

New Technologies, the Changing Nature of the Work, and Jobs

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Três grandes medos

1. A superação dos humanos pelas máquinas. Riscos comprometeriam o futuro da humanidade

2. Novo ciclo tecnológico melhora a vida das pessoas. Mas também abre espaço para remodelar o mundo para pior. Ameaças à democracia, quebra de privacidade, segregação e racismo são alguns dos problemas que afloram com força no mundo todo. Governos, partidos ou grupos podem monitorar, desinformar, distorcer ou controlar pessoas, contaminar regras sociais ou mesmo burlar legislações e eventos institucionalizados

3. IA desloca e/ou substitui trabalho e atividades humanas em praticamente todas as áreas da economia e da sociedade. Avanço da IA pode correr pactos sociais, políticas públicas, programas





Mudanças na Natureza da Competição

Antes das TICs	Hoje
Indústria manufatureira	Fusão de Serviços + Manufatura + Automação acelerada + AI
Qualidade	Qualidade + Baixo Custo + Customização + Velocidade
Tecnologia: suporte da produção e serviços	IA estrutura as empresas: Tecnologia + Novos Modelos de Negócio + Tecnologia
Comércio de Produtos	Comércio de conhecimento + Gestão + Serviços
Skills	Aprendizagem Contínua + Trabalho cooperativo homem-mulher/máquina
Baixo custo do capital	Eficiência + Alta qualificação

Remarks

- As global economy is integrated, new technologies in one place affects work in others
- 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)
- 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?

Technology and Jobs

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

Are the gains of technological progress destined to benefit only the top 1% of earners?

Based on history, the answer is: **No**

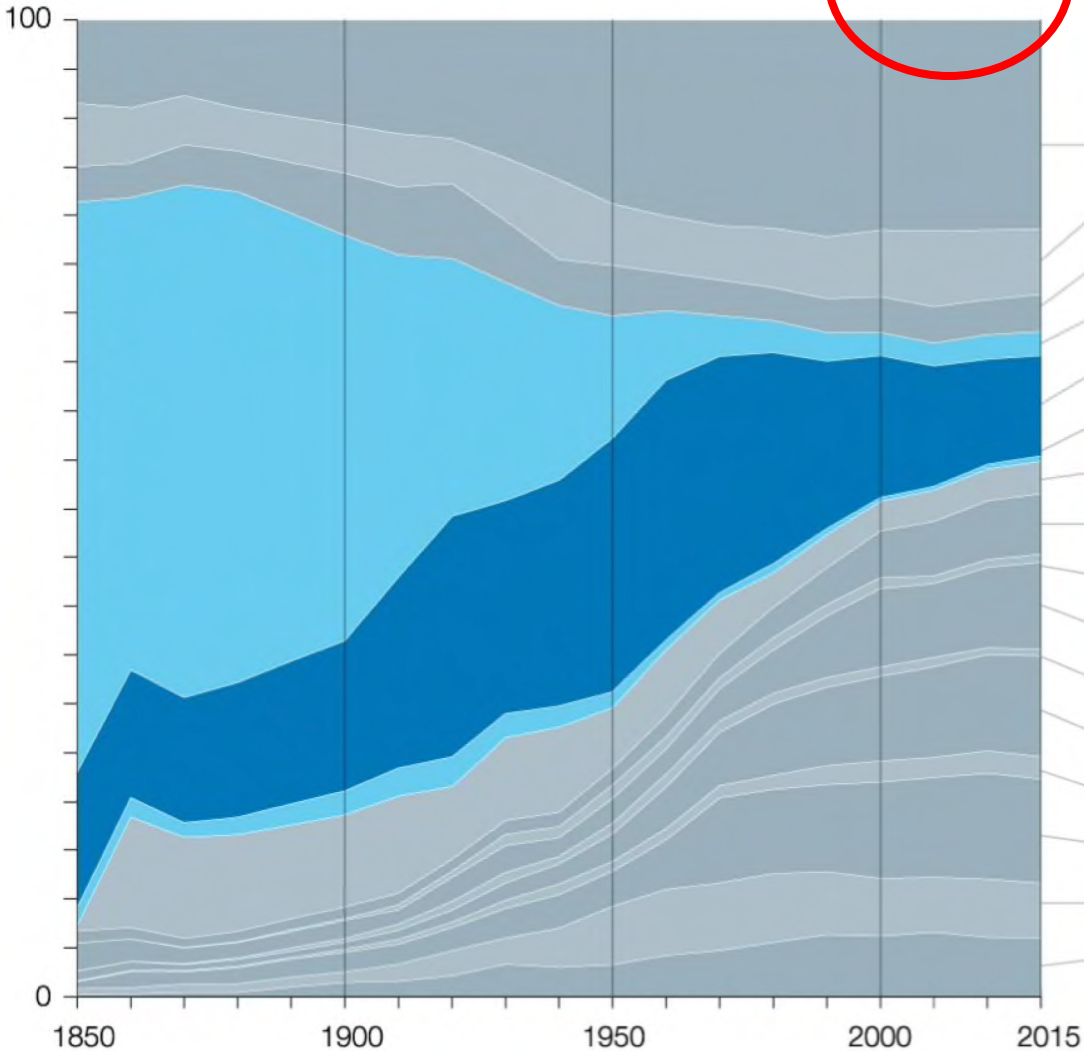
Despite mechanization, people have found jobs. Innovation has transformed living standards. Life expectancy has gone up. Basic health and education are widespread

Será que o futuro vai repetir o passado?

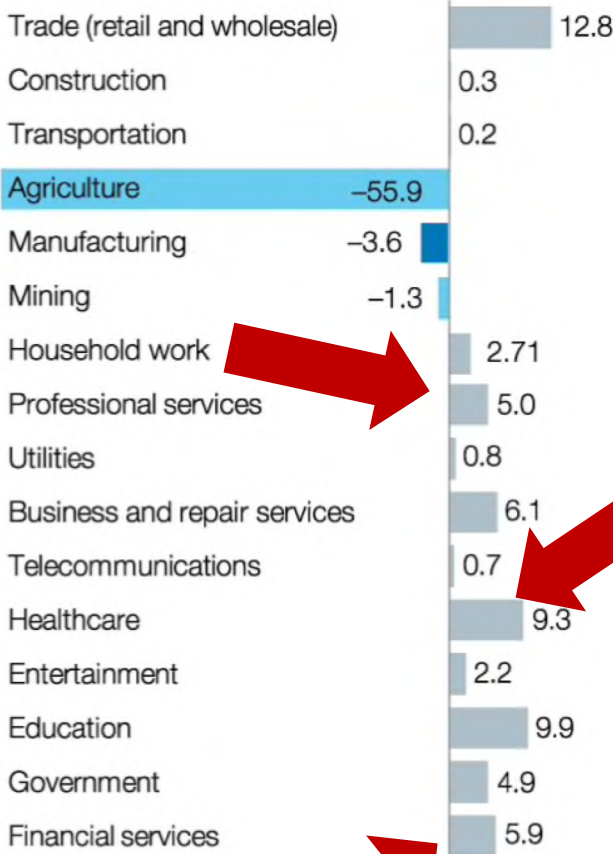
- Os sinais e tendências negativas atuais são passageiros?
- Será que os ganhos de produtividade e salários que se cresceram do século XIX até os anos 70 vai se repetir?
- Pode ser. Mas é preciso olhar em detalhes os sinais

