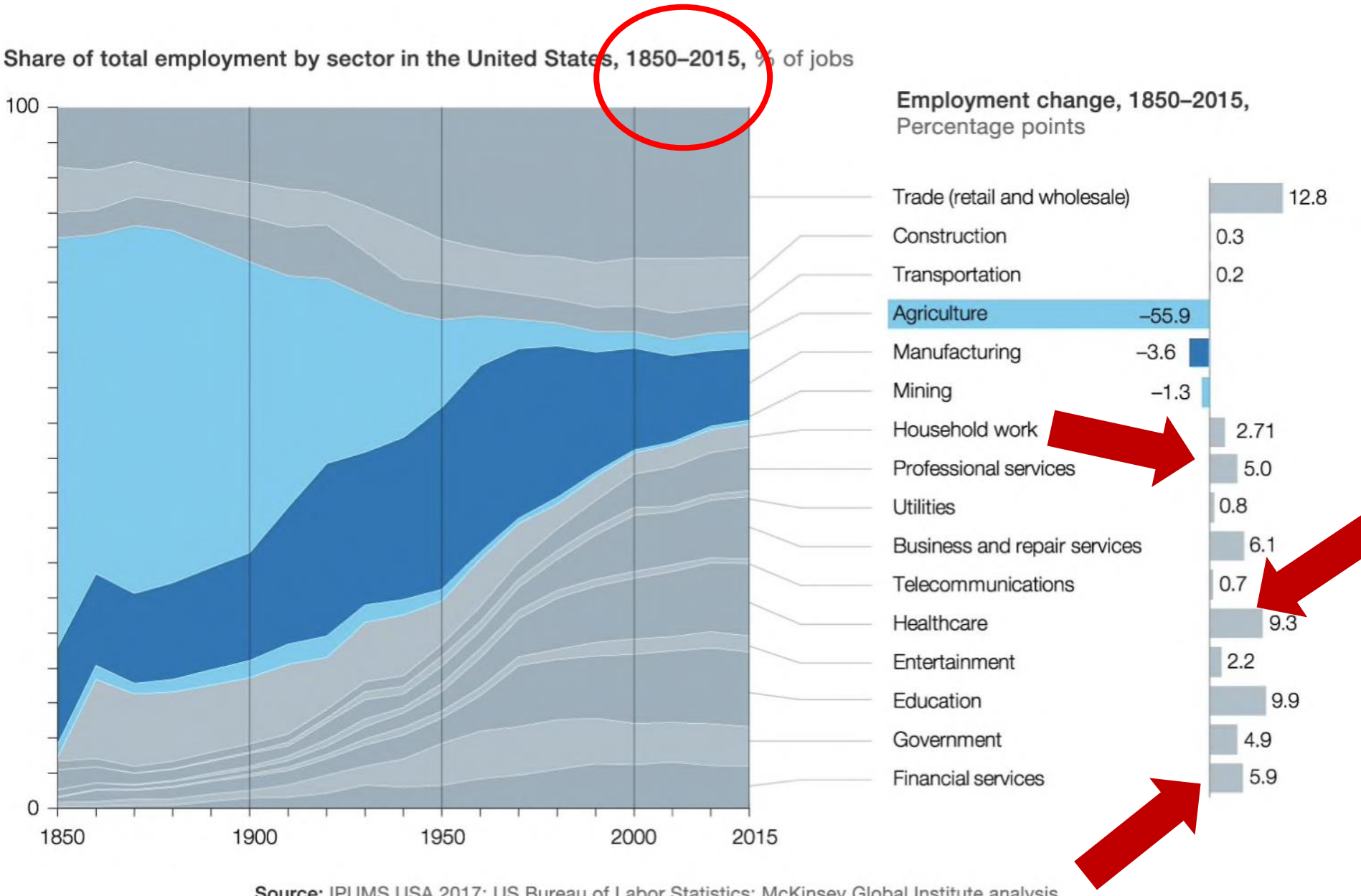
1. **As global economy is integrated, new technologies in one place affects work in others**
2. **The technological revolution that spread prosperity in the West could not be replicated in the East, where we have modern 'underdeveloped countries' (Africa and South America)**
3. **In the past four decades the world has seen many job losses, falling real wages, and rising inequality as the gains from growth moved to the top 1%**

But most analysts say that the economy has always adjusted, and in the future it always will. Right?

