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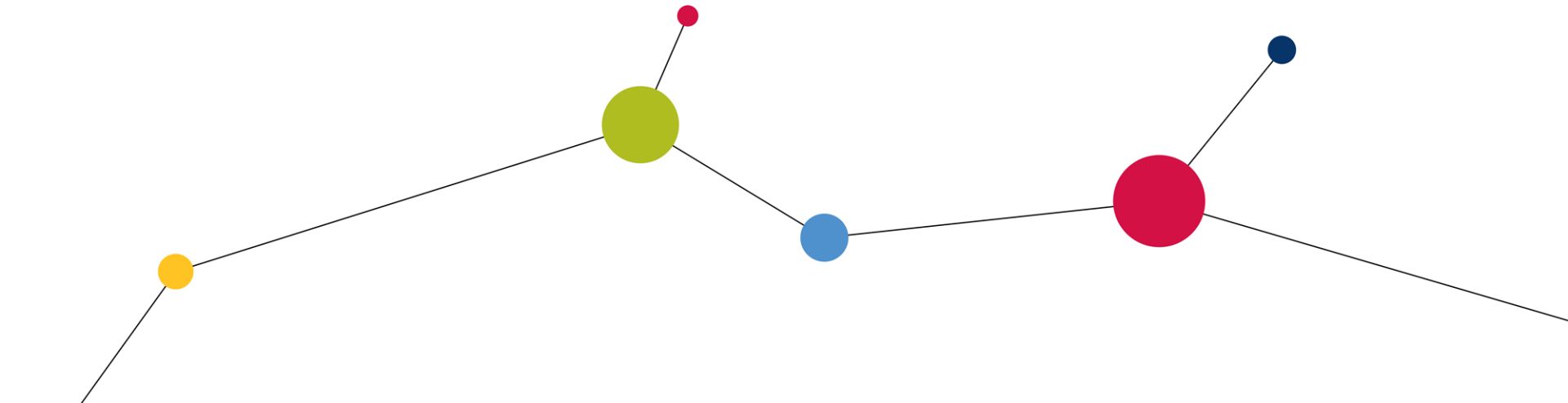
The Future of Work:
Is This Time Different?

Carl Benedikt Frey



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“Civilization is pursuing two precisely opposite goals at one and the same time. On Mondays, Wednesdays and Fridays it invents new methods of abolishing labour, and on Tuesdays, Thursdays and Saturdays new labours to relieve the consequent unemployed.”—Fredrick Soddy

Occupations that disappeared – a few examples

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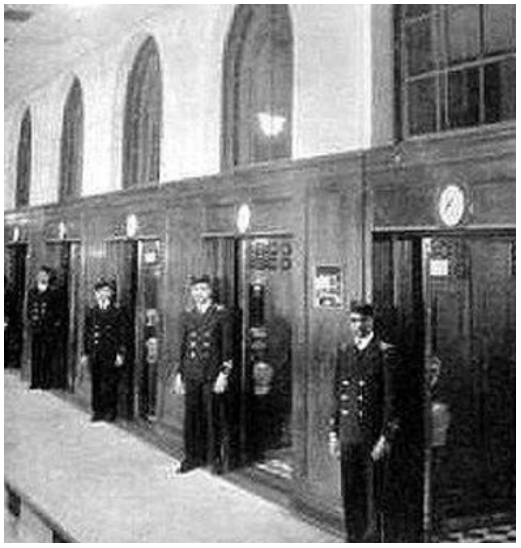
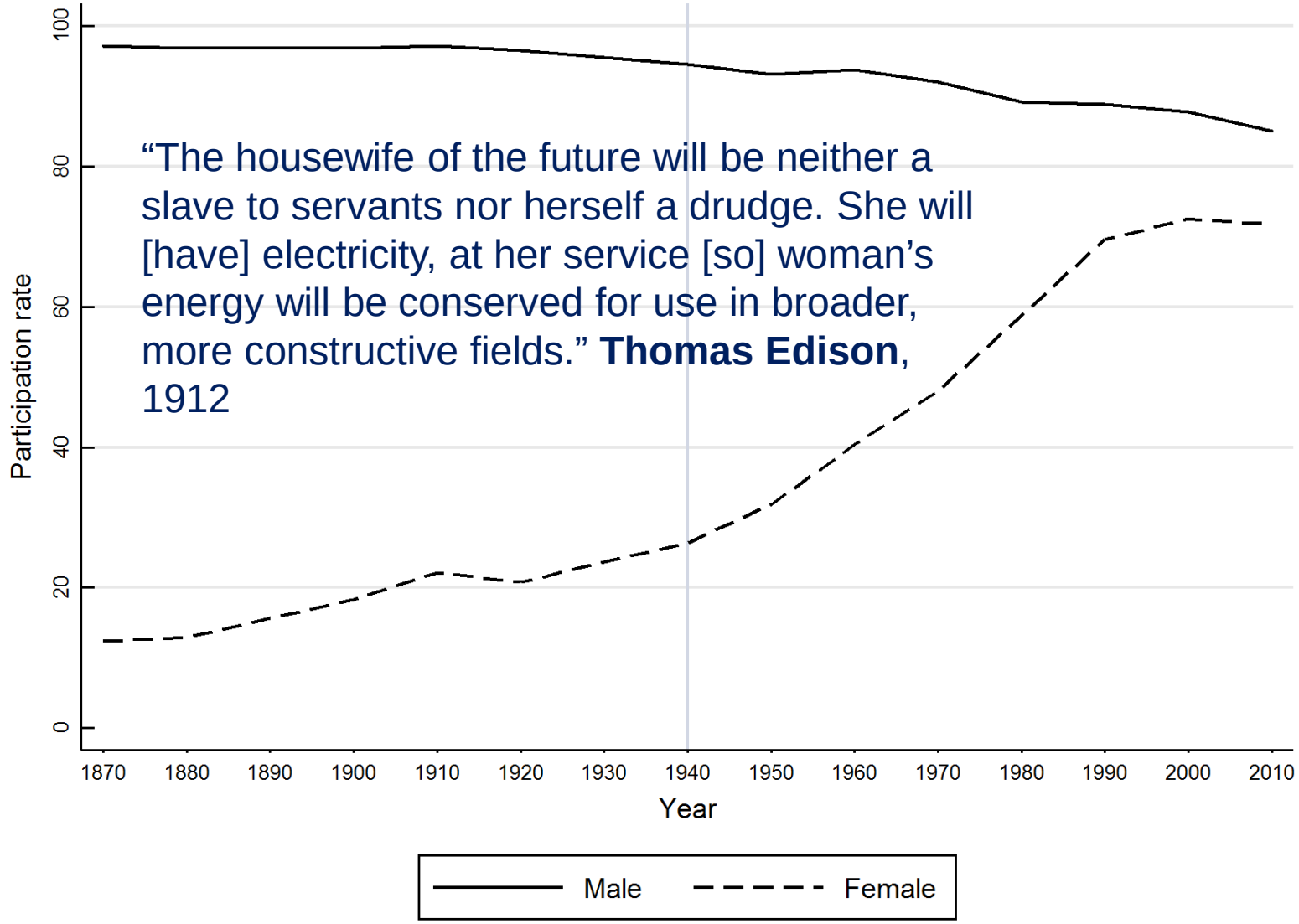