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

Share of total employment by sector in the United States, 1850–2015, % of jobs



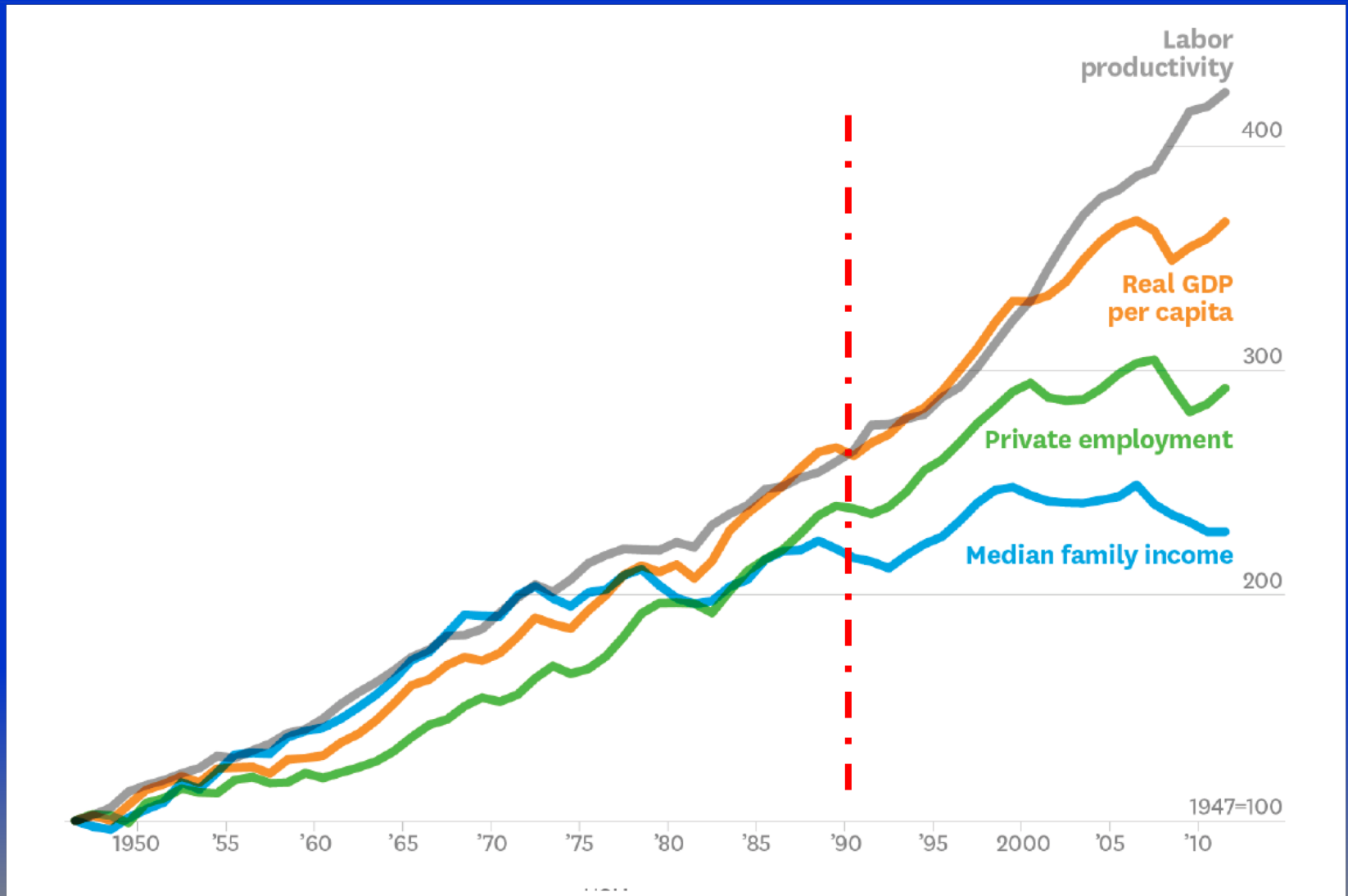
Employment change, 1850–2015, Percentage points



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

**There are new realities relating
Productivity, Jobs and Income**

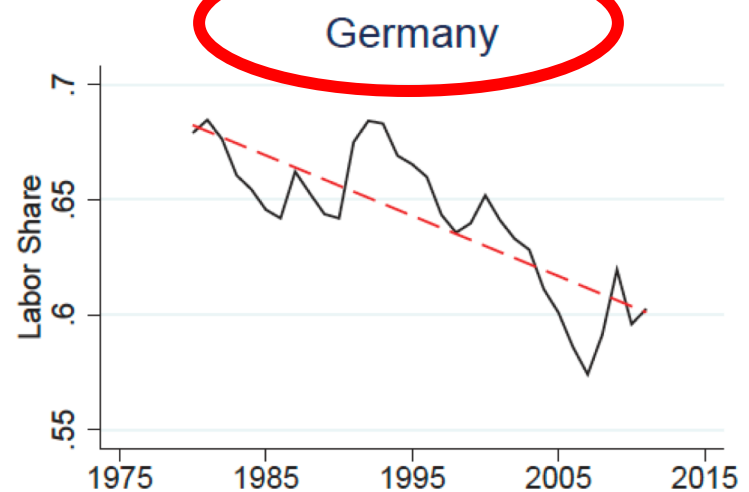
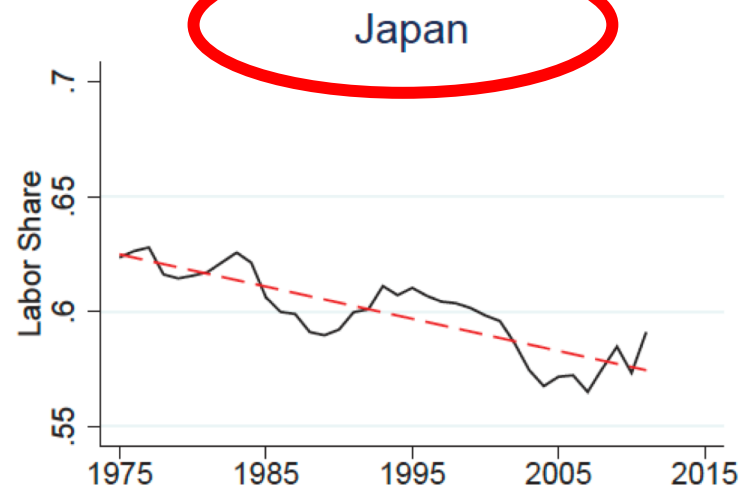
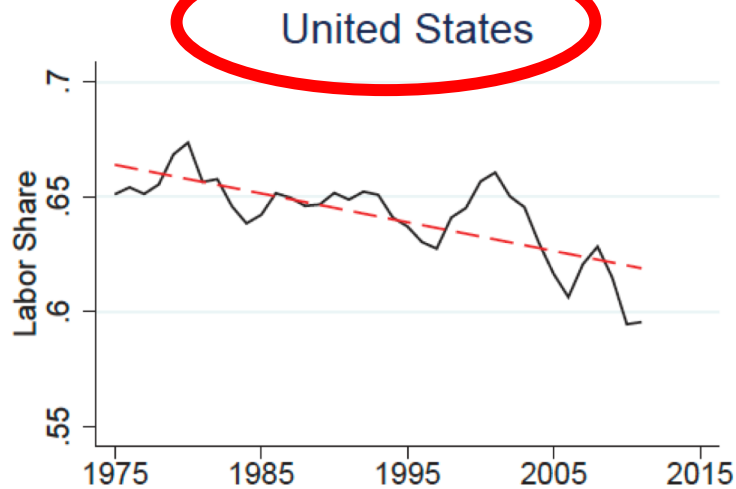
Productivity / GDP per capita, Jobs, Average Family income



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

Global Decline of the Labor Share / GDP

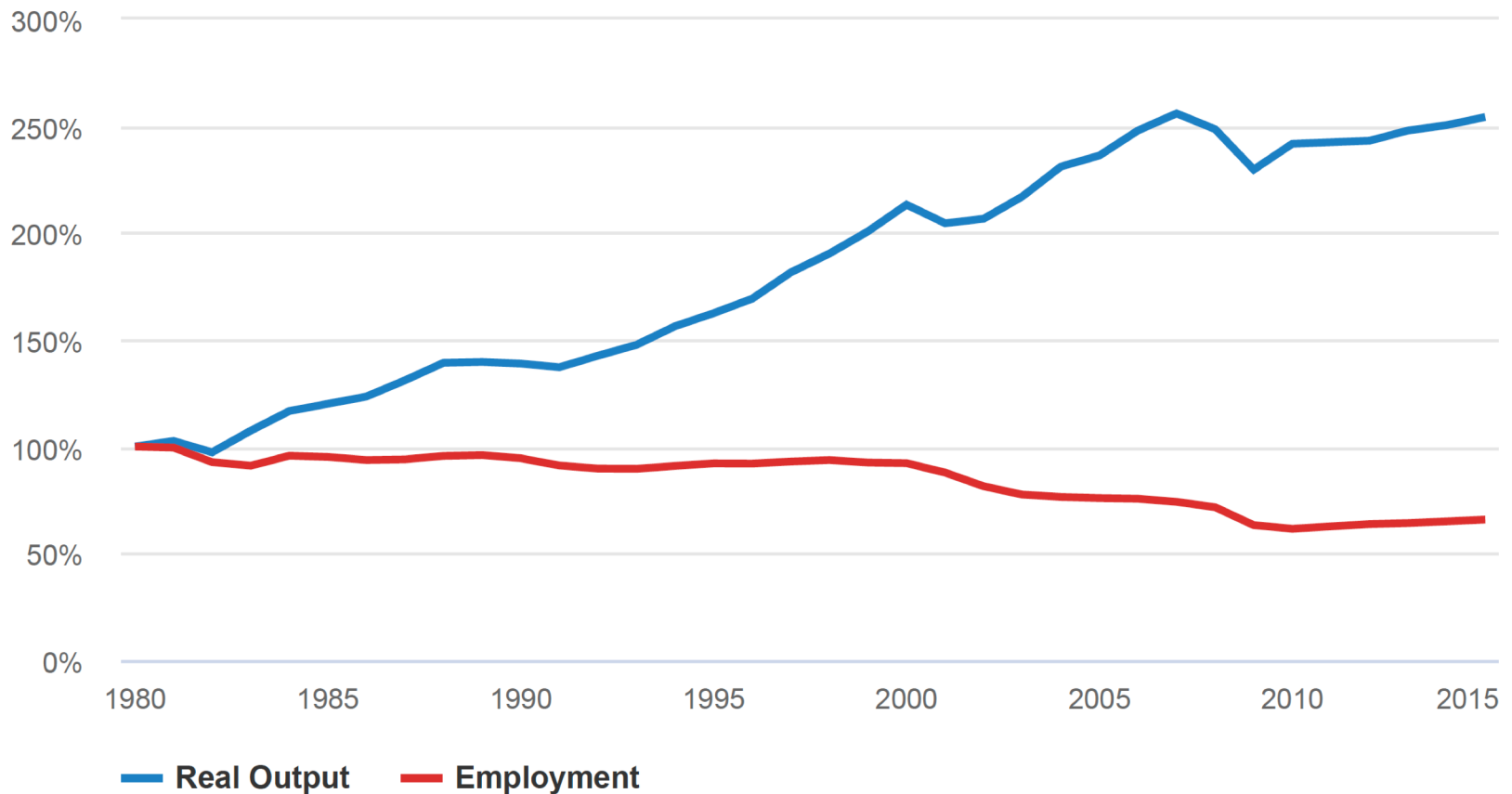
(selected countries)



U.S. Productivity and Jobs

More Output, Less Employment

The manufacturing sector has gotten more productive, while giving fewer people jobs (compared to 1980 levels).