Dilemmas

- Did the ‘adjustment' end in 1970, or are the recent negative trends just a blink?
- Might what was normal in 1850–1970 will return soon, with new gains in productivity and wages?
- Could be. But let’s take a look at the trends.

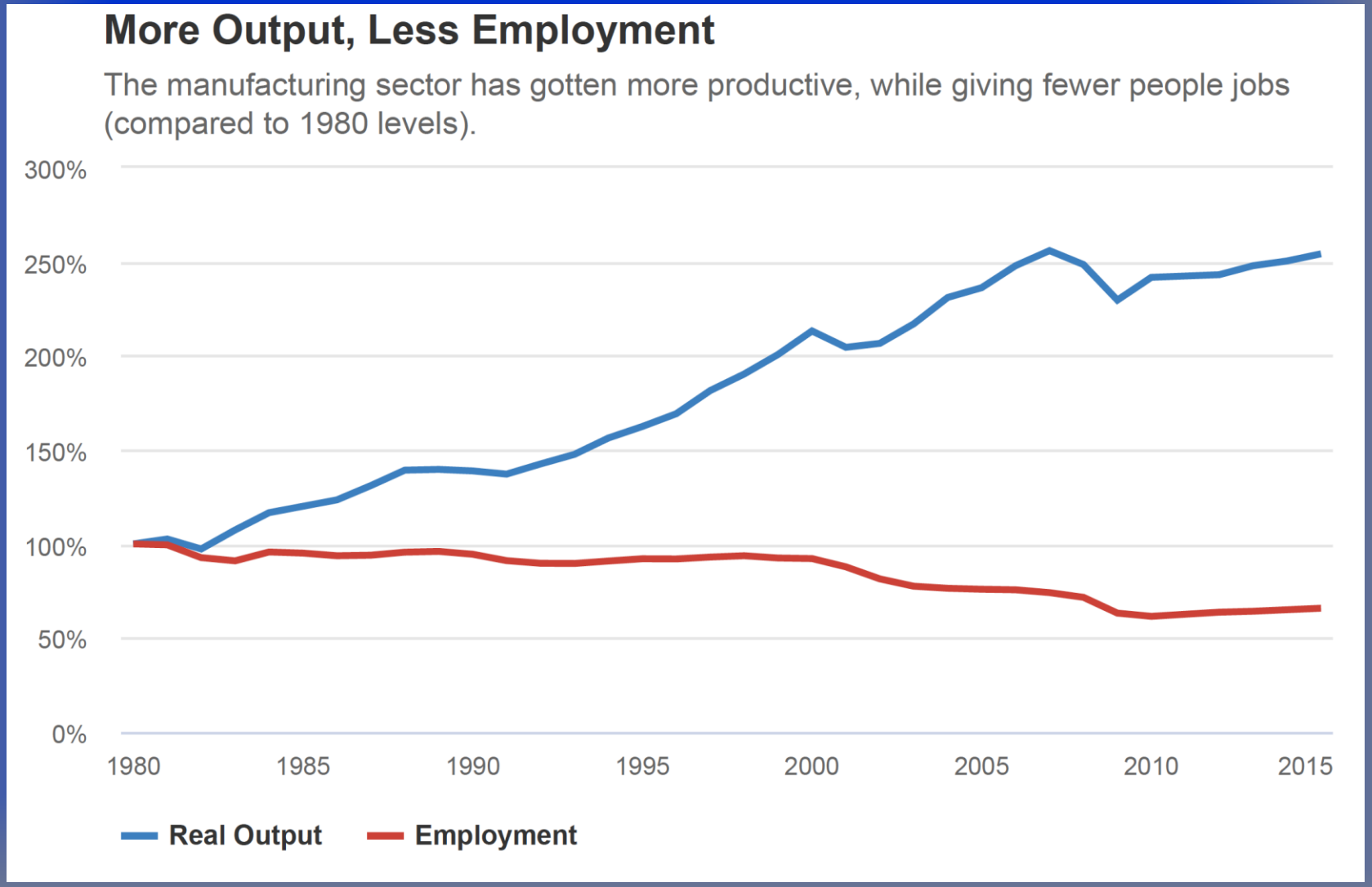
History shows that technology has created large employment and sector shifts, but also creates new jobs.