More jobs than ever – labour force participation



The cost of computing

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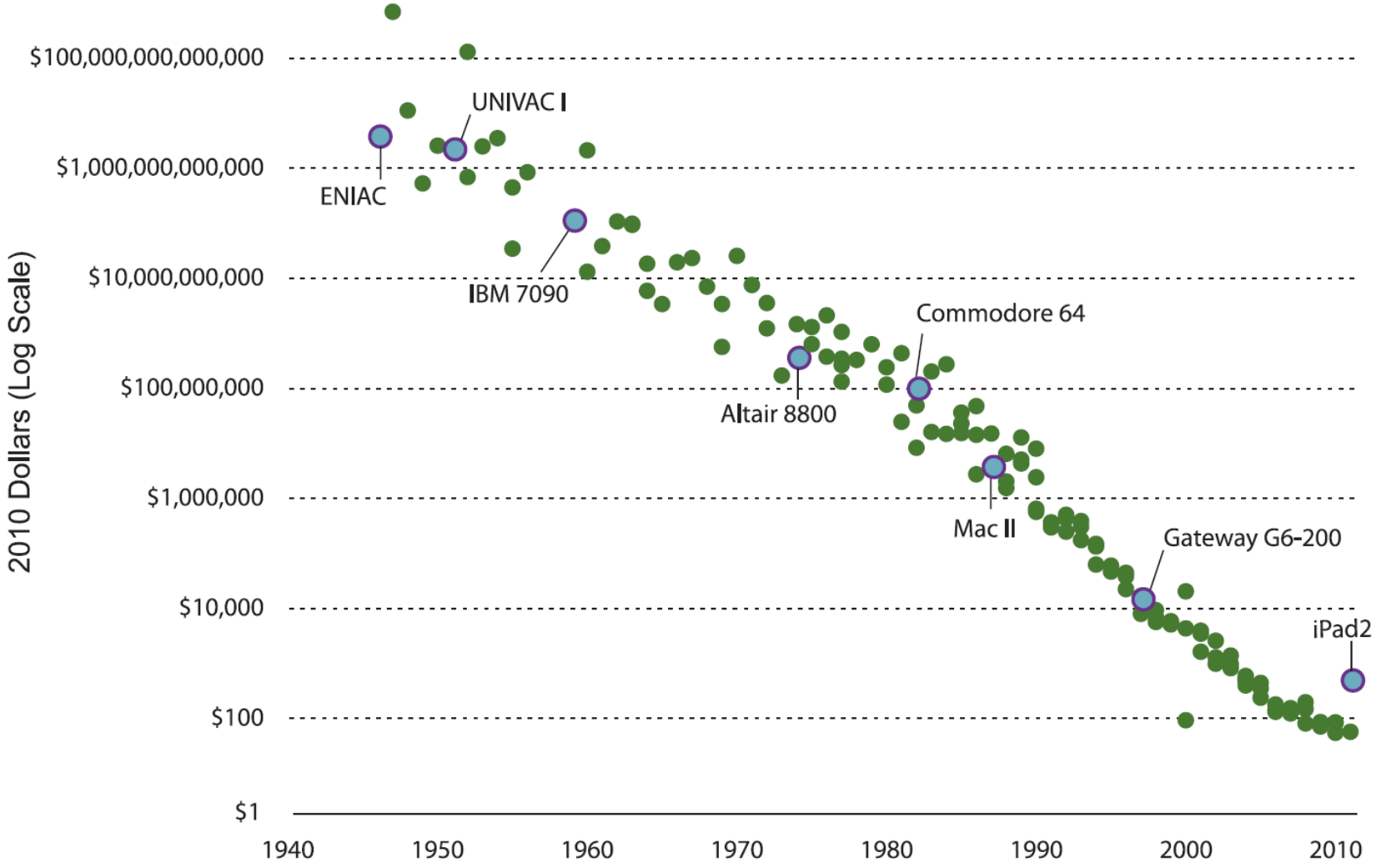

What computers do

The expanding **scope** of computers

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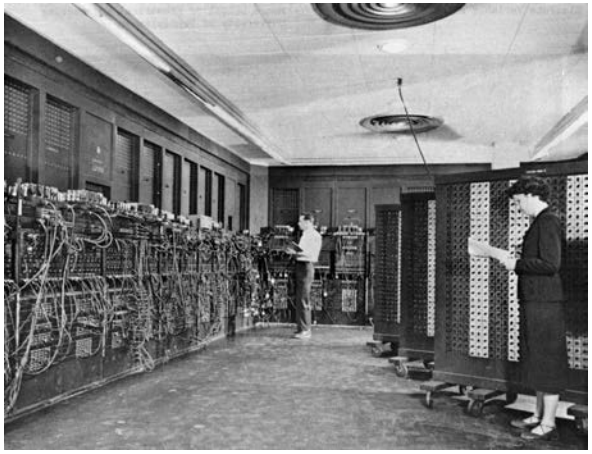
Human computers
performing mathematical calculations

"The human computer is supposed to be following fixed rules; he has no authority to deviate from them in any detail." (Turing, 1950)

Electronic computers
performing routine tasks:

- **Calculation**
- **Repetitive customer service**
- **Picking or sorting**
- **Repetitive assembly**



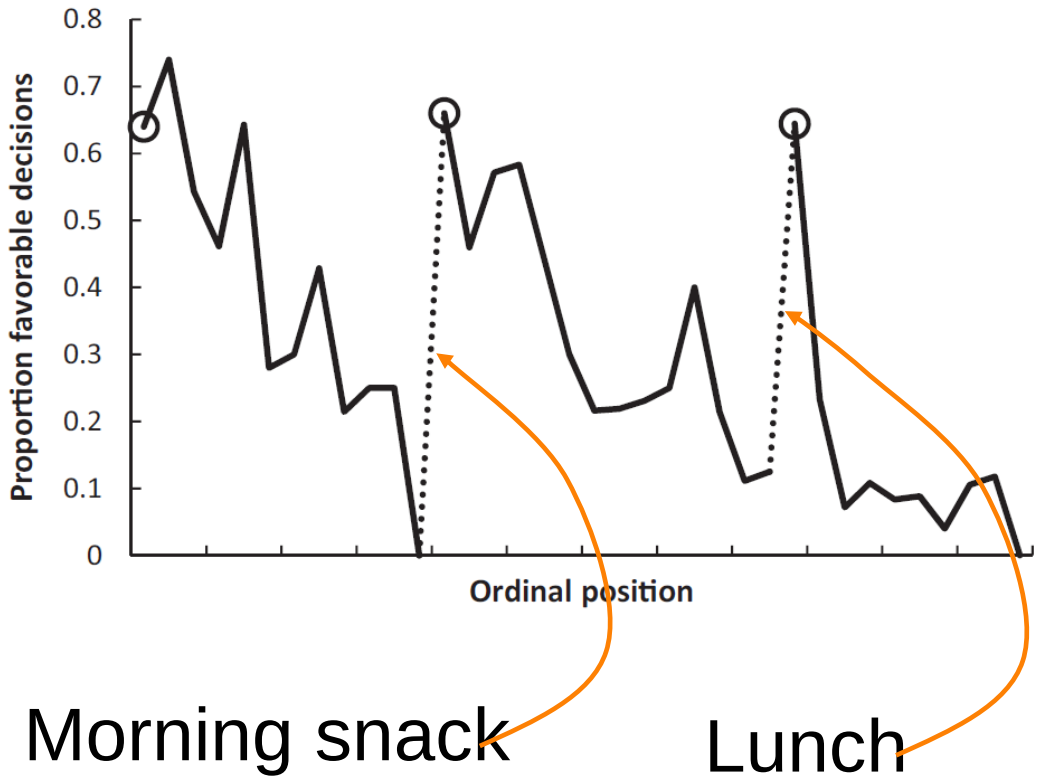
Machine learning algorithms
performing **non-**routine tasks:

- **Medical diagnostics**
- **Document review**
- **Translation**
- **Driving**

Google Translate

Break through language barriers.

Human workers are not infallible either…



Israeli judges are significantly more lenient after a food break (Danziger et al 2011).