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 different?

Why the difference?

High Impact of Automation

Example occupations

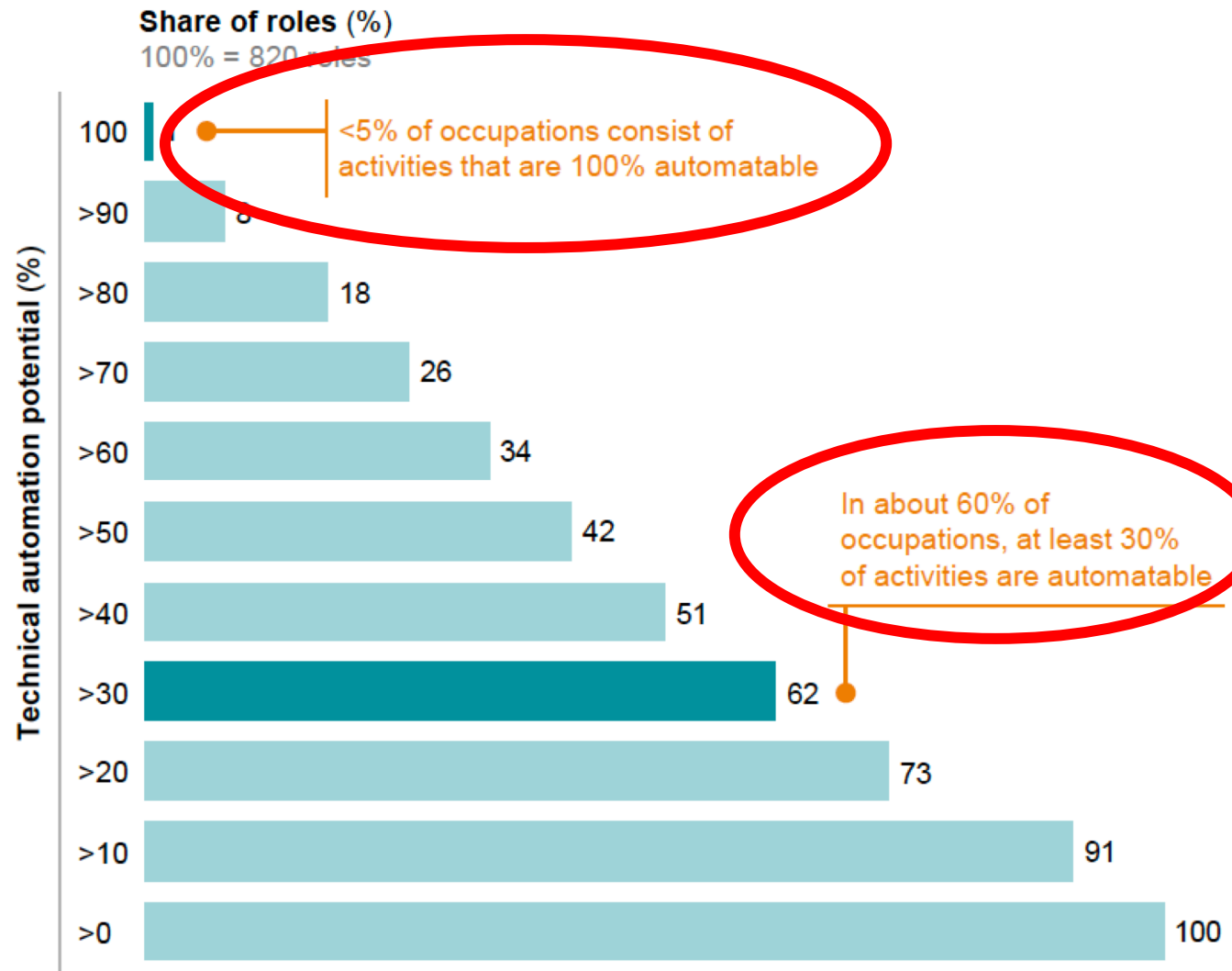
Sewing machine operators,
graders and sorters of
agricultural products

Stock clerks, travel agents,
watch repairers

Chemical technicians,
nursing assistants,
Web developers

Fashion designers, chief
executives, statisticians

Psychiatrists, legislators



Research results on automation are not conclusive about overall impact

Predicted Jobs Automation Will Create and Destroy

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

*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?**

Reminder

- **We need new ways to invest in people and to protect them, regardless of their employment status**
- **2 billion people are working in the informal sector unprotected by stable wage employment, social safety nets, or the benefits of education**
- **Changes in the nature of work could worsen their condition**

Responding to the changing nature of work

New technologies



Changing Skills

Public Policy to open new opportunities and mitigate negative effects of change

Education

Larger social protection

Competitive markets

Researching and Debating are Essential

Three examples

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

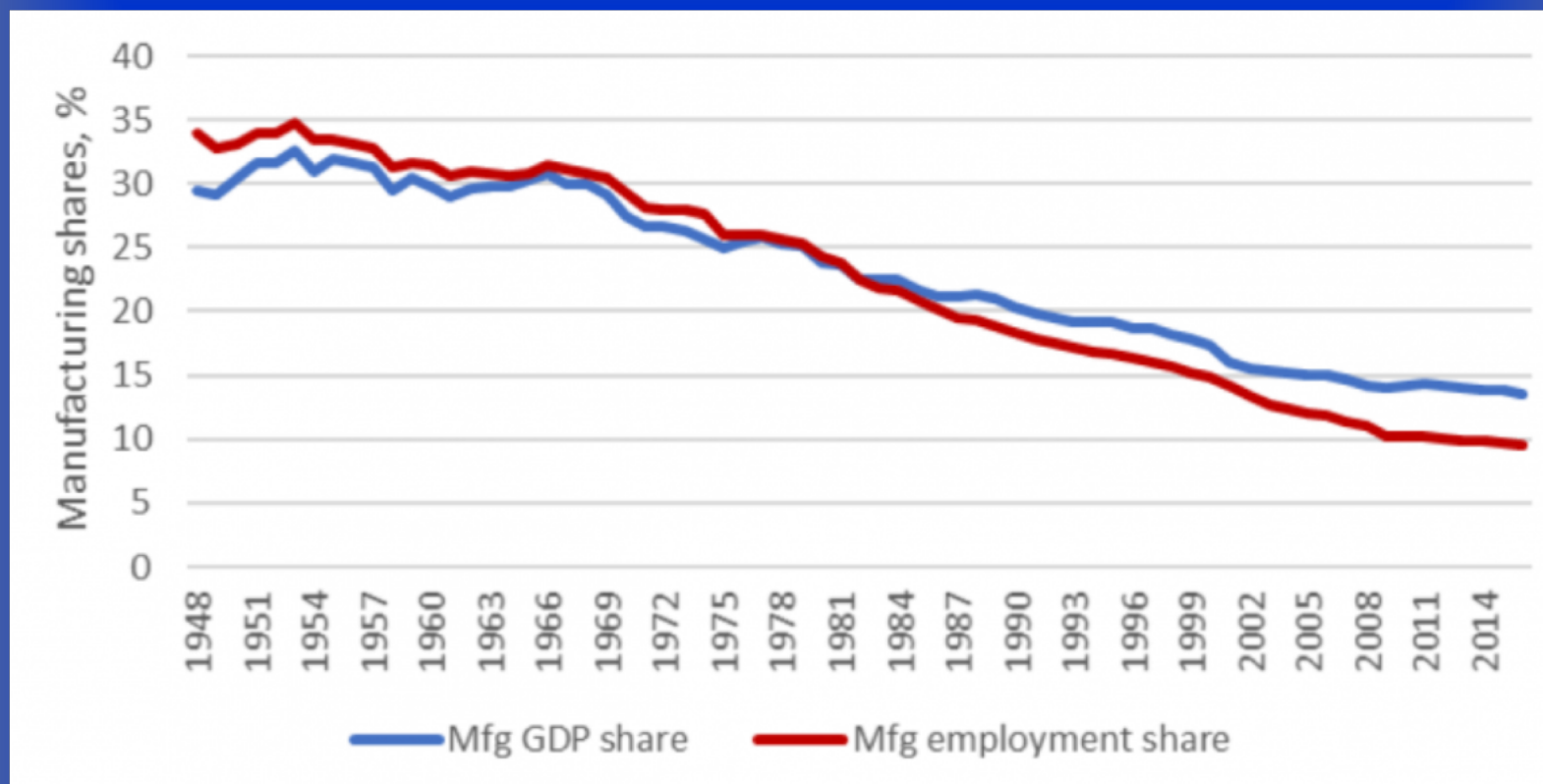
Trends are trends.

