

Perpetual Anxiety
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Demand
○○○○○

Production
○○○○

Technology
○○○

Human Capital
○○○

Markup
○○○○○○○○○○○○

End
○

What do you humans want?

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University College London

UCL

June 4, 2019



ANXIETY ABOUT TECHNOLOGY

*“What worries many job experts more is that automation may prevent the economy from creating enough new **jobs**...”*

The Automation Jobless. TIME magazine story dated February 24, 1961.

*“The basic fact is that technology eliminates jobs, not **work**.”*

Bowen, 1966. Report of the National Commission on Technology, Automation, and Economic Progress.

QUESTION ABOUT FOOD FROM 1950s PERSPECTIVE.



QUESTION ABOUT FOOD FROM 1950s PERSPECTIVE.



A consumer can perceive goods to be substitutes or complement
Choosing between goods:

Substitutes: very sensitive to price

Complements: less sensitive to price change

SUBSTITUTES AND COMPLEMENTS

Choosing between goods:

Substitutes: very sensitive to price

Complements: less sensitive to price change

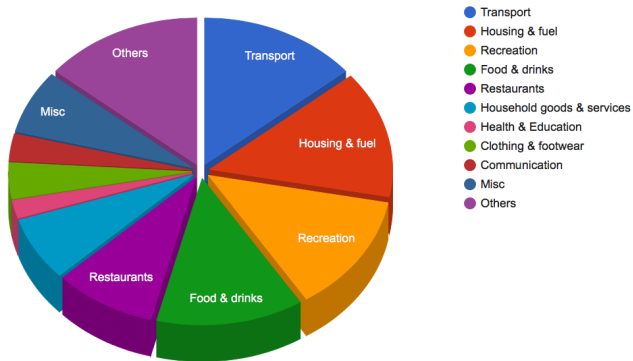
Can bundle *substitutes* into a category, but not *complements*.

Do consumers perceive automated goods to be substitutes or complements?

Does price and market power matter?