What computers do **not** do

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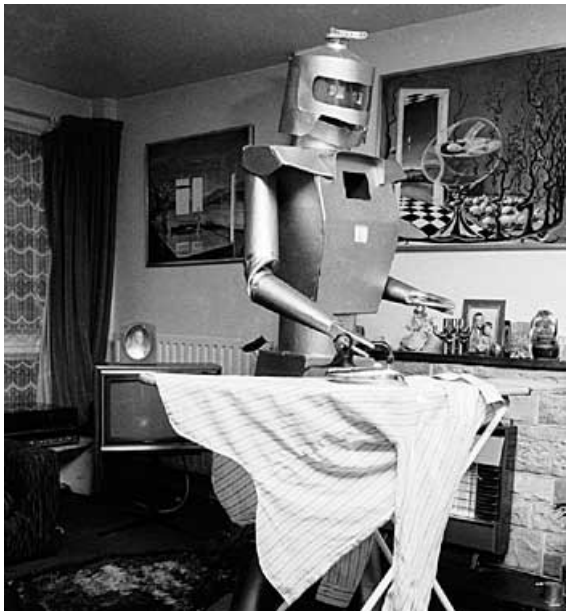
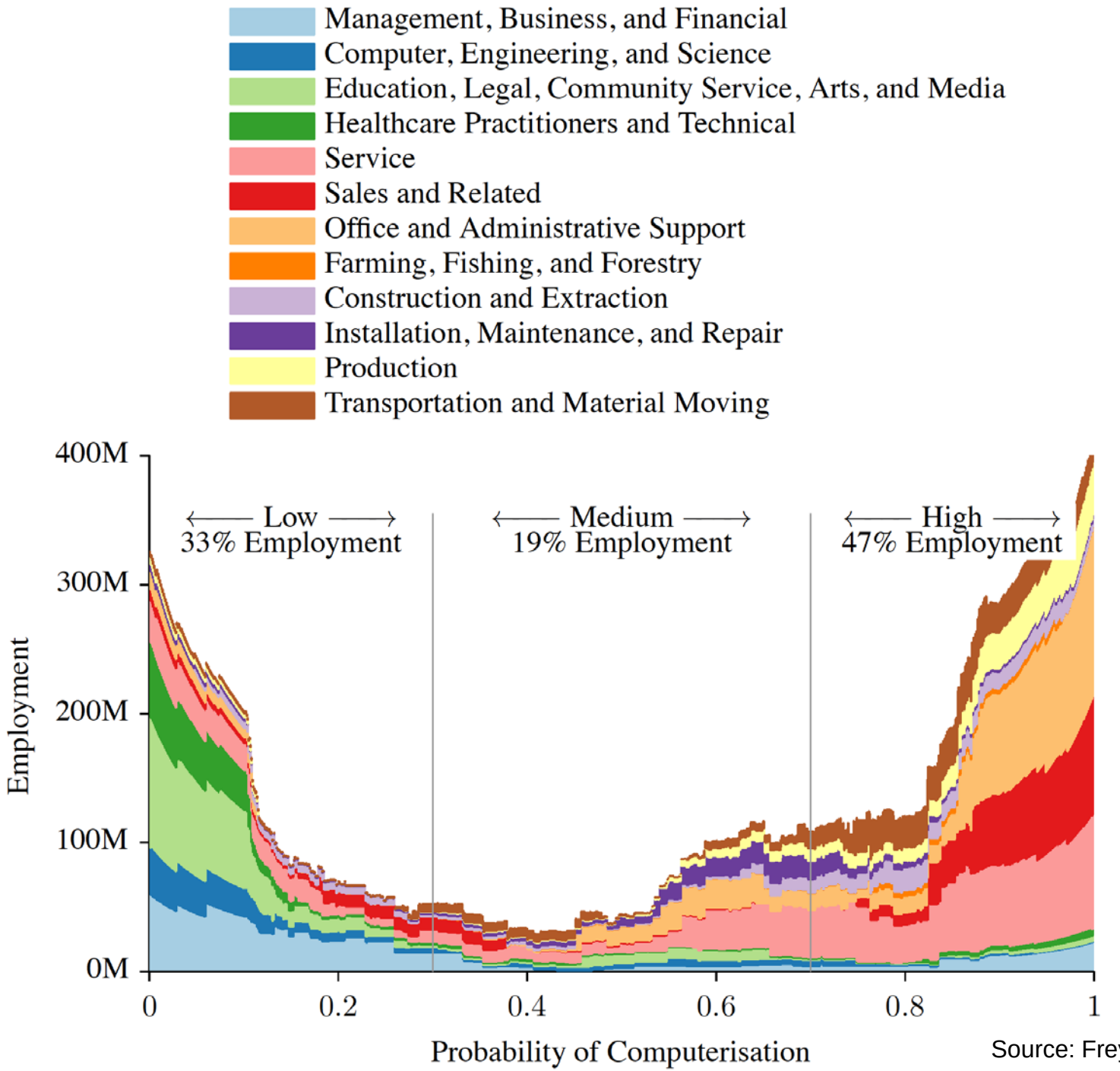
"God gave the easy problems to the physicists" —Niels Bohr

Creativity

Social intelligence

Perception and manipulation





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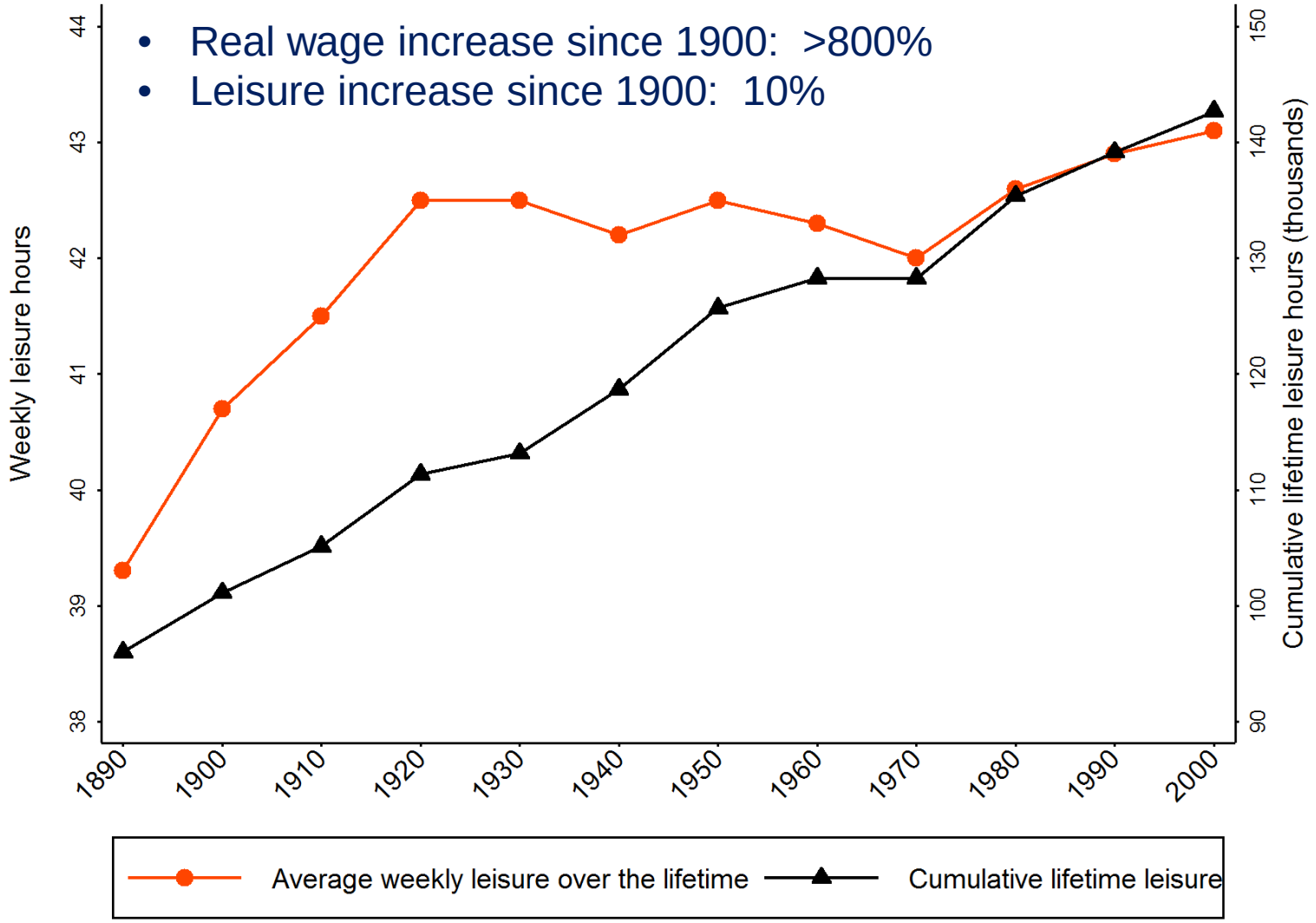
Source: Frey & Osborne (2017)

Preparing for a life of leisure?



Source: Ramey & Francis (2009)

Who gains from progress?