Source: IPUMS USA 2017; US Bureau of Labor Statistics; McKinsey Global Institute analysis

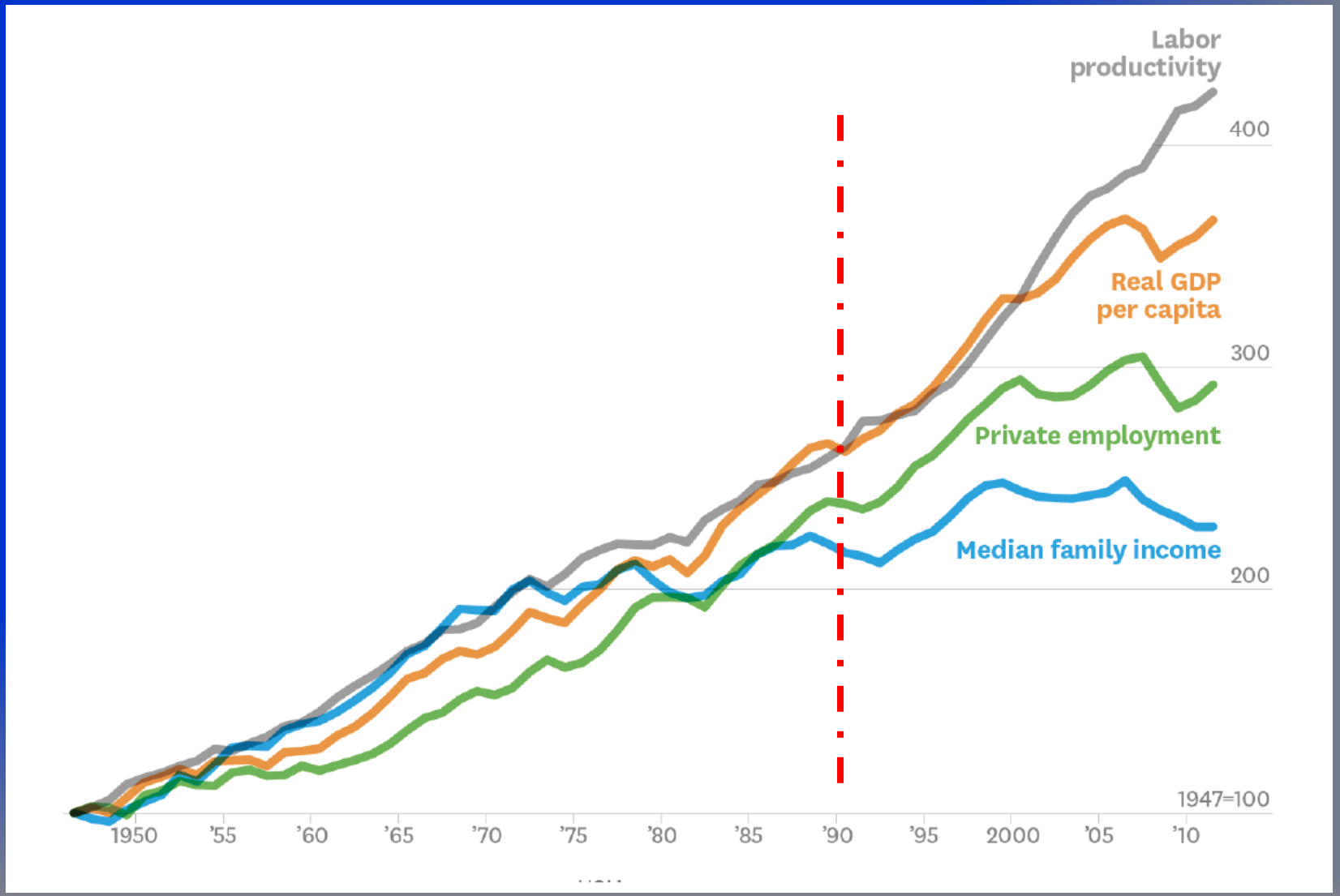
There are new realities relating Productivity, Jobs and Income

