

Institute for
New Economic Thinking

Capitalism in an Age of Robots

Adair Turner

Chairman

Institute for New Economic Thinking

School of Advanced International Studies

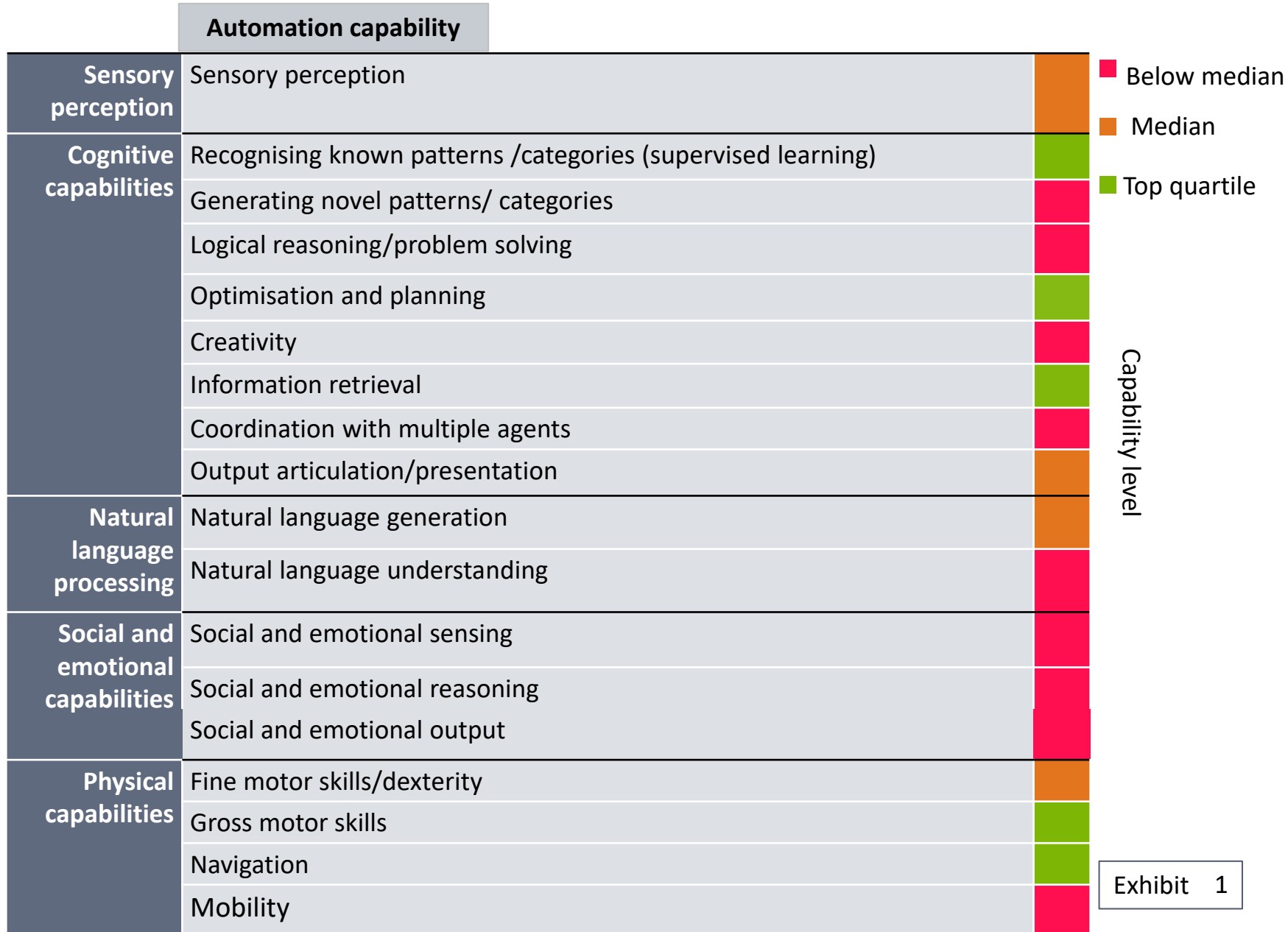