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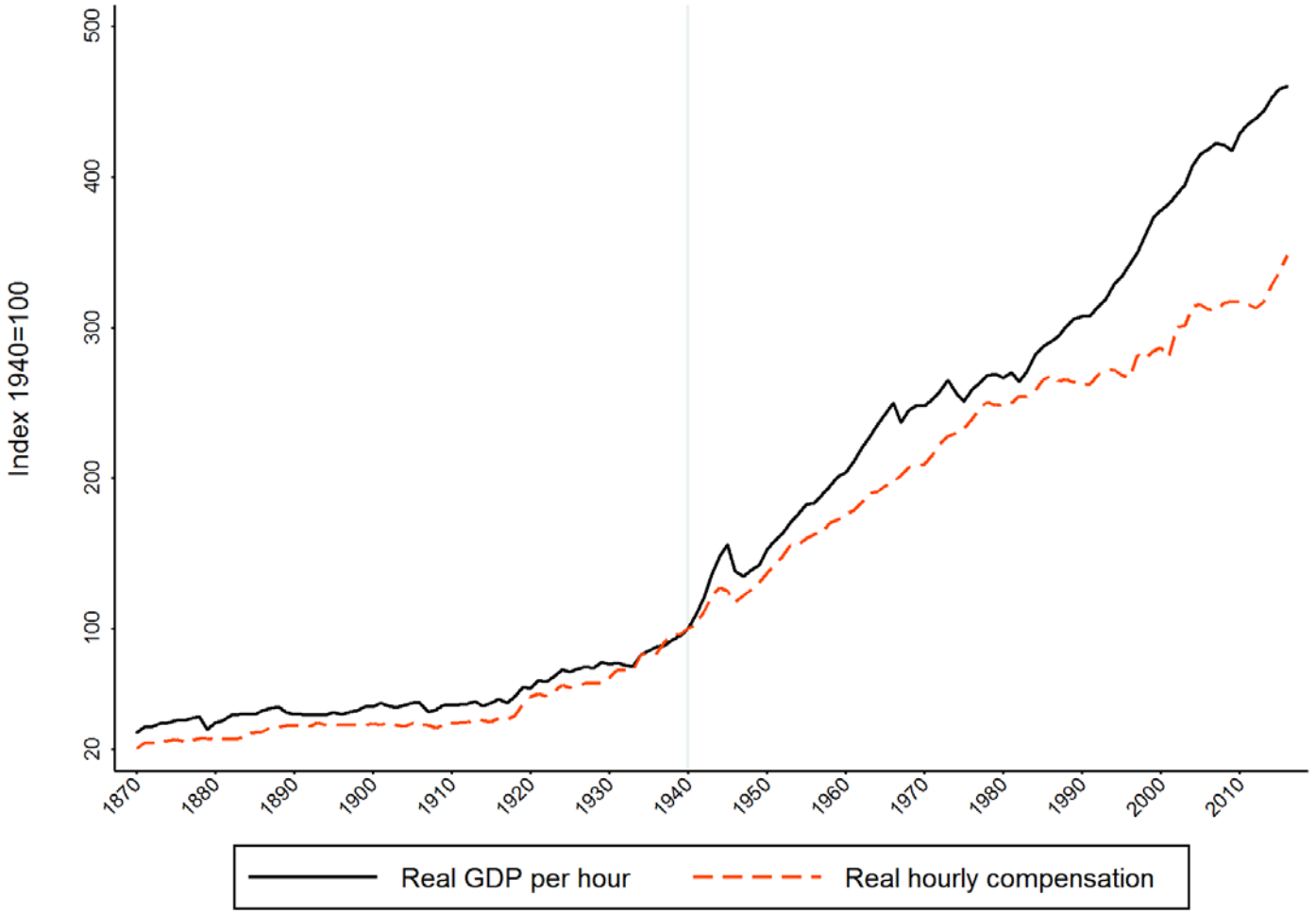
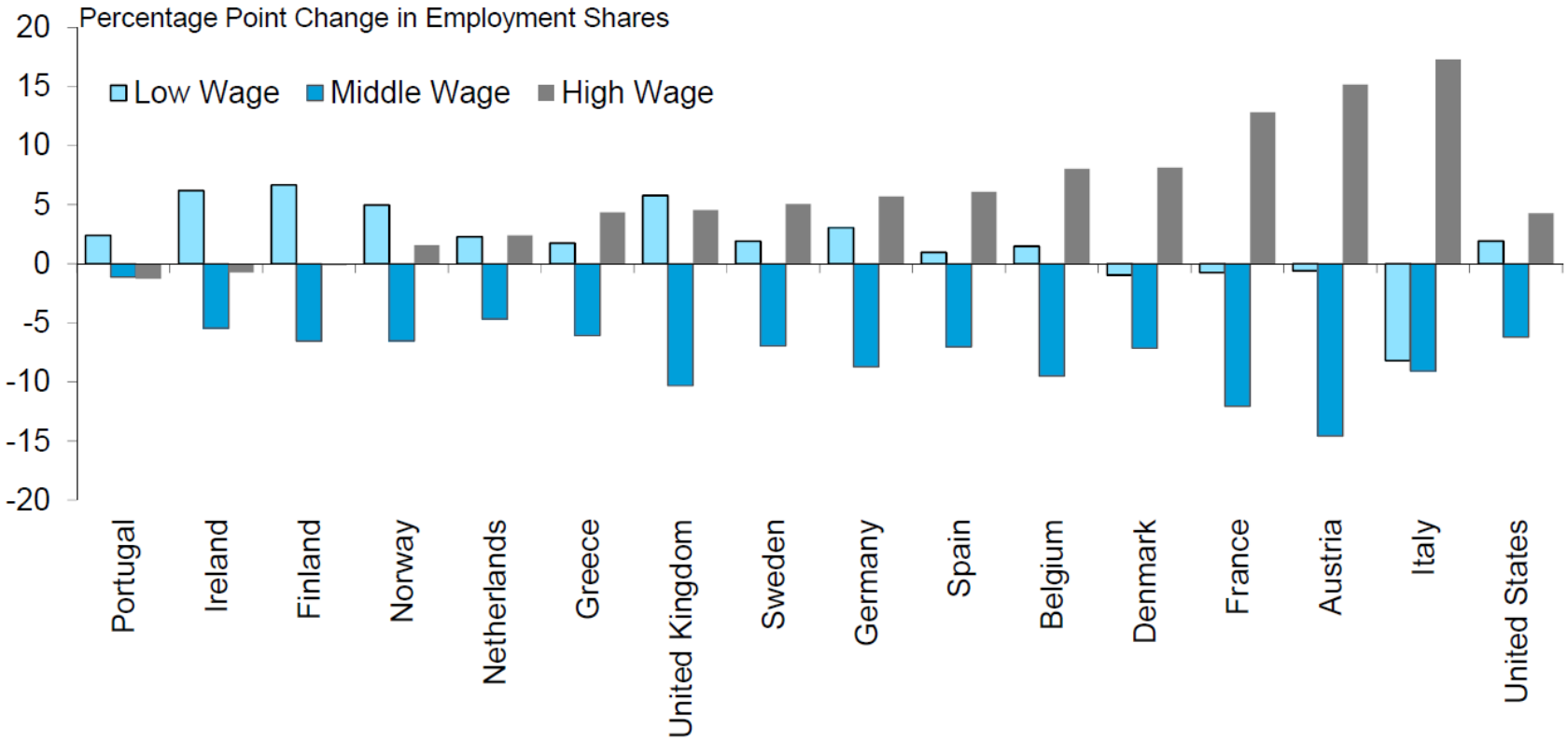