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

O declínio da manufatura



World Bank, 2016

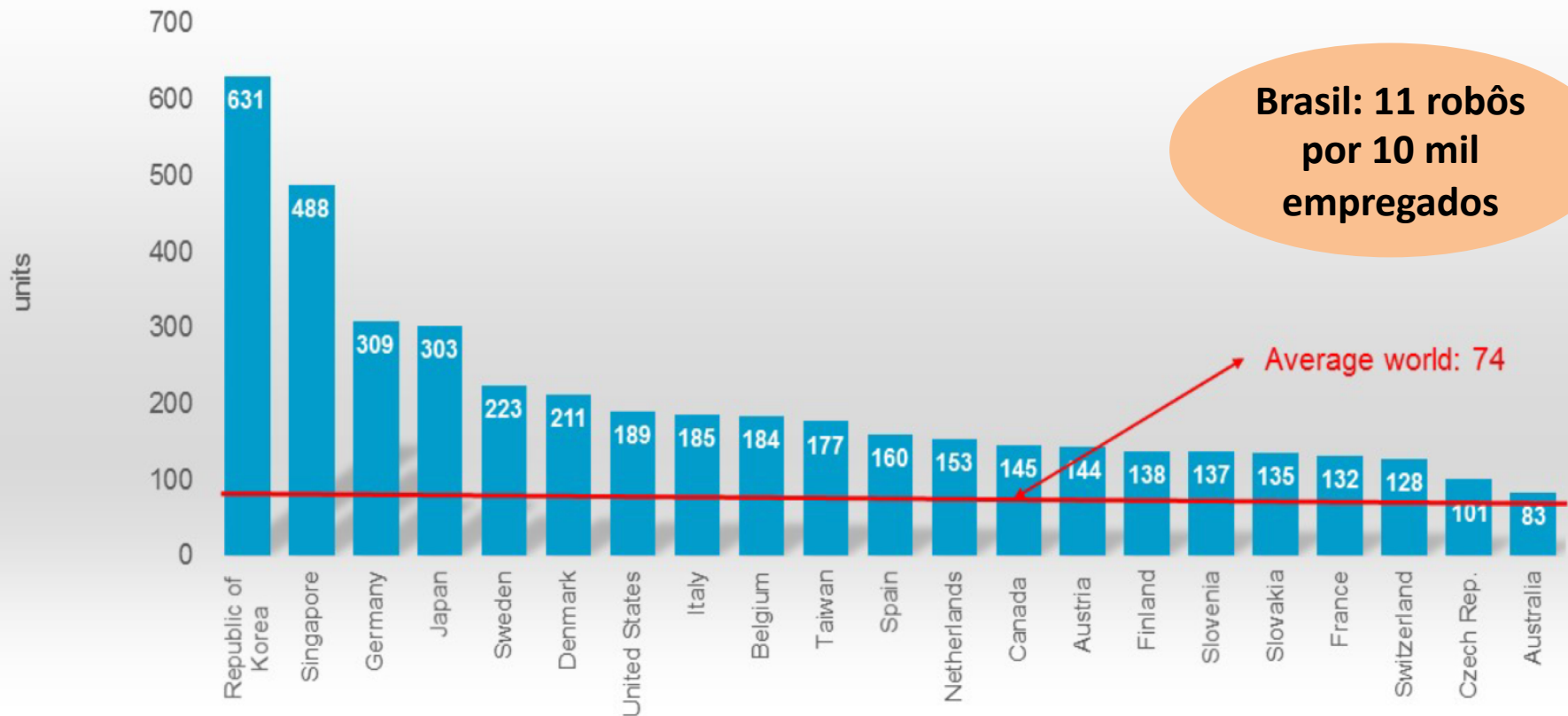
Apesar desse declínio, a indústria ainda possui forte efeito multiplicador e pode impulsionar inovações em outras áreas da economia e da sociedade

Mas qual indústria?

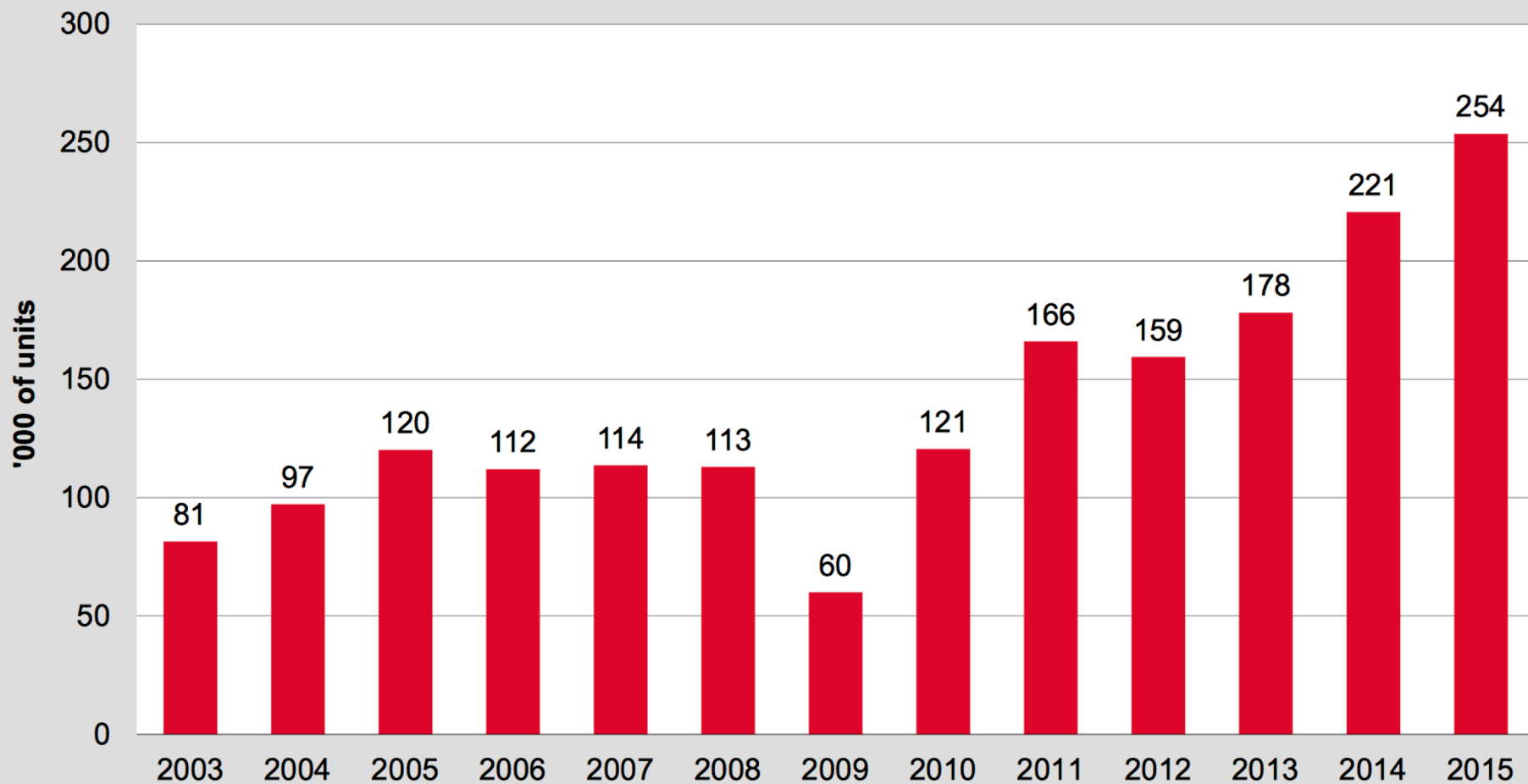
Para expresser dinamismo, a indústria precisa
constantemente se renovar

Ou seja, precisa elevar continuamente sua
produtividade

Number of installed industrial robots per 10,000 employees in the manufacturing industry 2016