U.S. Produtivity and Jobs



Fonte: US Bureau of Labor Statistics, 2016

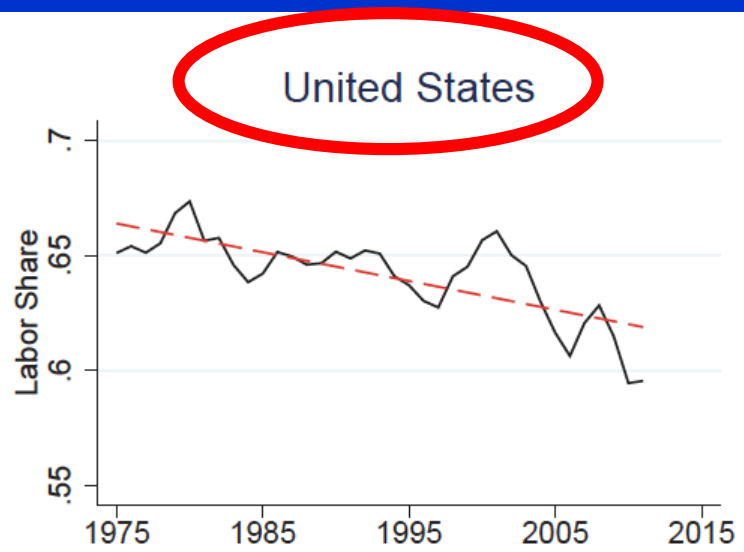
Productivity / GDP per capita, Jobs, Average Family income

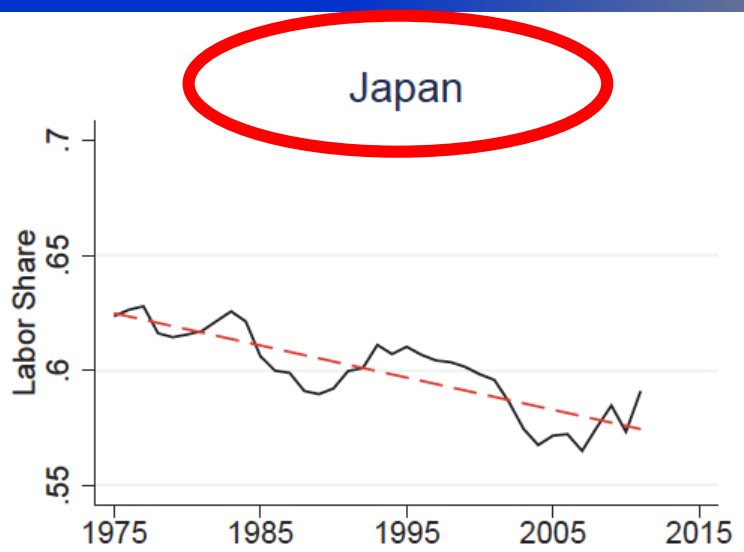


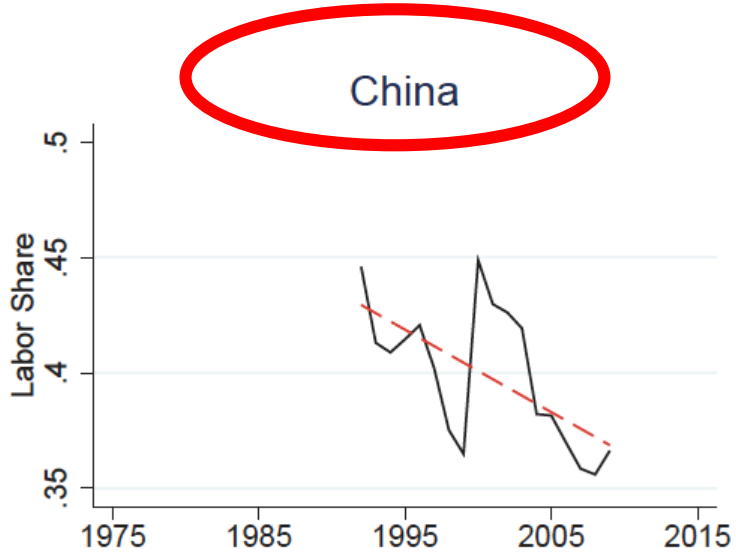
Source: Brynjolfsson & McAfee, "Why the Middle Class is Shrinking," Harvard Business Review, November 5, 2015