Washington DC, 10 April 2018

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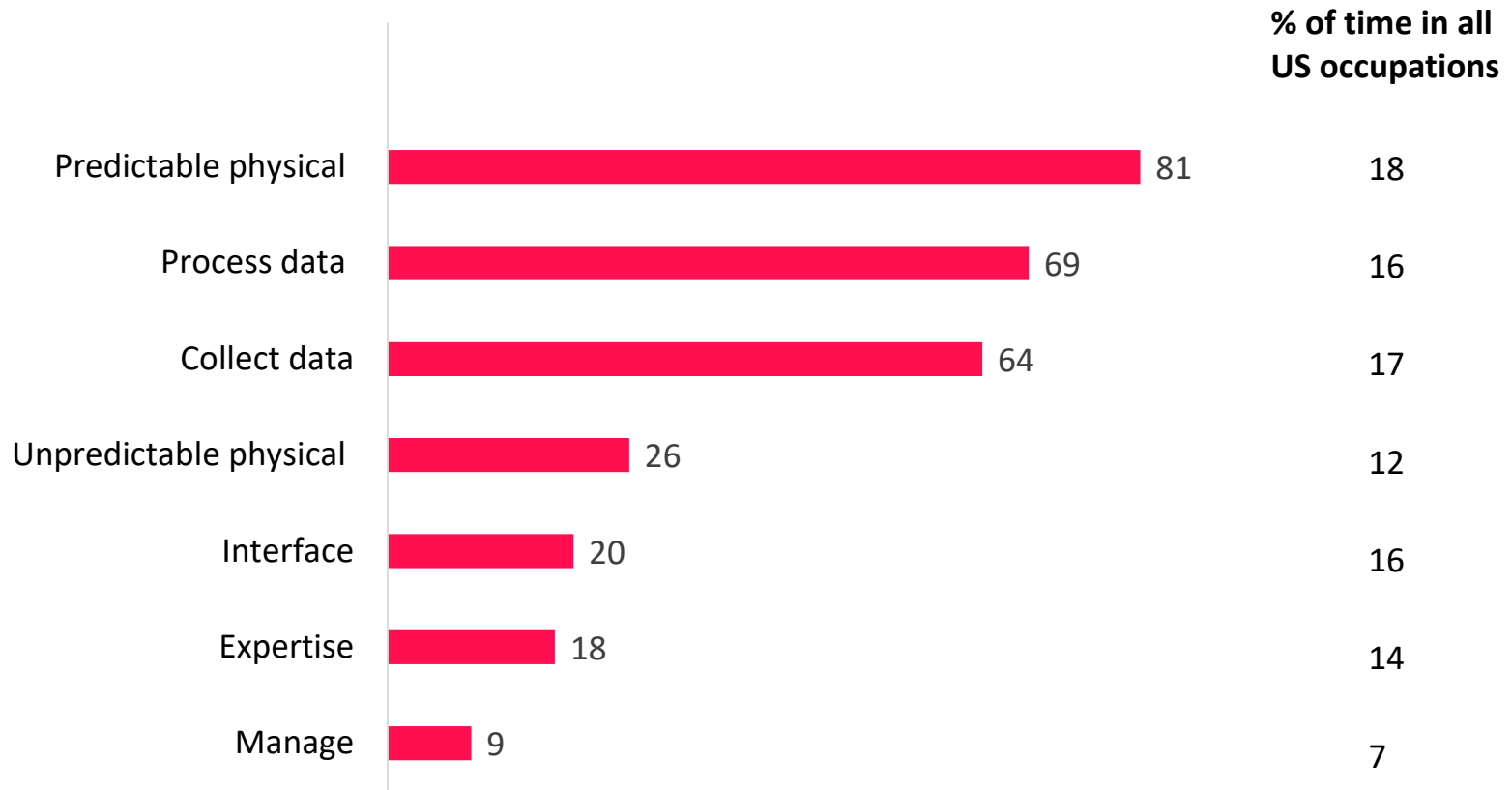
Current automation capability versus humans performance