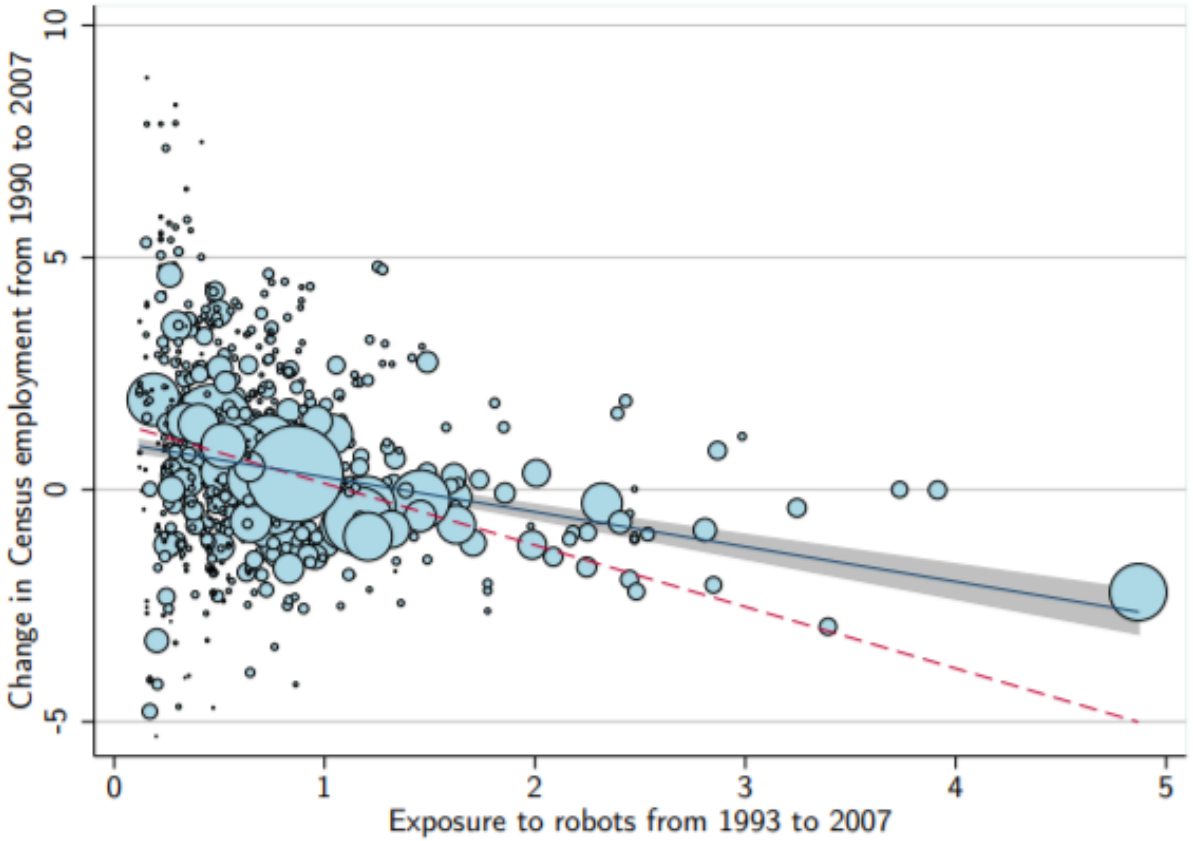
The winners and losers of automation

Polarization of labour markets (high-income countries)



Source: Autor (2010)

Robots and nonemployment



Source: Acemoglu & Restrepo (2017)

The winners and losers of automation

The displacement of the artisan

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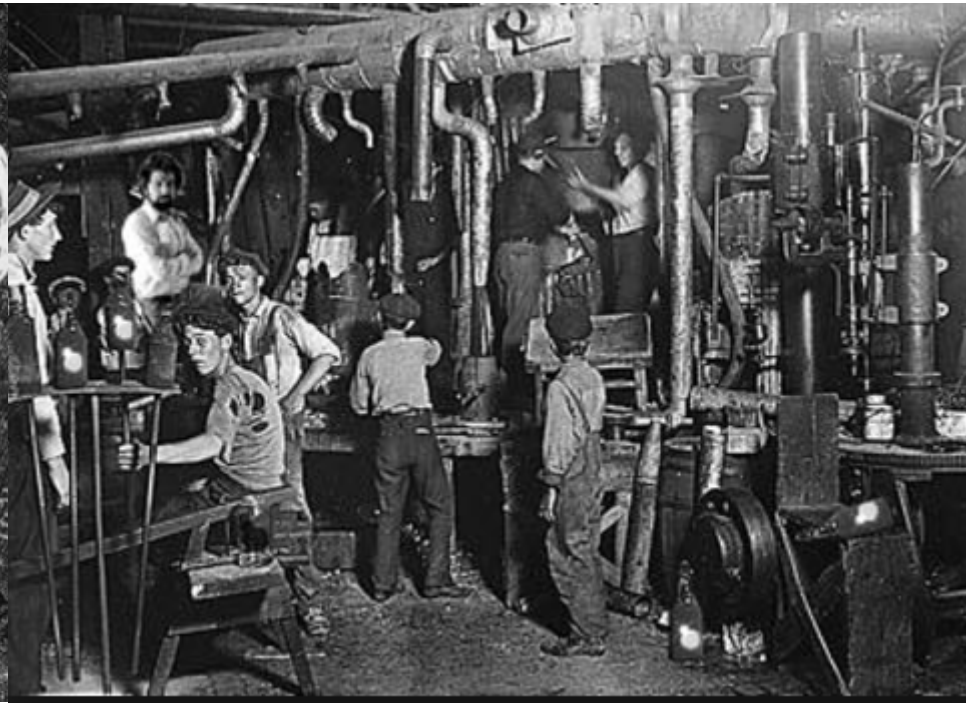
"Even in the present day [...] it is found to be nearly impossible to convert persons past the age of puberty […] into useful factory hands."

— Andrew Ure (1835)



History in repeat? A tale of two Industrial Revolutions

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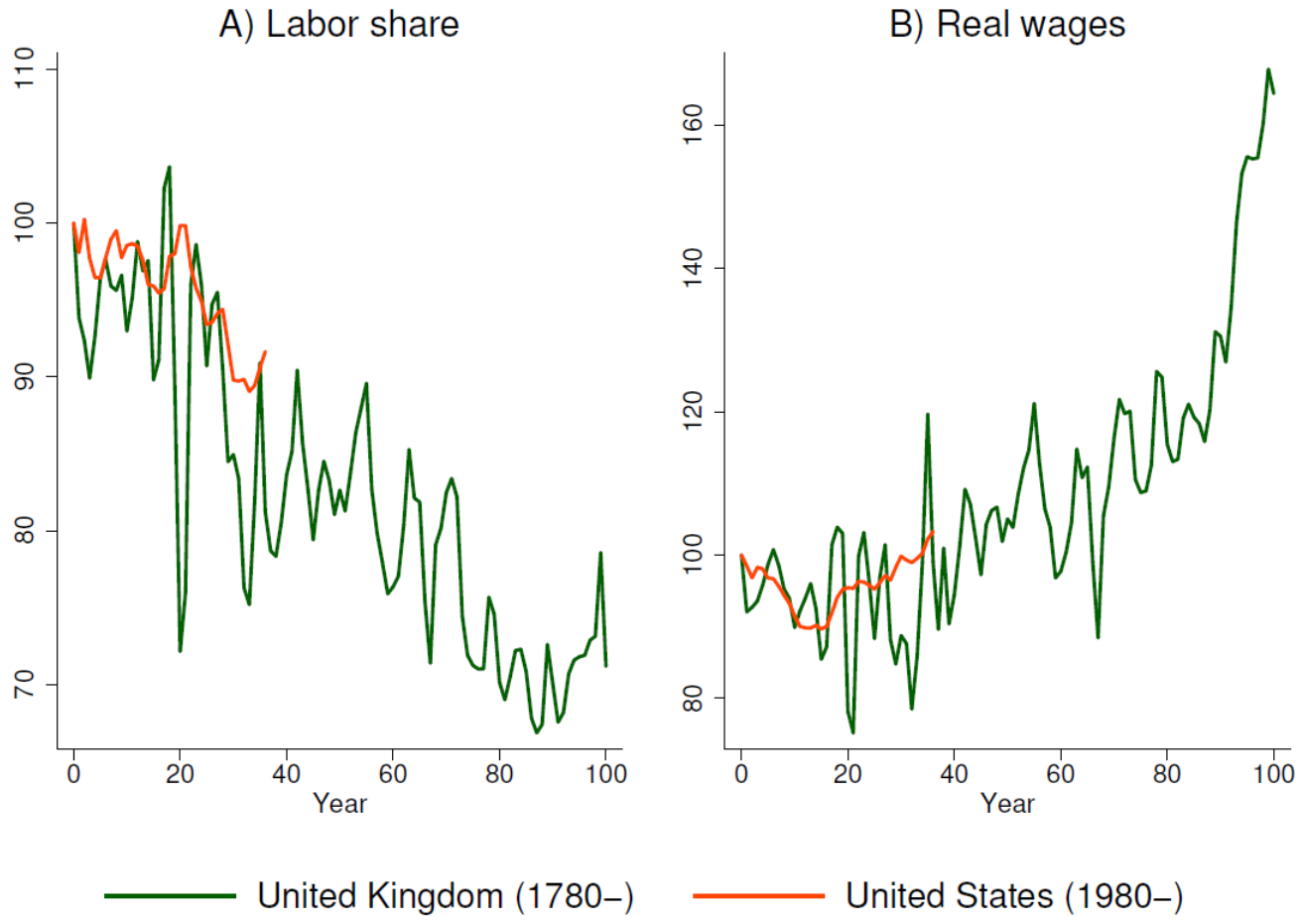