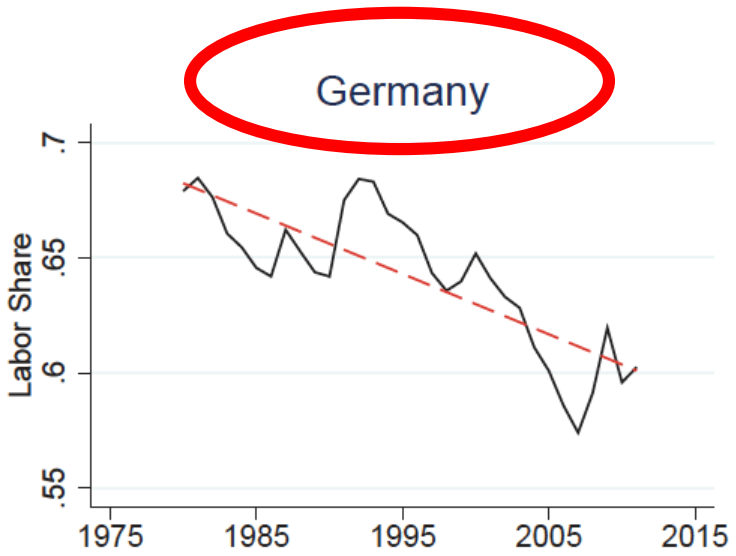
Global Decline of the Labor Share

(selected countries)