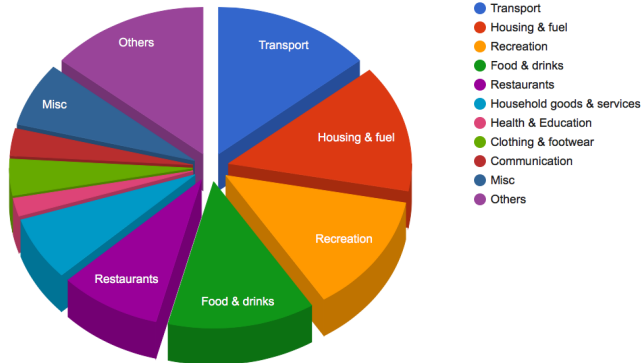
UK EXPENDITURE DATA 2016

Average UK household expenditure, 2016



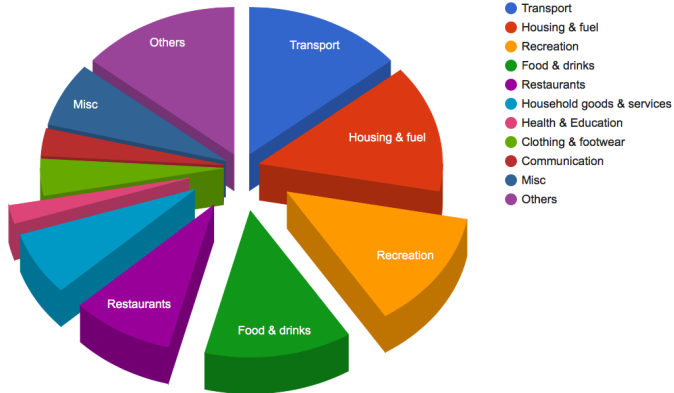
UK EXPENDITURE DATA 2016

Average UK household expenditure, 2016

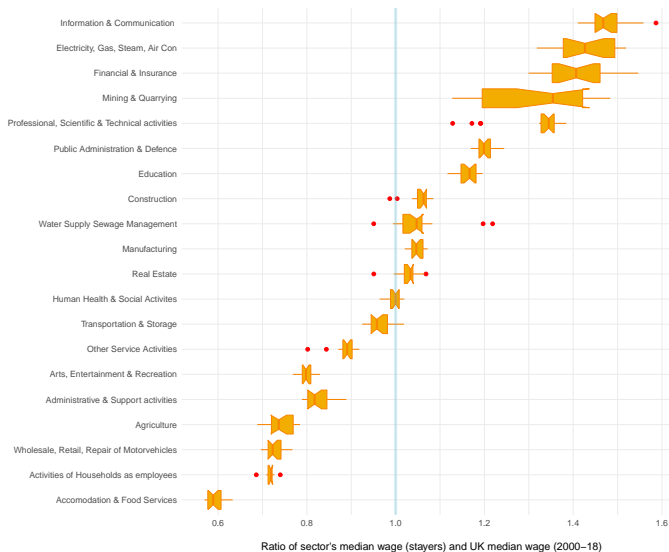


UK EXPENDITURE DATA 2016

Average UK household expenditure, 2016



SECTOR-WISE RELATIVE WAGE IN UK, 2000-2018



PRODUCTION: MACHINES VERSUS HUMANS

<i>Machines</i>	<i>Humans</i>
<i>Repetitive tasks</i>	<i>Copycats</i>
<i>Require explicit pathways</i>	<i>Contrarians</i>
<i>Problem interfacing humans</i>	

substitutes or complements

does skill-adjusted wage play a role

KASPAROV VERSUS IBM'S DEEP BLUE



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KISSINGER'S CONSTRUCTIVE AMBIGUITY



1820 The first *mass-produced calculator* invented by Charles Xavier Thomas

1822 Charles Babbage designs his first *mechanical computer*

1835 *Morse code* invented by Samuel Morse

1837 *Electric telegraph* invented by Charles Wheatstone & Samuel Morse

1873 Christopher Sholes invents the Remington *typewriter*

1877 *Microphone* invented by Emile Berliner

1888 Hertz produces *radio waves*

1893 *Wireless communication* invented by Nikola Tesla

1895 Radio signals were invented by Guglielmo Marconi

1919 James Smathers develops the first *electric typewriter*

1923 *Sound film* invented by Lee DeForest

1924 Electro Mechanical *television* system invented by John Logie Baird

1927 Philo Farnsworth invents *video camera tube*

1937 *Alan Turing* develops the concept of a *theoretical computing machine*

1971 *E-mail* invented by Ray Tomlinson

1973 *Ethernet* invented by Bob Metcalfe and David Boggs

1973 *Personal computer* invented by Xerox PARC

TECHNOLOGICAL PROGRESS

Dynamic complementarities: when complementarities between inputs span across time

realising the full benefits from one invention relies on other seemingly unrelated invention

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1973 *Personal computer* invented by Xerox PARC

1990 *World Wide Web* invented by *Tim Berners-Lee*

HONING THE HUMAN CAPITAL

Chetty (2014)

Duflo (2001)

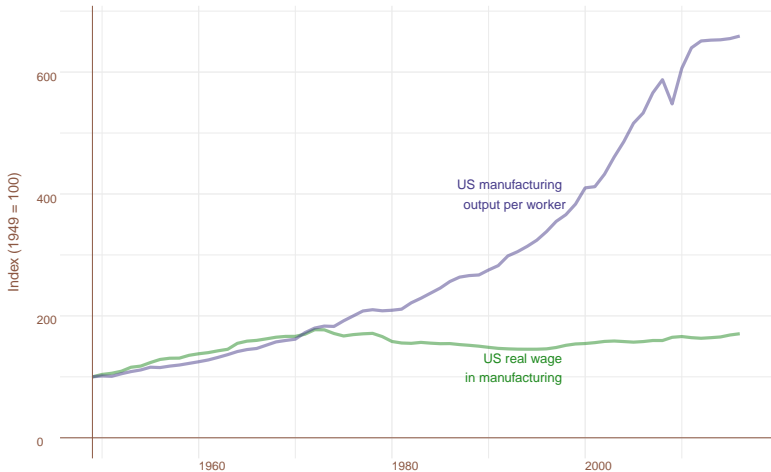
Heckman and Cunha's framework:

Self-productivity channel

Dynamic complementarity

Early broad based education allows workers to be more flexible to move across jobs.