A Wave of Machinery Riots

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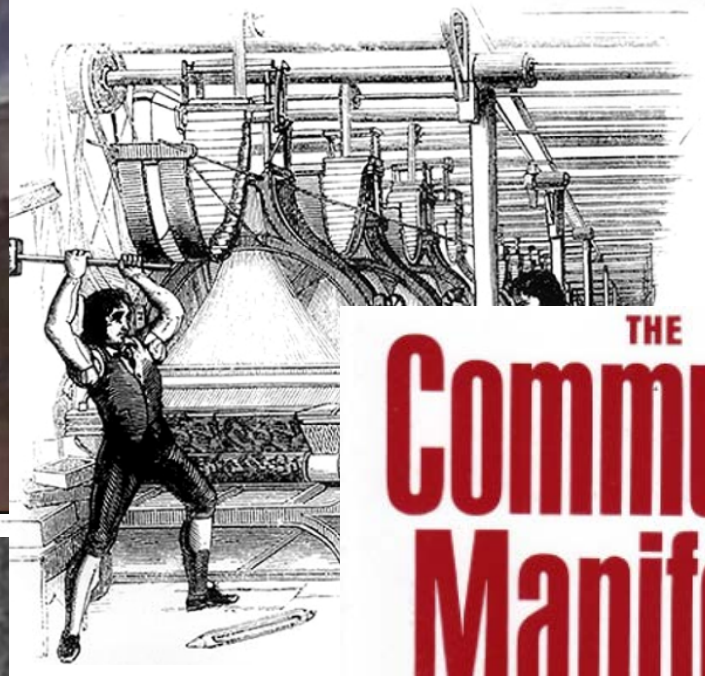
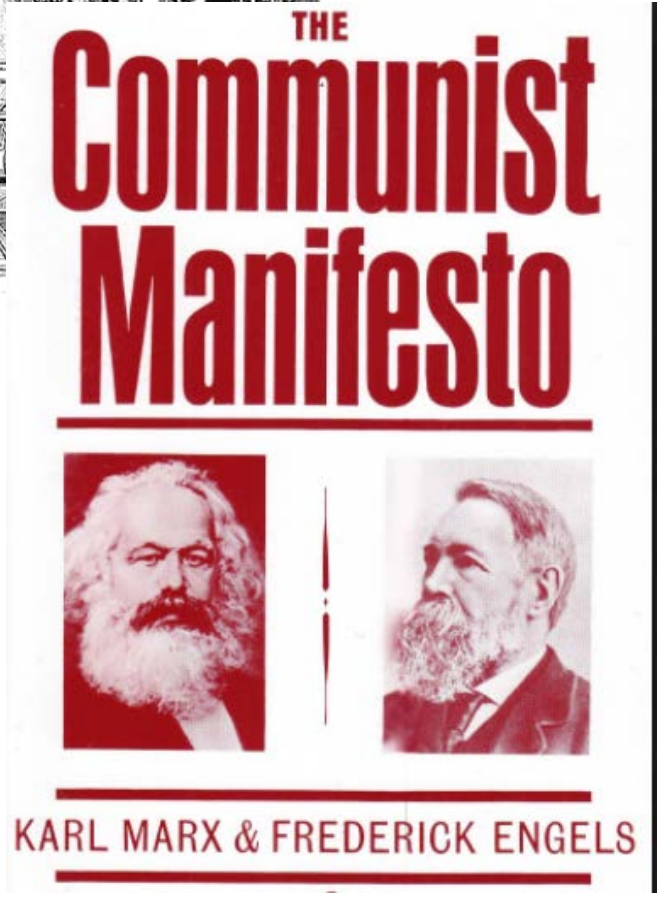
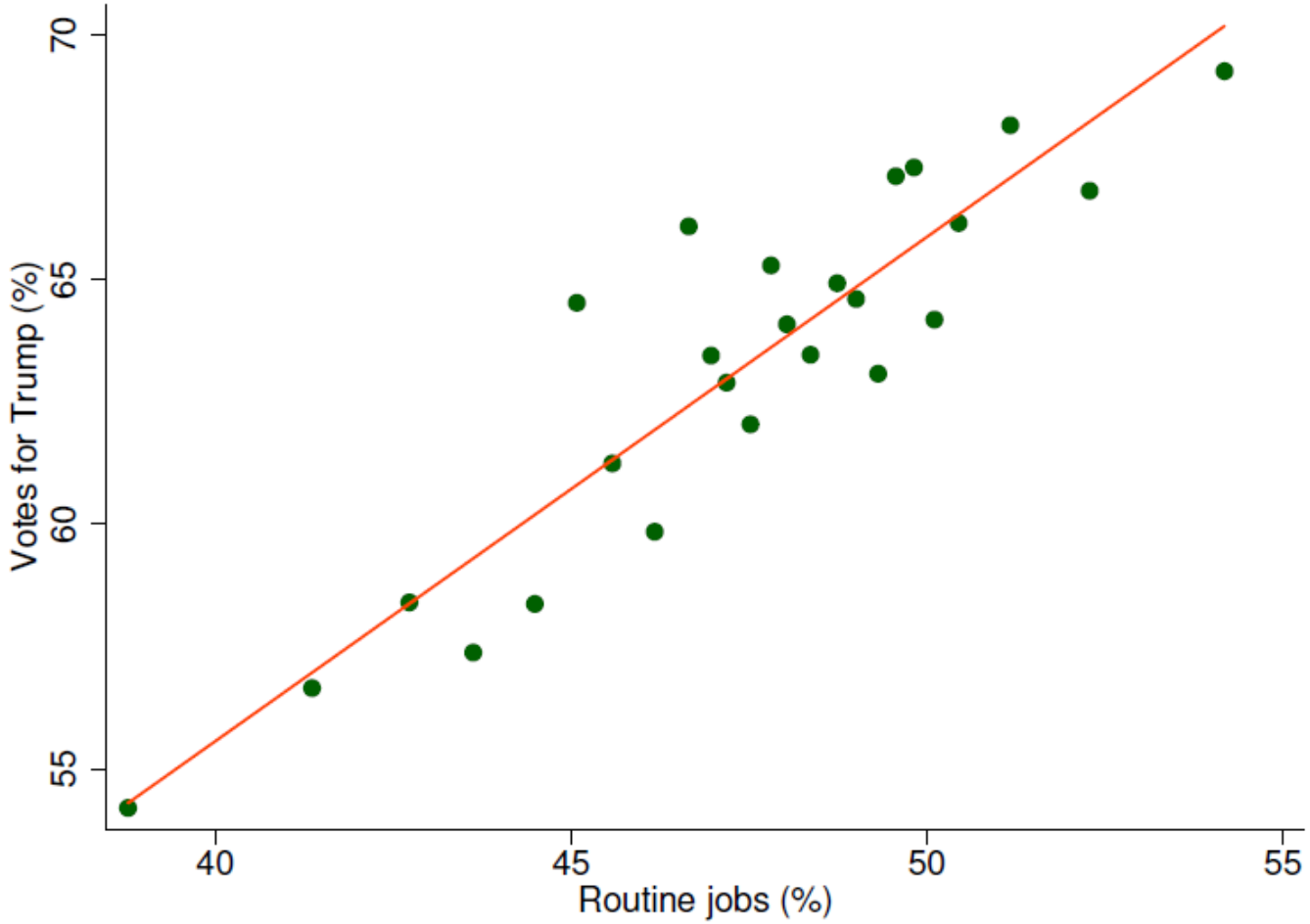


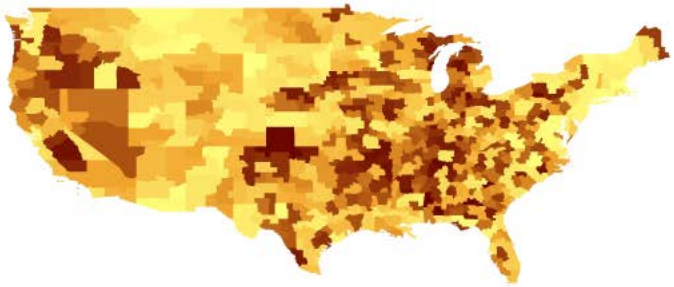


The 2016 U.S. Presidential Election: A Modern Equivalent?