Karabarbounis & Neinam. NBER, Working Paper 19.136

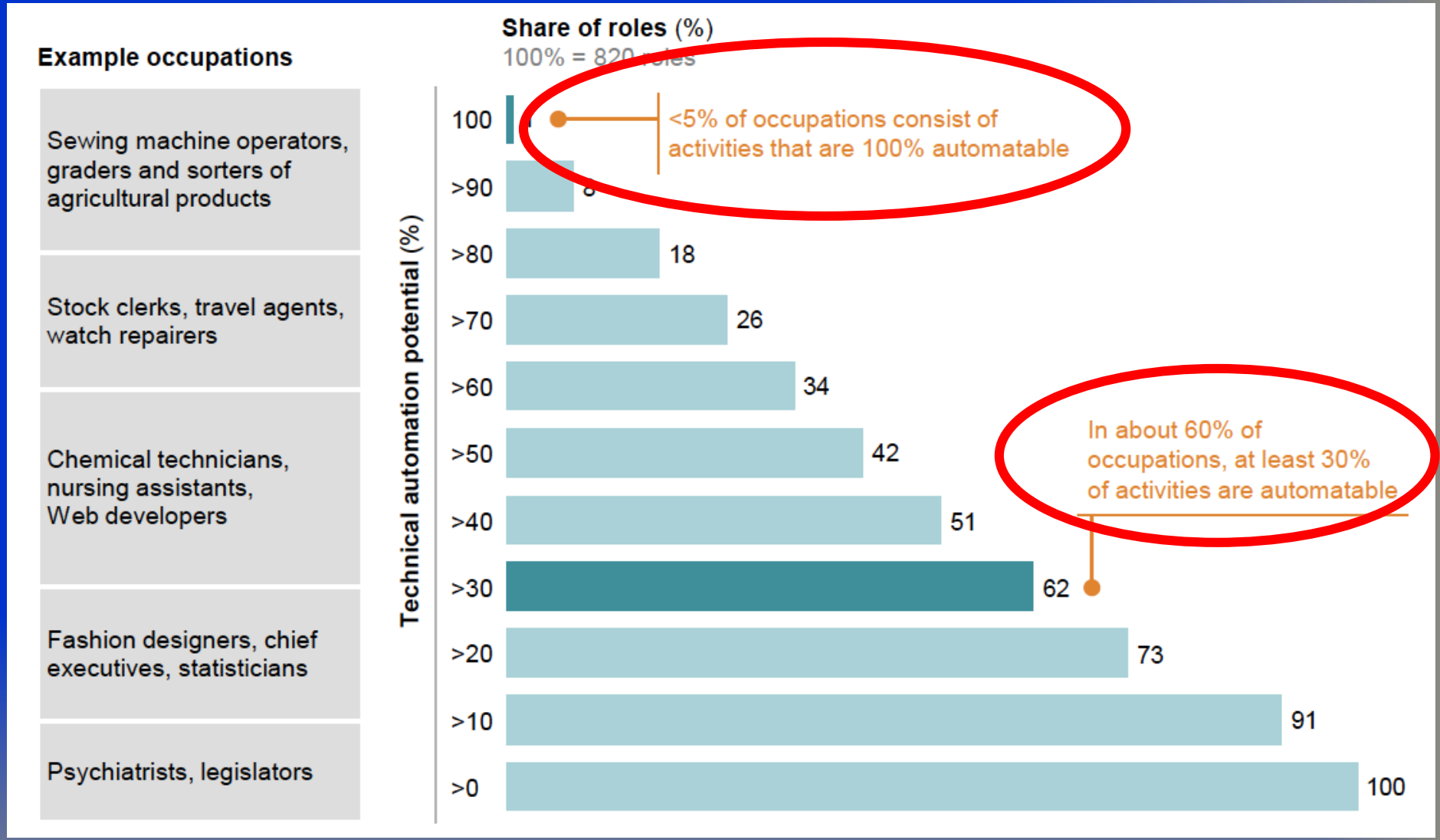
Worrisome Data

- In many cases, wages have been falling in real terms over the past four decades.
- The rise in inequality has shown that could be an inflection point in economic history
- A deviation of this magnitude suggests that the new pattern may not be transitory

What is diferent?

Why the difference?

High Impact of Automation



Fonte: US Bureau of Labor Statistics; McKinsey Global Institute, January 2017

Research results on automation are not conclusive about overall impact

Based on MIT Technology Review, Feb 2018

Predicted Jobs Automation Will Create and Destroy

When	Where	Jobs Destroyed	Jobs Created	Predictor
2016	worldwide		900,000 to 1,500,000	Metra Martech
2018	US jobs	13,852,530	3,078,340	Forrester
2020	worldwide		1,000,000-2,000,000	Metra Martech
2020	worldwide	1,800,000	2,300,000	Gartner
2020	sampling of 15 countries	7,100,000	2,000,000	World Economic Forum (WEF)
2021	worldwide		1,900,000-3,500,000	The International Federation of Robotics
2021	US jobs	9,108,900		Forrester
2022	worldwide	1,000,000,000		Thomas Frey
2025	US jobs	24,186,240	13,604,760	Forrester
2025	US jobs	3,400,000		ScienceAlert
2027	US jobs	24,700,000	14,900,000	Forrester
2030	worldwide	2,000,000,000		Thomas Frey
2030	worldwide	400,000,000-800,000,000		McKinsey
2030	US jobs	58,164,320		PWC
2033	US jobs	67,876,460		Oxford University
2035	US jobs	80,000,000		Bank of England
2035	UK jobs	15,000,000		Bank of England
No Date	US jobs	13,594,320		OECD
No Date	UK jobs	13,700,000		IPPR

*Values that were given as percentages were converted to number of jobs based on the number of jobs in the US when the prediction was made according to the BLS

What we do know?