Source: A Future that Works, McKinsey Global Institute Report, 2017



Automation potential by type of activity

% of time automatable with current technology



Source: McKinsey Global Institute, A Future that Works, 2017

Automation potential by occupation

% of specific activities automatable

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

% of specific roles and time which can be automated



Source: McKinsey Global Institute, A Future that Works, 2017

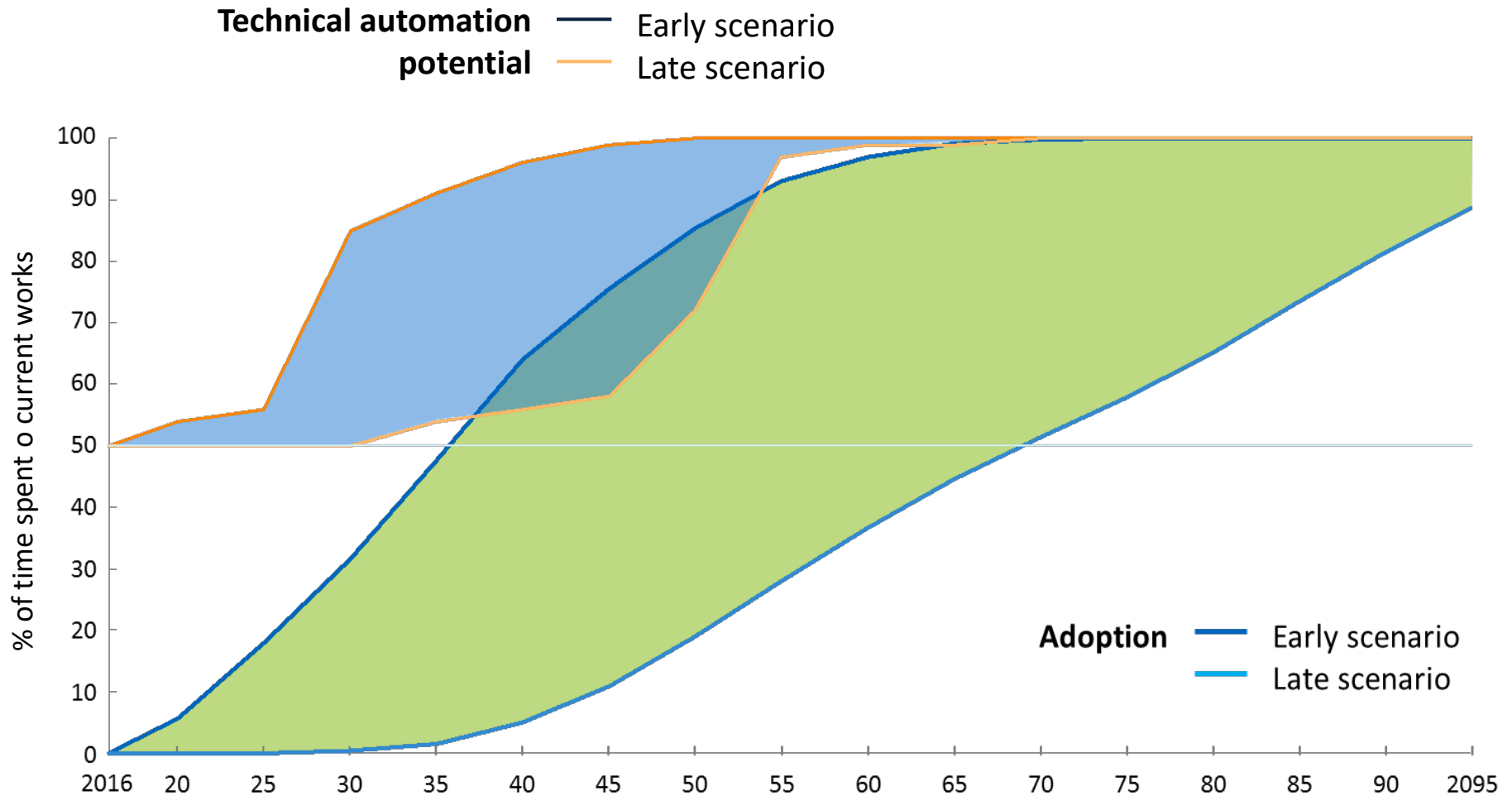
Potential to automate by sector

% of time automatable with current technology