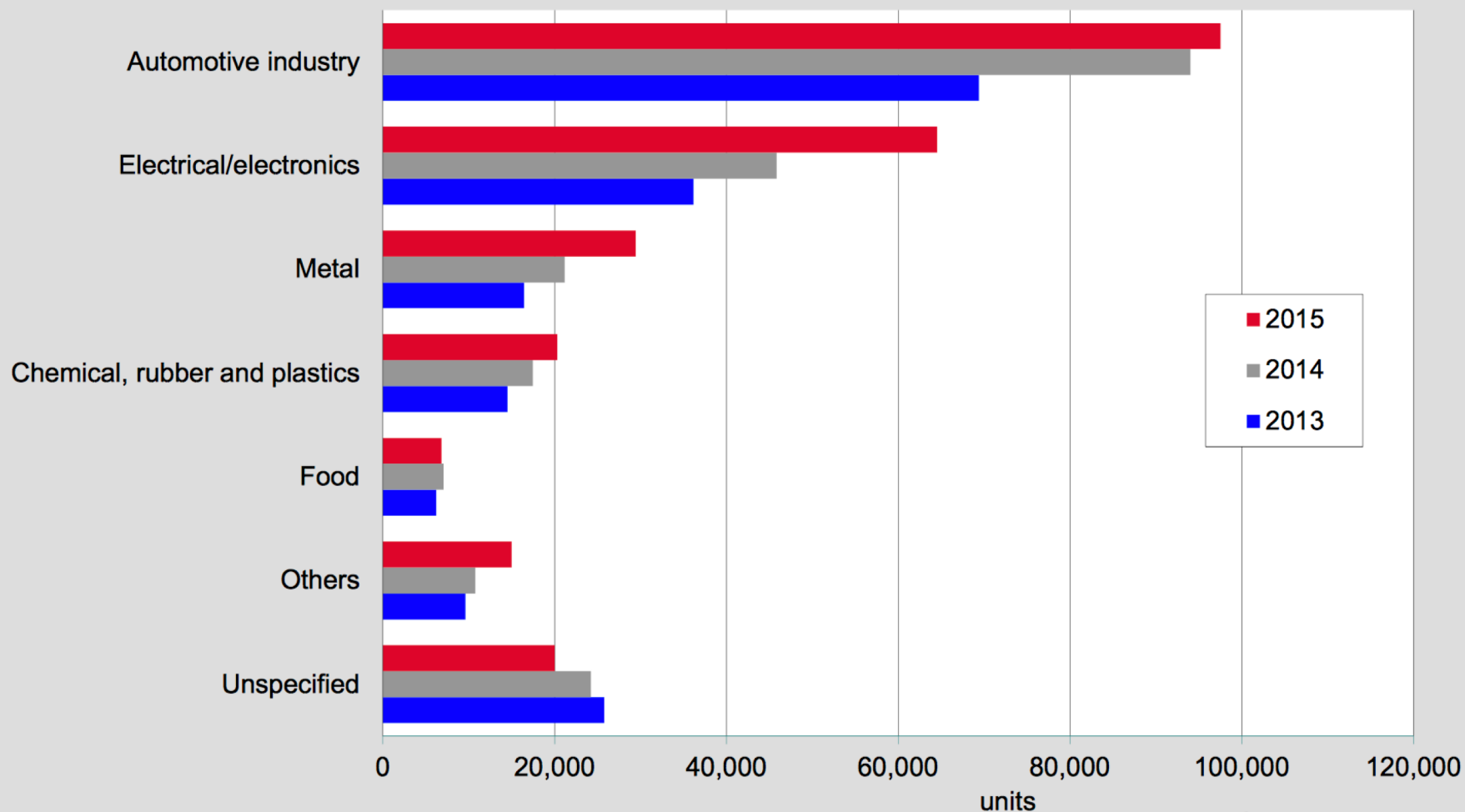


Estimated worldwide annual supply of industrial robots



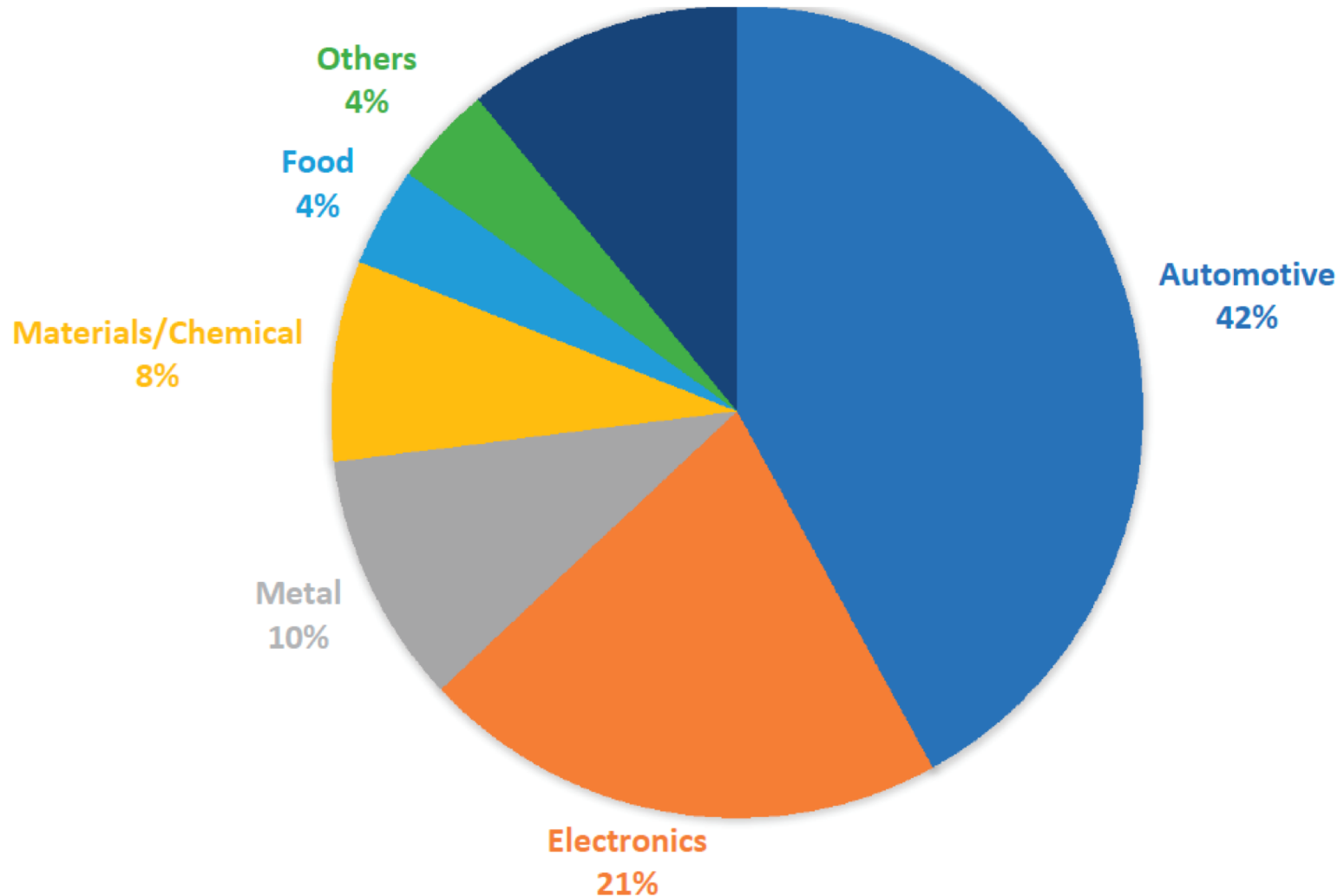
Source: World Robotics 2016

Estimated worldwide annual supply of industrial robots at year-end by industries 2013 - 2015



Source: World Robotics 2016

2015: áreas de maior concentração de robôs



Mudanças do mercado de trabalho

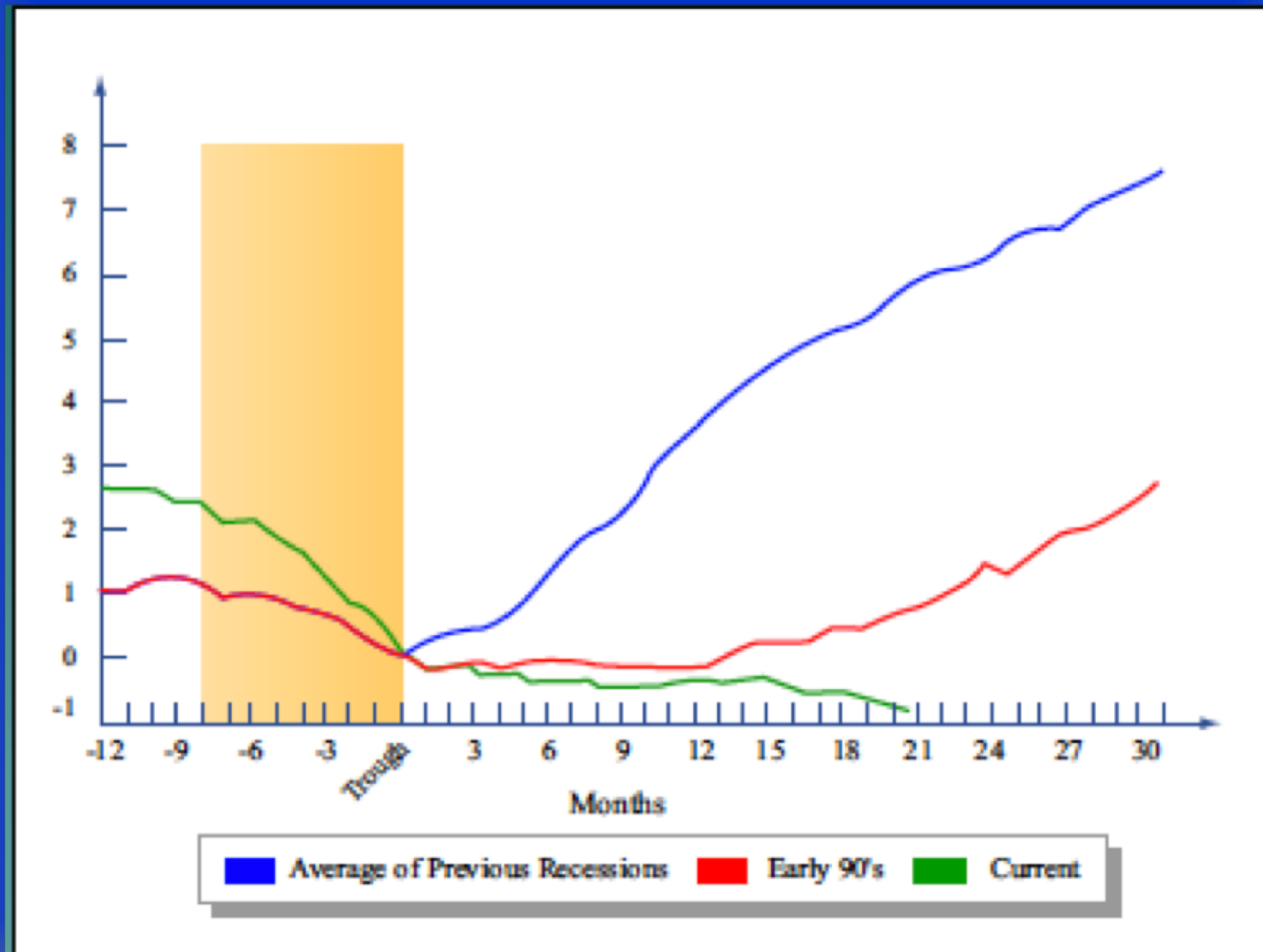
Desafio:

- Como alcançar e manter dinamismo em meio à nova dinâmica das economias, que se recuperam mais lentamente da crise e que criam empregos com mais dificuldade?