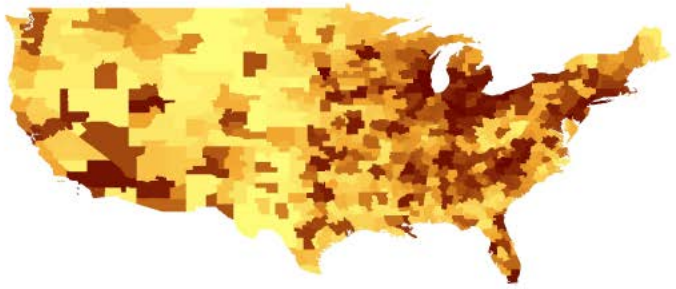


A Growing Challange

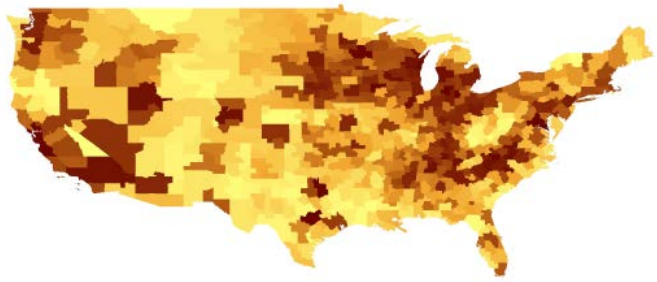
Past and present patterns of automation



Exposure to automation



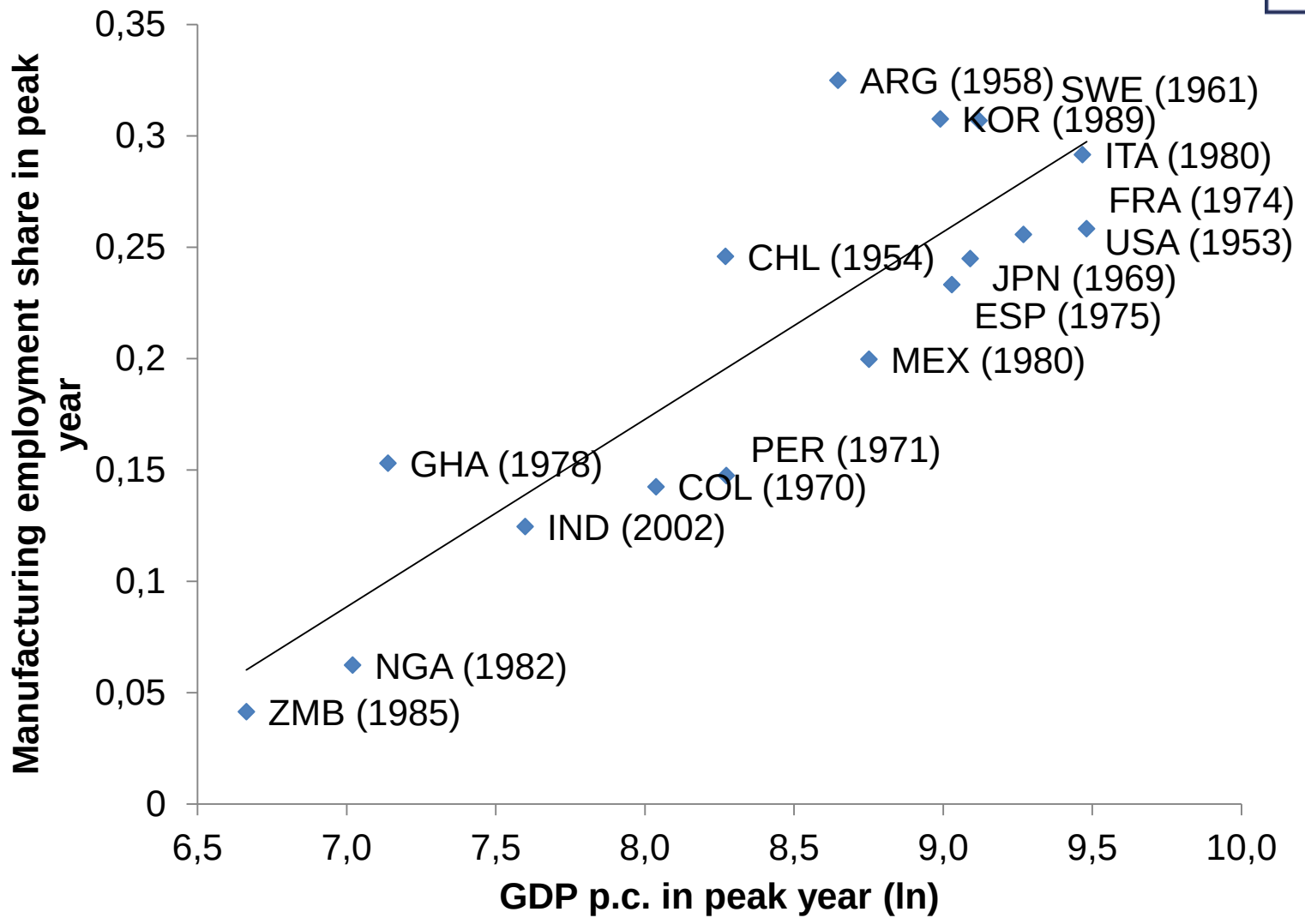
Routine share



Exposure to offshoring

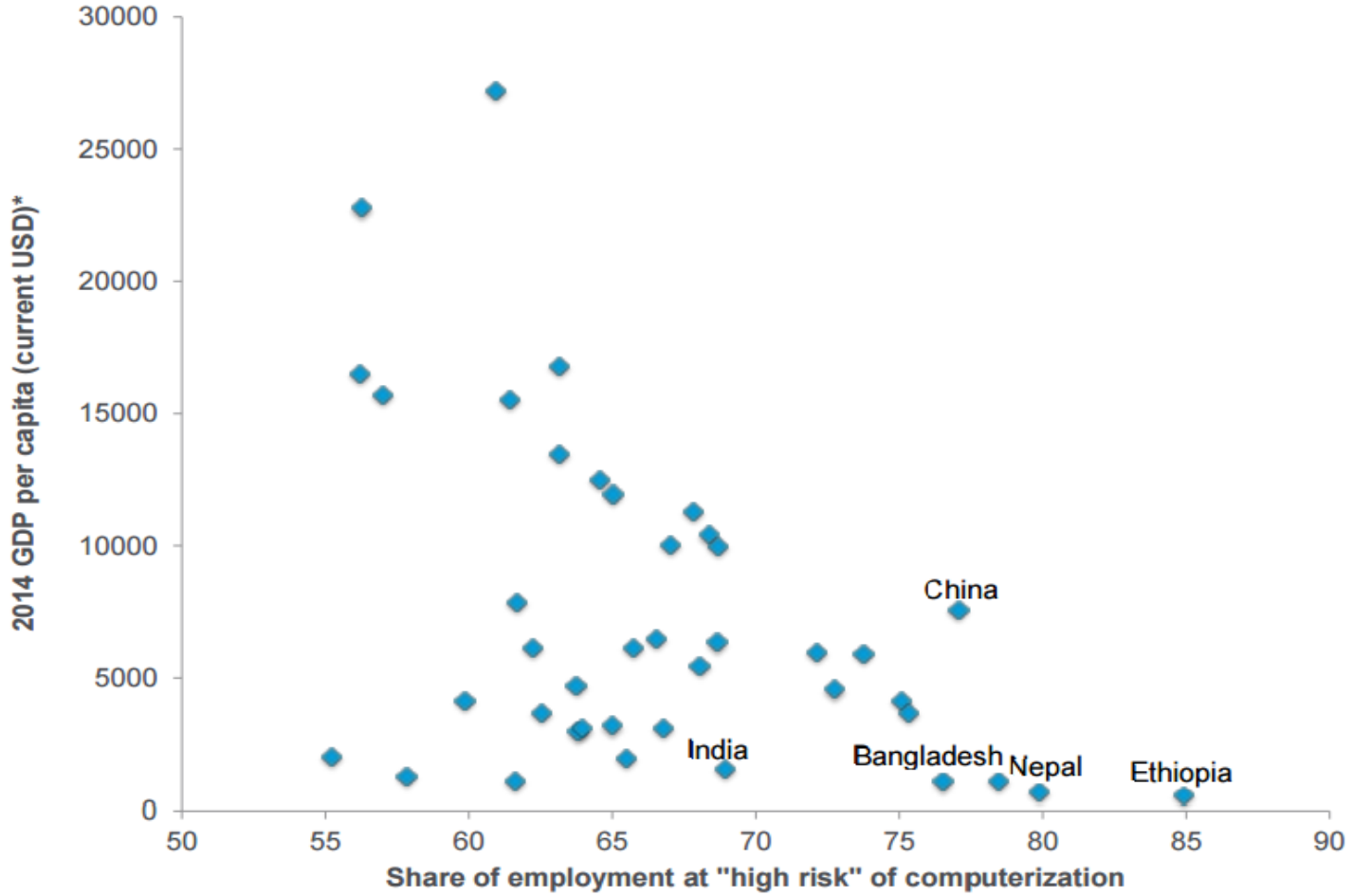
Source: Berger & Frey (2014)

The end of industrialization?