Source: US Bureau of Labor Statistics McKinsey Global Institute Analysis

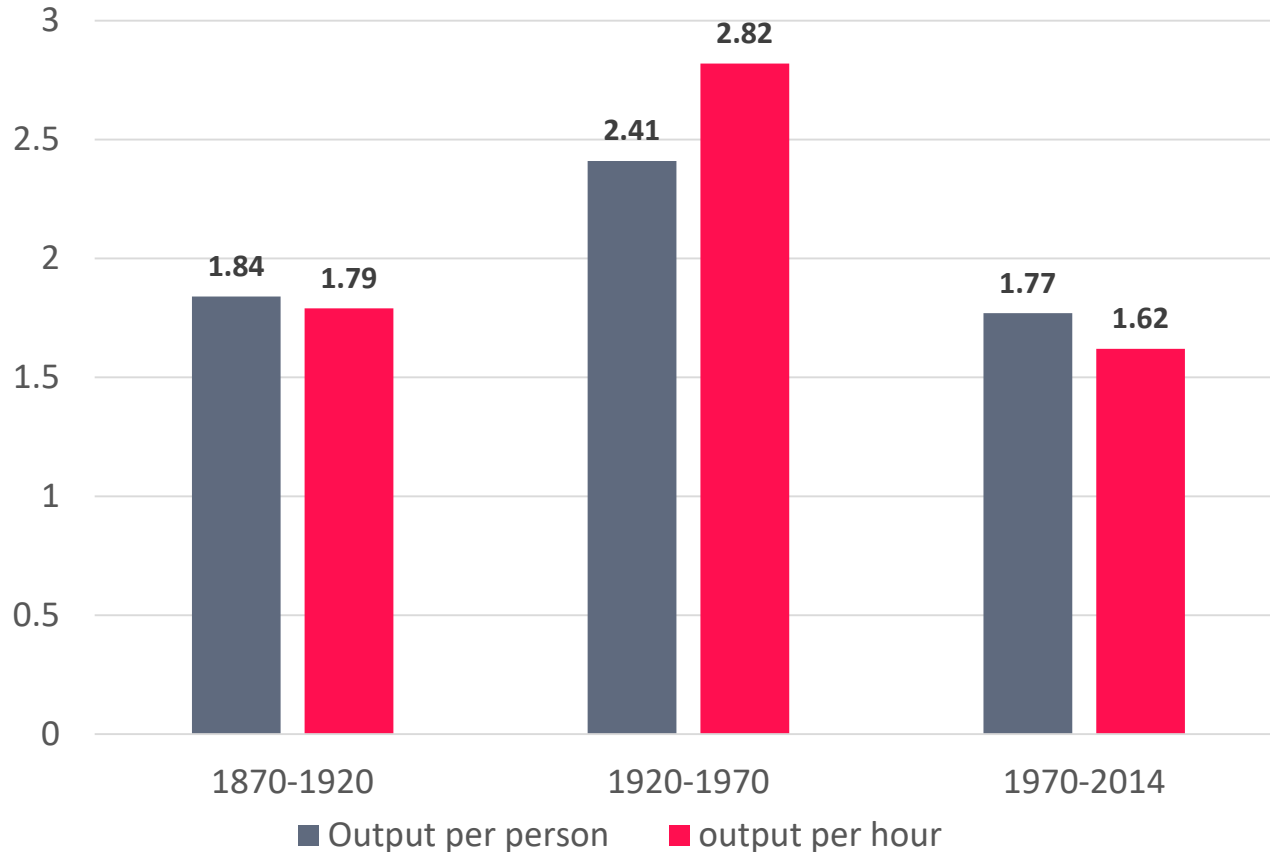
Scenarios for automation



Source: McKinsey Global Institute , A Future that Works, 2017

Productivity growth in the US

% per annum



Source: Robert Gordon, *The rise and Fall of American Growth* (Princeton University Press, 2016)

The standard paradigm

Starting Point



Technical progress

New position

50 farmers produce 100 units of food

50 workers produce 100 units of cars, washing machines, televisions, etc.

Measured total economy productivity doubles

Endlessly repeatable progress?