OUTPUT PER WORKER AND WAGE



OUTPUT PER WORKER AND WAGE, UK



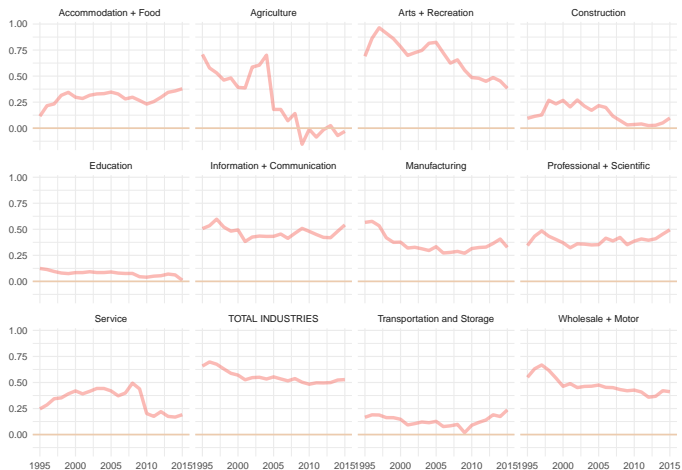
MARKUP OVER WAGE

A measure to capture the role *human labour* plays in the production process.

$$\textit{Markup over wage} = \frac{\text{Output per worker} - \textit{wage}}{\textit{wage}}$$

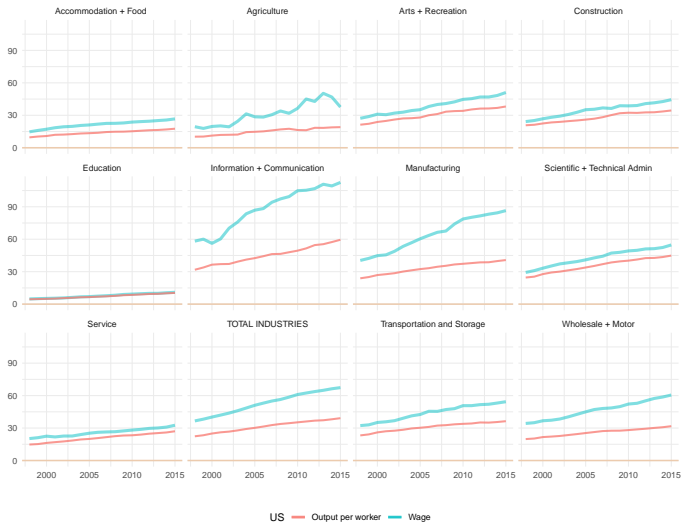
Easier to compute if firm level data is not available.