A capacidade de recuperação pós-crise e as alterações no perfil do emprego e na natureza do trabalho são peças chave desse quebra-cabeça

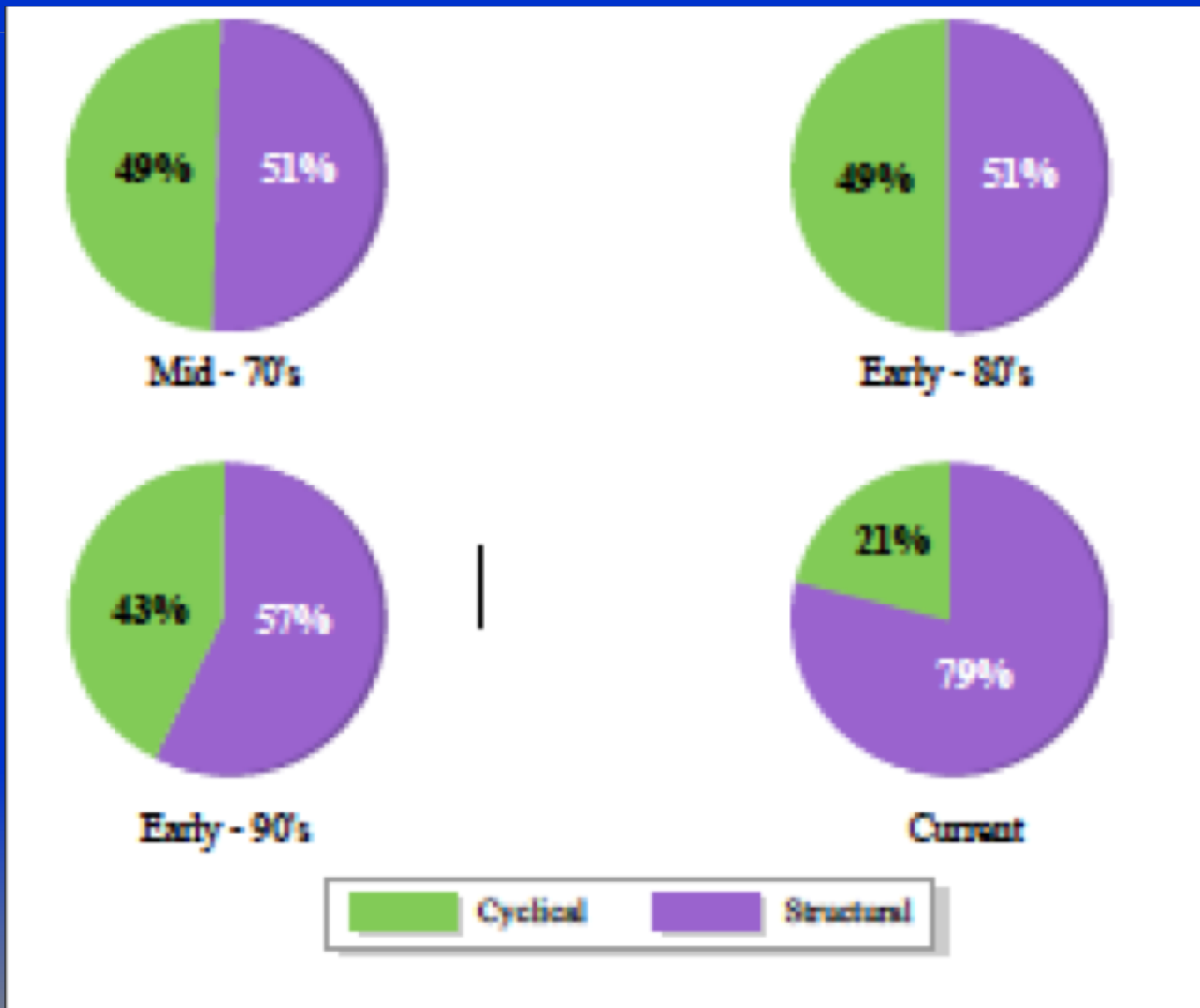
Retomada das crises

Emprego nas retomadas pós-recessão



E. Milbergs, Innovation and Emplymenmt Metrics, 2015

Perda de Empregos. Estrutural ou Conjuntural?



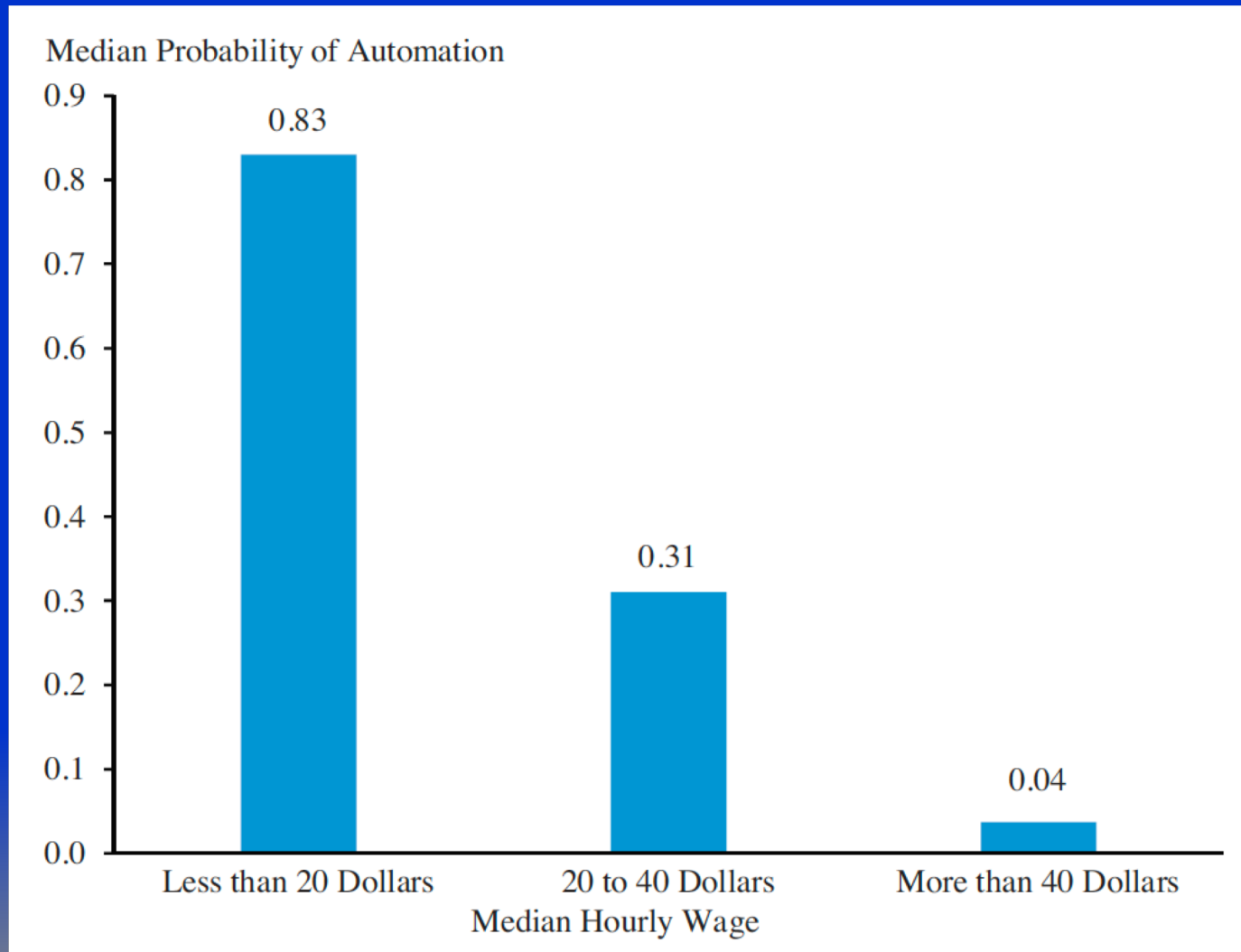
Nova realidade das relações entre PIB, Produtividade, Emprego e Renda

O que está na raiz dessa nova realidade?

A desconstrução da civilização industrial do sec XX?