50 farmers produce
100 units of food

50 factory workers
produce 100
manufactured goods

Further
technical
progress

- 25 farmers producing 100 food
- 50 factory workers producing 200 cars, washing machines, televisions
- 15 factory workers producing 60 units of computers, mobile phones and software applications
- 10 service workers producing 40 units of healthcare

400 units of value –
productivity doubled again

The Baumol Effect


100 farmers produce
100 units of food

Technical
progress

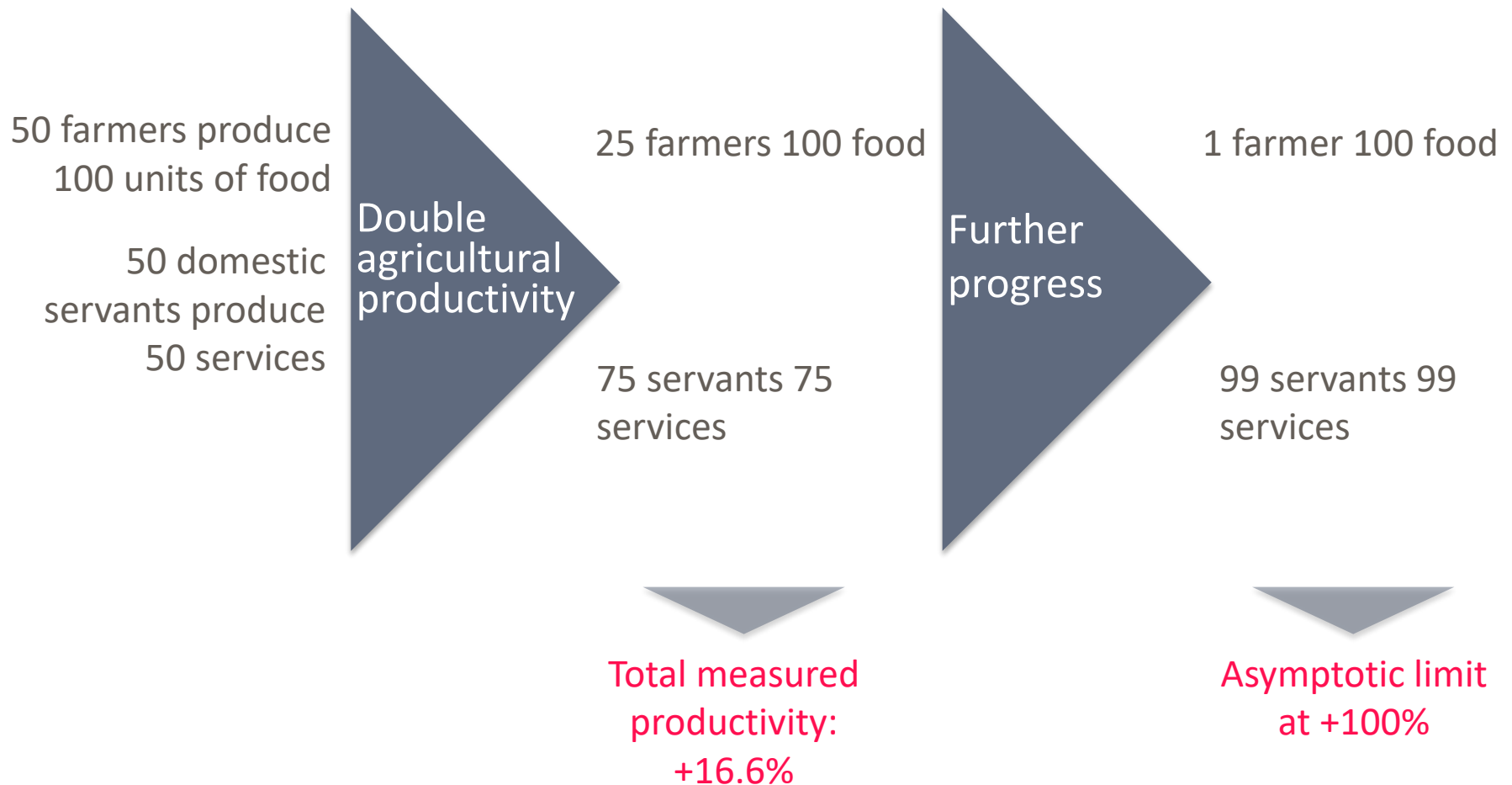


50 farmers produce 100 units of food

50 domestic servants paid ½ as much
produce 50 units of value

- 
- Agricultural productivity doubles
 - Total economy productivity increased 50%