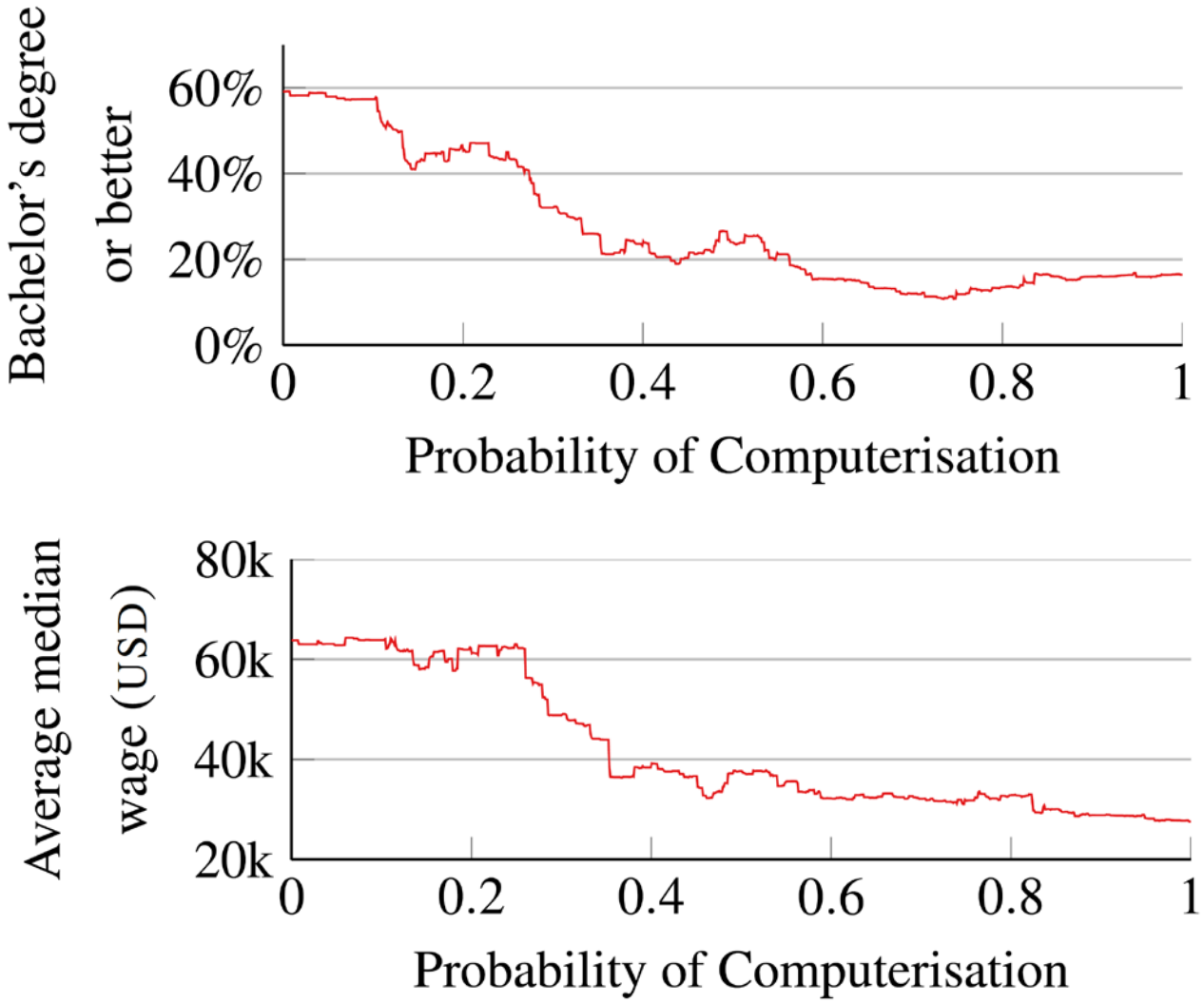
Who gains from technological progress?

The exposure of low-income countries



Source: World Bank Development Report 2016; World Bank national accounts data.
Note: For Angola and Malta 2013 GDP per capita figures were used, Citi Research

Education: Low-skilled jobs at risk of automation

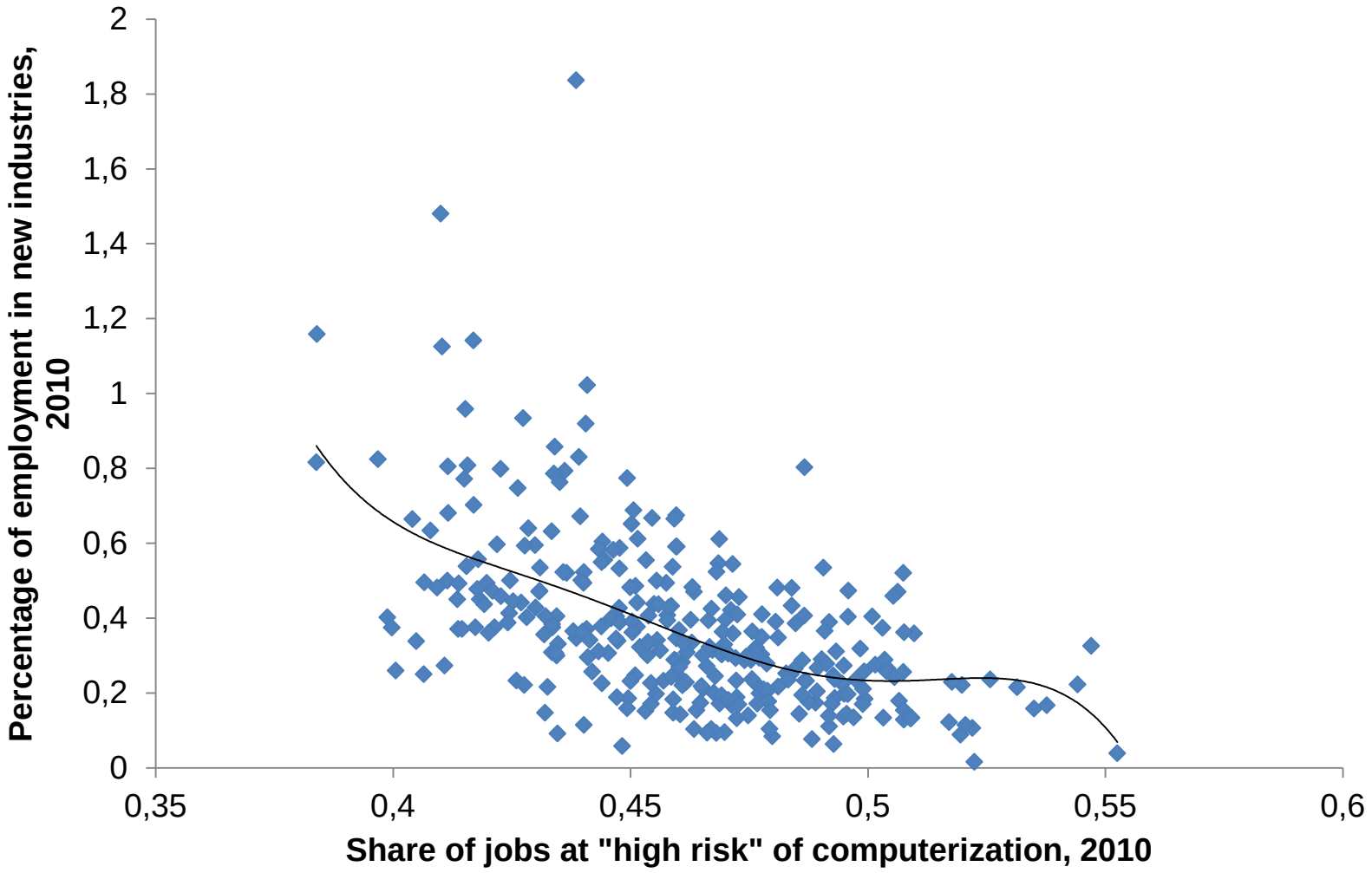


Education: Jobs that did not exist in 2000

Detailed industry (examples)	% of US Employment	% with college degree	Avg. Wages ($)
Internet publishing and broadcasting	0.06	69.6	81,138
Electronic shopping	0.08	49.7	45,372
Data processing, hosting, and related services	0.08	48.0	64,729
Electronic auctions	0.01	52.2	47,257

Source: Berger & Frey (2015)

Relocation: The geography of new jobs



Could there be a jobless future?

"I believe in the horse. Automobiles are a passing phenomenon."
- Kaiser Wilhelm II

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