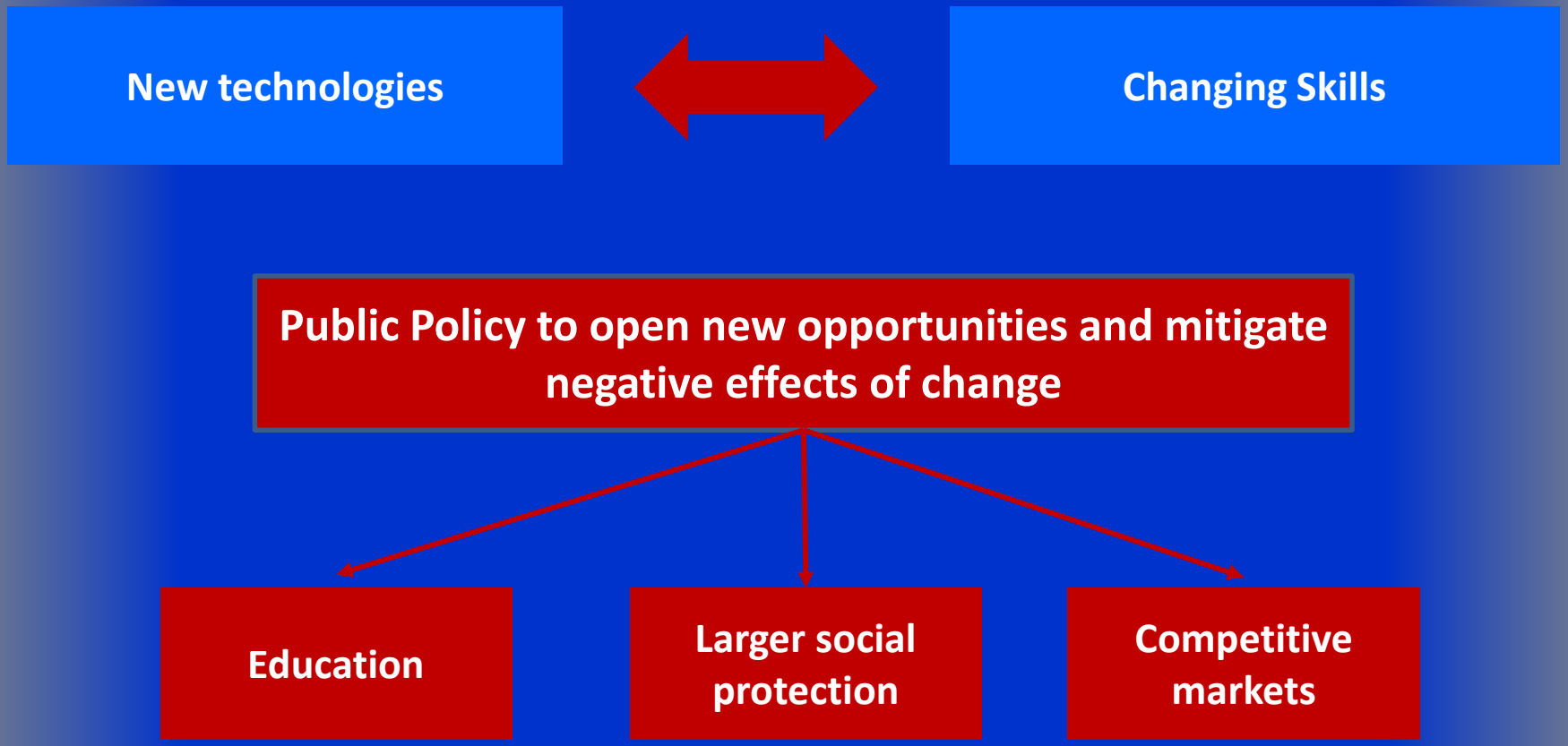
- Innovation will continue to accelerate
- Emerging countries need to act to ensure they can compete in the economy
- They will have to invest in their people with a sense of urgency
- especially in health and education, the building blocks of human capital
- But right now too many countries are not making these critical investments

Three types of skills are increasingly important

1. Advanced cognitive skills (complex problem-solving)
2. Sociobehavioral skills (such as teamwork)
3. Skill combinations (reasoning and self-efficacy)

Building these skills requires strong human capital foundations and lifelong learning
Are developing countries working with that kind of priority?

Responding to the changing nature of work



Researching and Debating are Essential

Three exemples

- **Universal basic income**
- **Taxing robots**
- **Companies are responsible for requalifying employees targeted to be fired**

Trends are trends.
New technology cycle is just at the beginning

There are opportunities to speed up and make new technologies work for everyone

But it would be better to wake up quickly

Thanks

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USP
Observatory for Innovation

USP ie] Instituto de Estudos Avançados da Universidade de São Paulo oi observatório da inovação