Asymptotic rather than endlessly repeatable progress



The Baumol Effect with high paid artists

100 farmers produce
100 units of food

Technical
progress

50 farmers produce 100 units of food

45 domestic servants paid $\frac{1}{2}$ as
much produce 45 units of value

5 artists, singers, entertainers and
fashion designers paid twice as much
produce 20 units of value

Productivity growth
still eventually
asymptotes

Twenty first century technology

London



US Jobs growth forecast 2014 – 2024

Occupational categories by speed of job growth		Forecast job growth (000s)	Median annual wage May 2014 (\$000s)
1	Personal care aides	458	20
2	Registered nurses	439	67
3	Home health aides	348	21
4	Food preparation and serving workers	343	21
5	Retail sales persons	314	18
6	Nursing assistants	262	25
7	Customer services reps	253	22
8	Cooks, restaurant	158	31
9	General and operations managers	151	97
10	Construction labourers	147	31
Total top 10		2873 (29%)	
13	Janitors and cleaners	136	23
14	Software developers, applications	135	95

All sector average: 36

Source: Bureau of Labor Statistics, www.bls.gov; Projections of Occupational Employment, 2014 – 2024

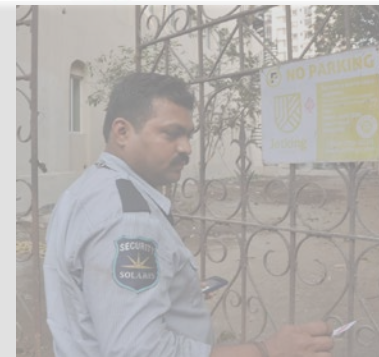
The Baumol effect in India:

Automation of tea packing

A manager explains what will happen when he opens the crates:

His job will go. And his over there; and that one's too

But the manager insists that, as in the past, he will somehow find jobs for everyone – as drivers or even watchmen if necessary