MARKUP OVER WAGE FOR UK



UK — Output per worker as a markup on wage

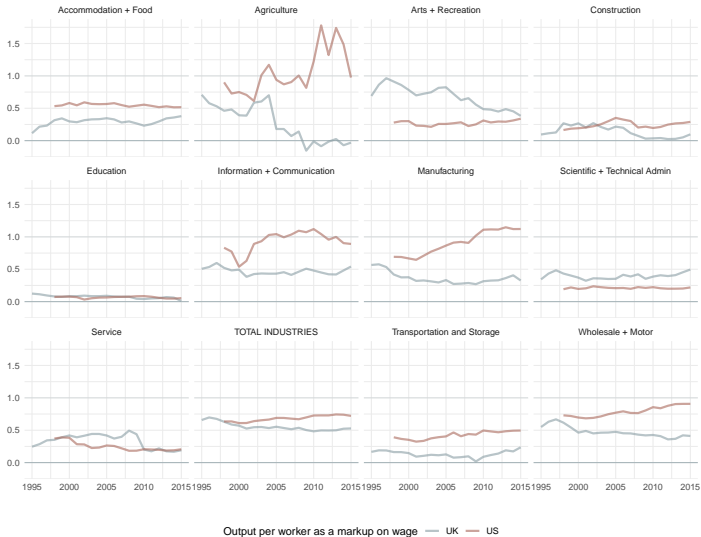
OUTPUT PER WORKER AND WAGE, US



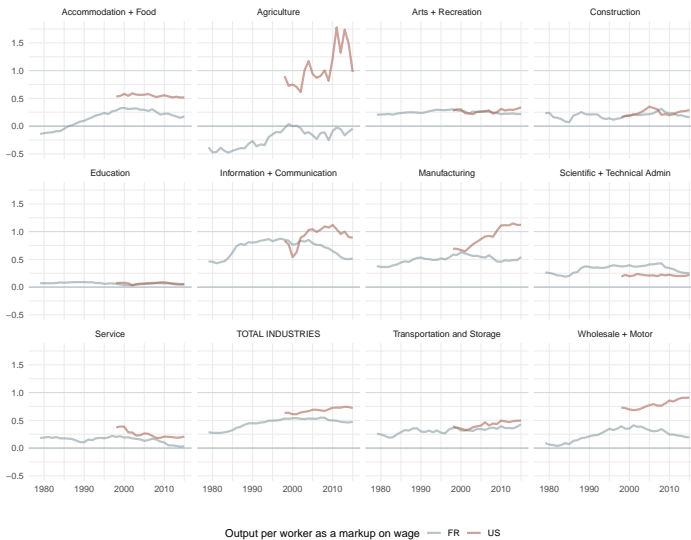
MARKUP OVER WAGE FOR US



MARKUP OVER WAGE: US VERSUS UK



MARKUP OVER WAGE: US VERSUS FRANCE



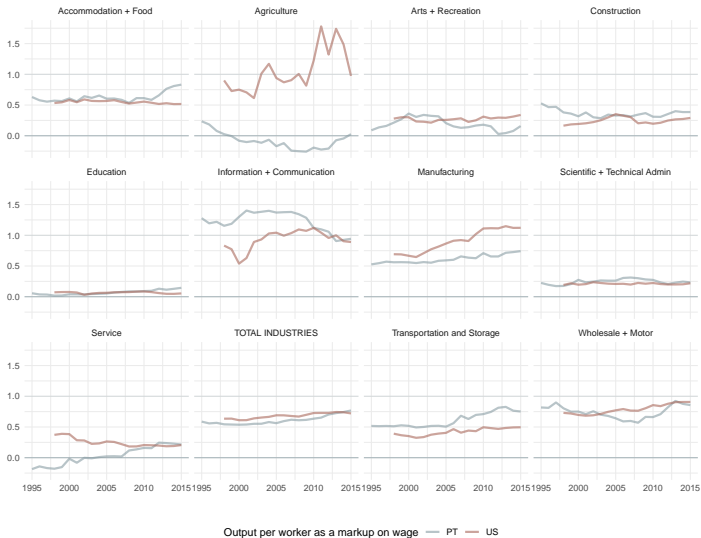
MARKUP OVER WAGE: US VERSUS EURO AREA



MARKUP OVER WAGE: US VERSUS SWEDEN



MARKUP OVER WAGE: US VERSUS PORTUGAL



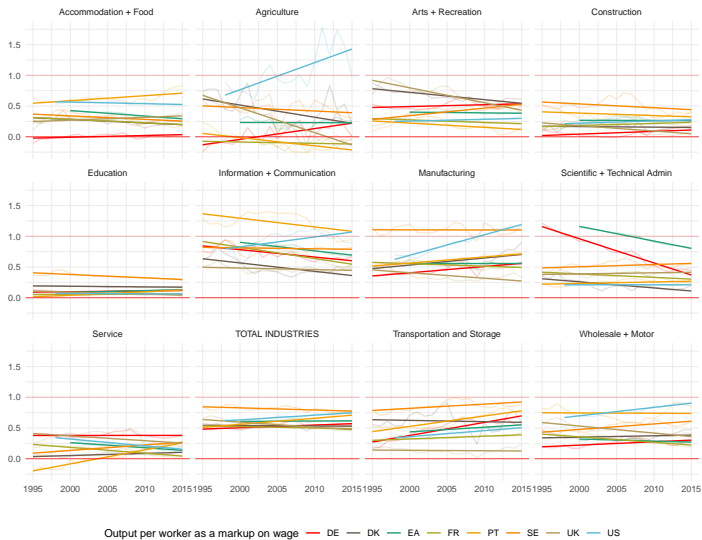
MARKUP OVER WAGE: WORLD



MARKUP OVER WAGE: WORLD



MARKUP OVER WAGE: WORLD



END

Technological progress comes in waves through micro and macro innovations and build into crescendos

Technology leaders acquire *market power* in period of accelerated change

Human skills and their *self-learning capacity* are set in stone through early education

Consumers choose between human and machine intensive goods

Multiple equilibria in the economy