- Pesquisa da Universidade de Chicago, em 56 países, detectou que em 38 havia forte queda da renda do trabalho na renda nacional
- No Japão, Canadá, França, Itália, Alemanha, EUA e China, o declínio aumentou nos últimos 10 anos
- Empregos repetitivos e de baixa qualificação tendem a desaparecer rapidamente
- Mas não é só a base da pirâmide que é afetada. Gestores, Técnicos e Especialistas também são atingidos
- David Autor (MIT) identificou 4 ocupações que serão muito afetadas: vendedores, pessoal administrativo, manutenção e operários do chão de fábrica

US: estimativa de automação para empregos/hora trabalho



Council of Economic Advisors (CEA), 2016, Economic Report of the President, USA, 2016

Dores da transição?

- Até meados dos anos 70, tecnologia atingiu a indústria mecânica, química, engenharia aeronáutica, transportes
- Anos 80, com TI de primeira geração, trabalhadores qualificados aumentaram salários, como no pós-guerra
- Anos 90: TI saltou novamente. Boom de empregos

Debate atual

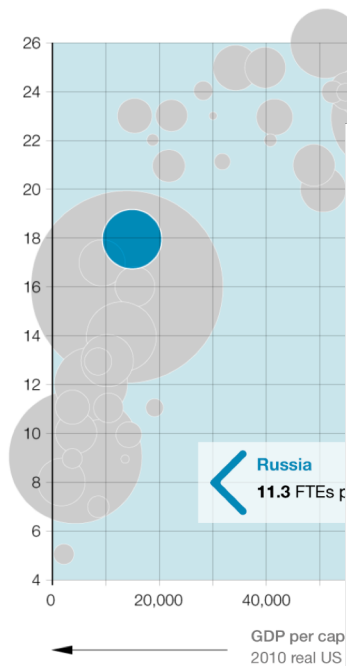
Anos 2000: digitalização acelerou ainda mais. E há sinais que as tecnologias passaram a substituir empregos. E que os novos criados não compensam os eliminados

Previsões Atuais

Estimativa de atividades deslocadas pela automação em 2030

Scenarios for labor displacement by automation

Midpoint automation adoption. Full-time equivalents (FTEs) potentially displaced by 2030, millions



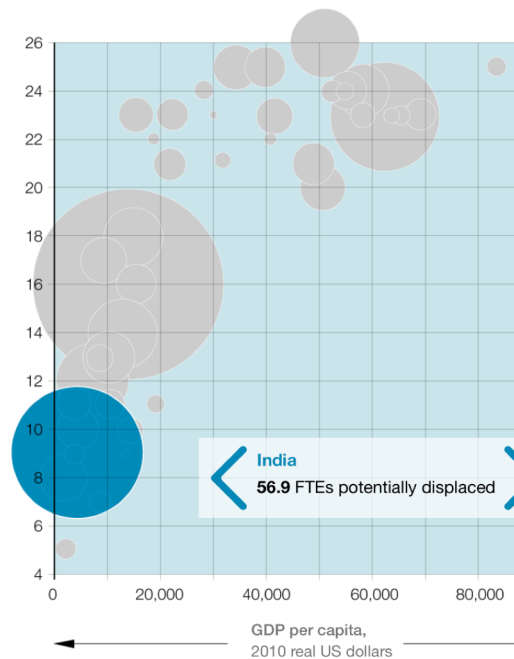
NOTE: These estimates for automation displacement are based on scenarios for automation adoption and should not be interpreted as predictions.

McKinsey&Company | Source: McKinsey Global Institute analysis

Russia

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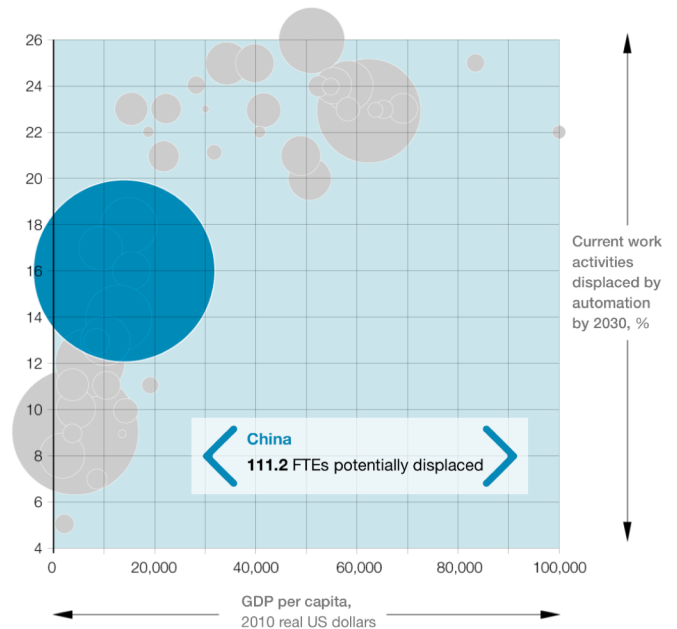
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Índia

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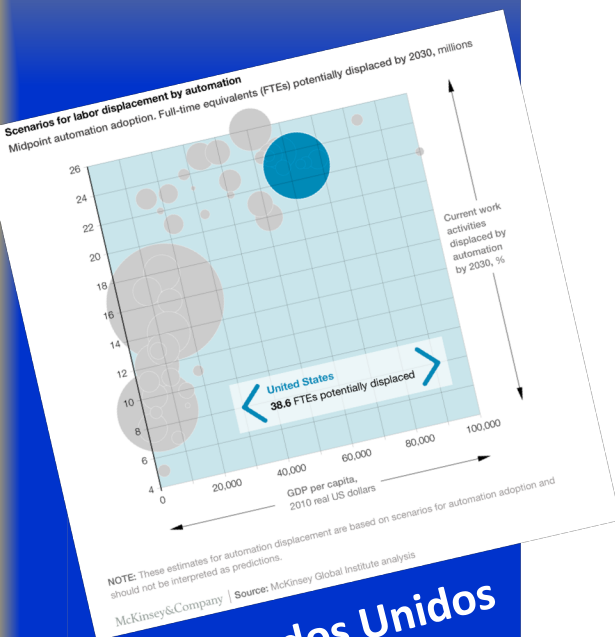
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McKinsey&Company | Source: McKinsey Global Institute analysis

China

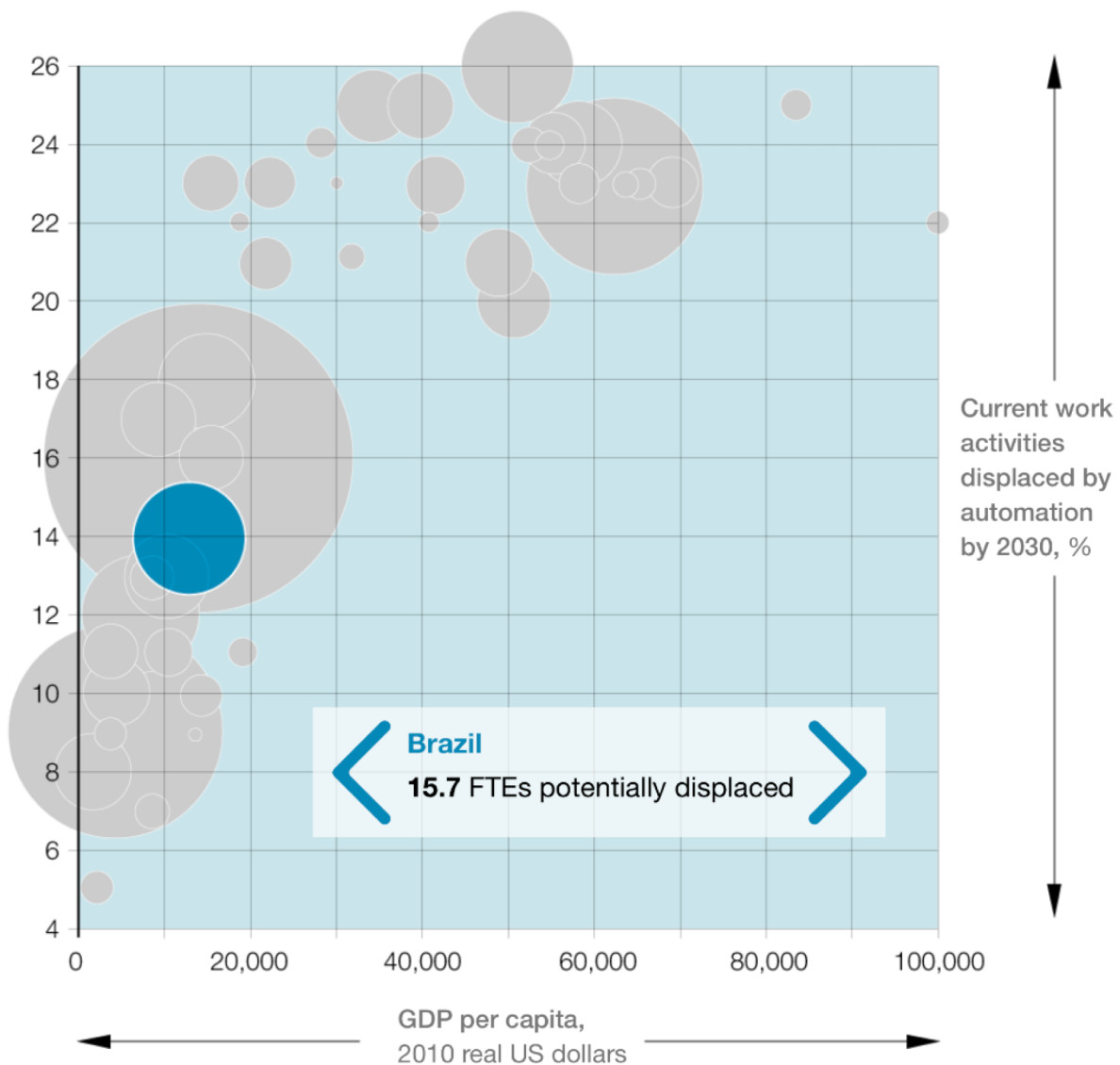
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Midpoint automation adoption. Full-time equivalents (FTEs) potentially displaced by 2030, millions



Estados Unidos

Brasil



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O que se sabe?