India's Economy: Just the job. The Economist, 16 September 2017

Zero-sum activities in the simple model

100 farmers produce
100 units of food

Technical
progress

50 farmers produce 100 food

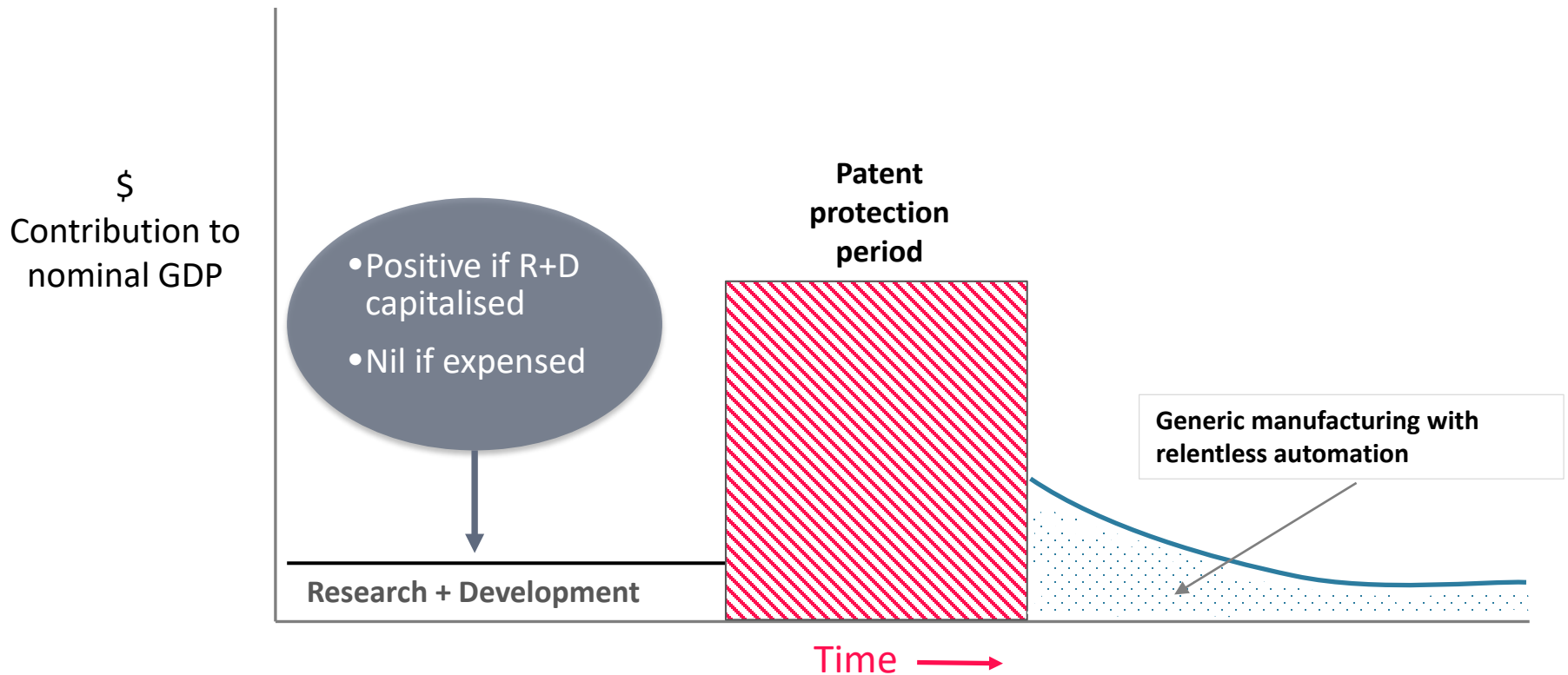
25 criminals

25 police paid same as farmers

- Total measured productivity increases 25%
- But no human welfare benefit of increased consumption