Mudanças no perfil do trabalho não eliminam necessariamente todo o posto de trabalho.

Parte da atividade tende a ser realizada por máquinas.

Avanço Digital produz crescimento da economia. Mas não está dado que todos serão beneficiados

Levels of Automation



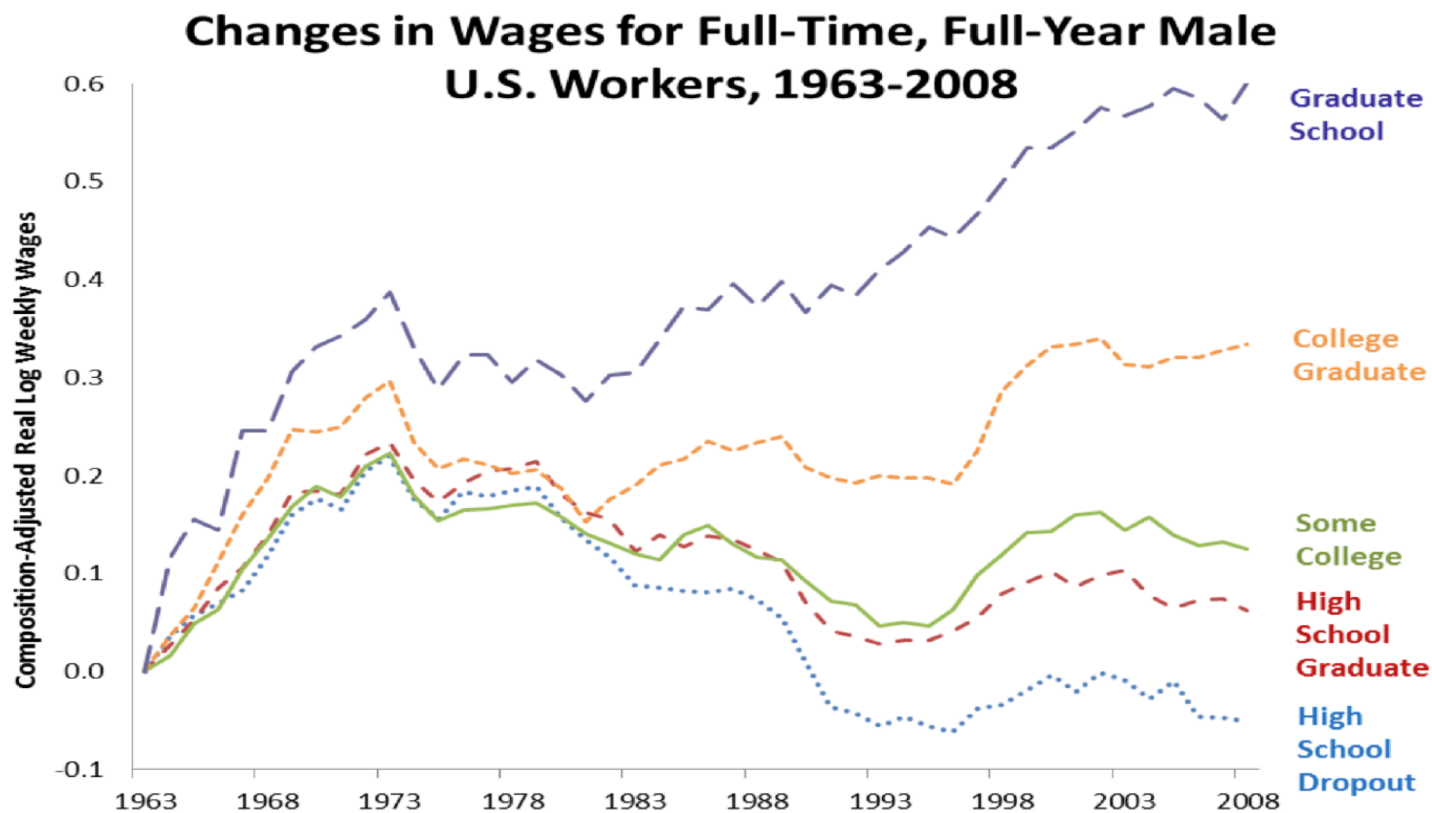
0	1	2	3	4	5
No Automation	Driver Assistance	Partial Automation	Conditional Automation	High Automation	Full Automation

Quem perde e quem ganha

Trabalhadores

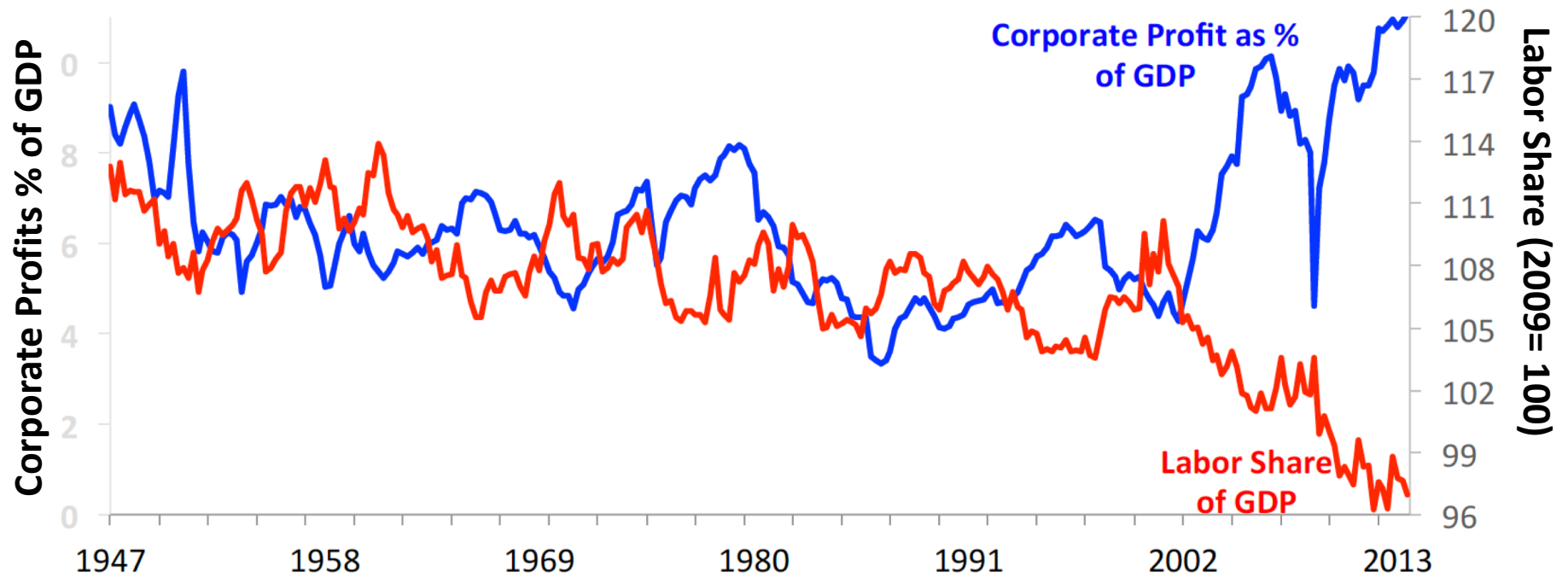
Alta qualificação X Média e Baixa qualificação

Contrastes



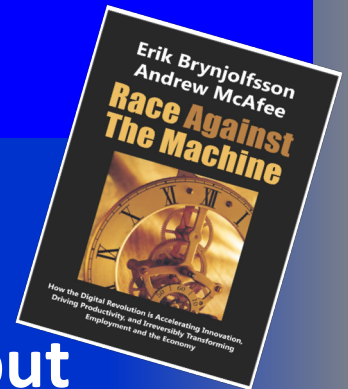
Capital X Trabalho

Corporate Profits After Tax as % of GDP & Non-Farm Labor Share, 1947-2013



O que precisamos aprender

- Futuro do trabalho depende do equilíbrio entre forças opostas. Até hoje, o pêndulo favoreceu humanos
- E amanhã?



“Digital technologies change rapidly, but organizations and skills aren’t keeping pace.

As a result, millions of people are being left behind.”

Economia Digital e Sociedade

- Os problemas colocados pelo ciclo tecnológico atual vão além do emprego
- Tocam nos alicerces das sociedades
- Pedem ação rápida, coesão e transparência das políticas públicas
- O Brasil (como a quase totalidade dos emergentes) tem participação marginal nesse ciclo. E esse distanciamento pode aprofundar ainda mais o posicionamento atual

O Brasil está fadado a ficar para trás?

- Não necessariamente
- Como as tecnologias ainda não estão maduras, há oportunidades para acelerar e saltar etapas no caminho do desenvolvimento

Obrigado