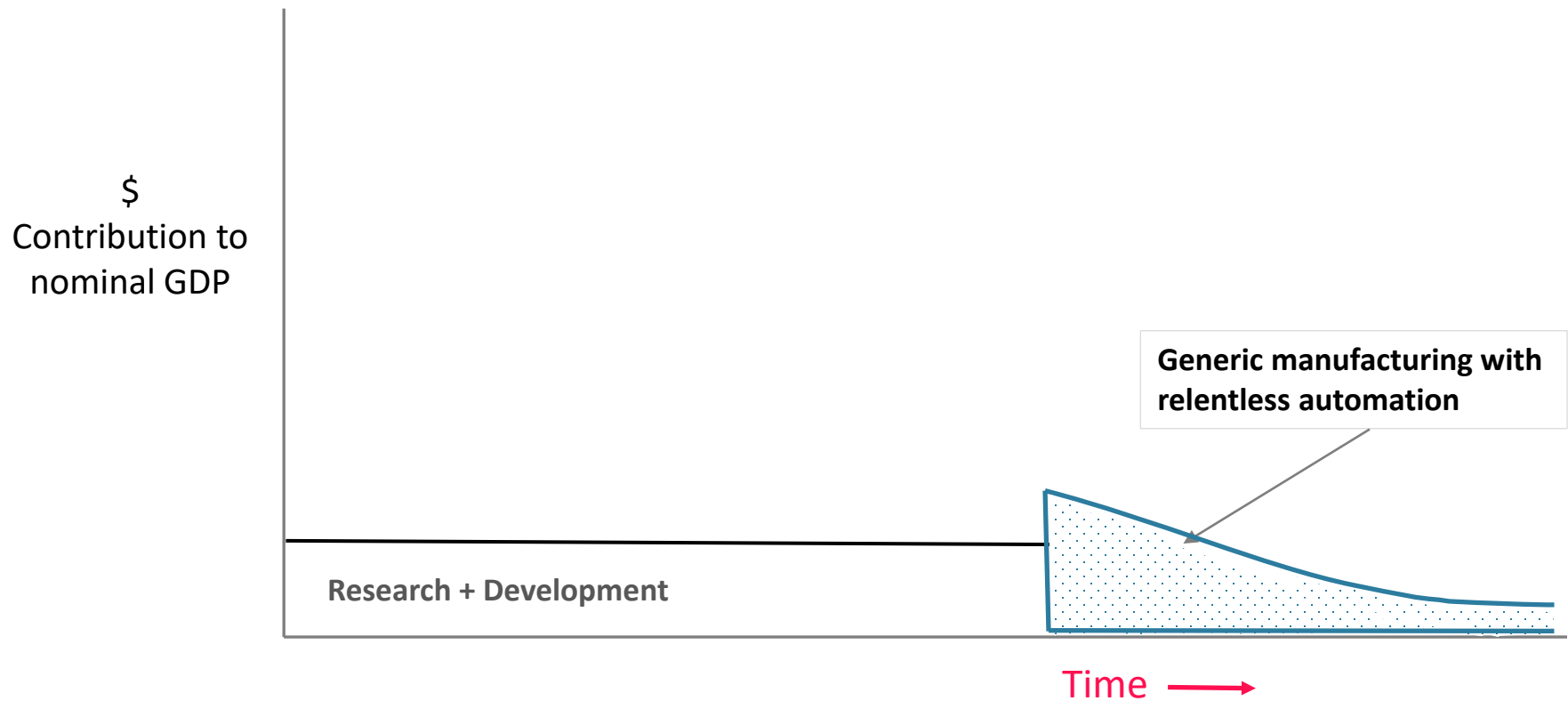
Wonder drug contribution to nominal GDP

With private development and patent protection



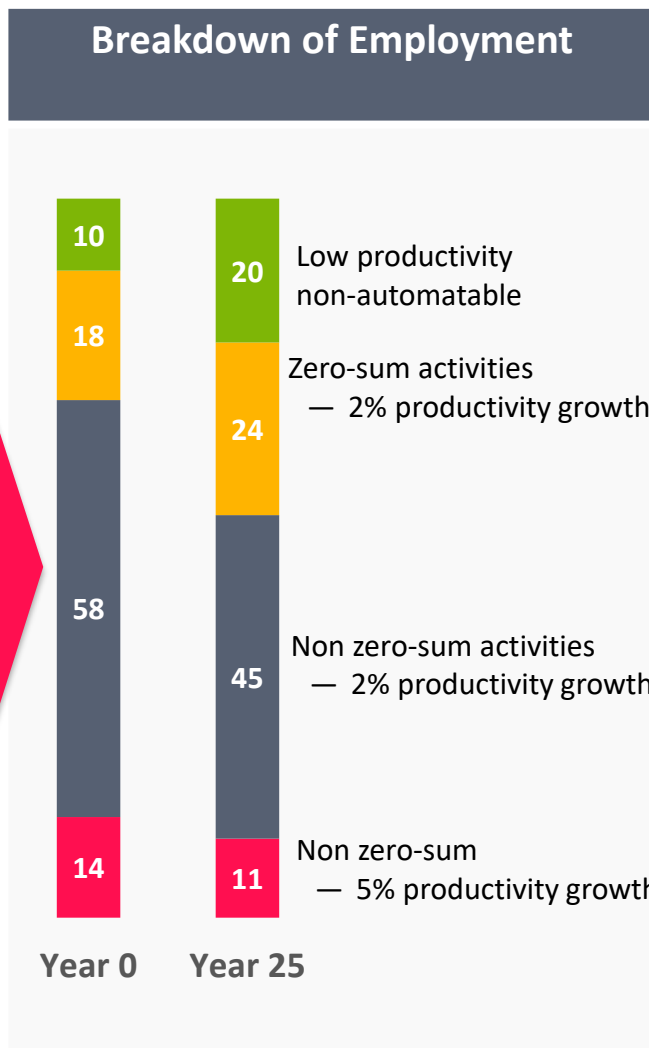
Wonder drug contribution to nominal GDP

If government or charitable development



Three effects combined: An illustrative scenario

Assumptions	% of employment
Non-automatable low productivity	10% → 20%
Automatable	90% → 80%
of which:	
Zero-sum	20% → 30%
Non zero-sum	80% → 70%
... with 50% of zero-sum activity in GDP and 50% not	
Productivity growth in automatable sectors: 2% p.a. in 80% of activities 5% p.a. in 20% of activities	
Under-recorded benefits = 33% of growth in the high growth sectors	



Productivity growth

Of automatable sectors:	2.5% increasing to 2.7%
Of all sectors:	constant around 2.05%
Of measured GDP:	1.9% declining to 1.5%

The standard assumption

Technological advance
drives productivity
improvement across
the economy

Which shows up in
GDP measures of
output per hour
worked and per capita

Which provides a good
measure of
improvements in
human welfare

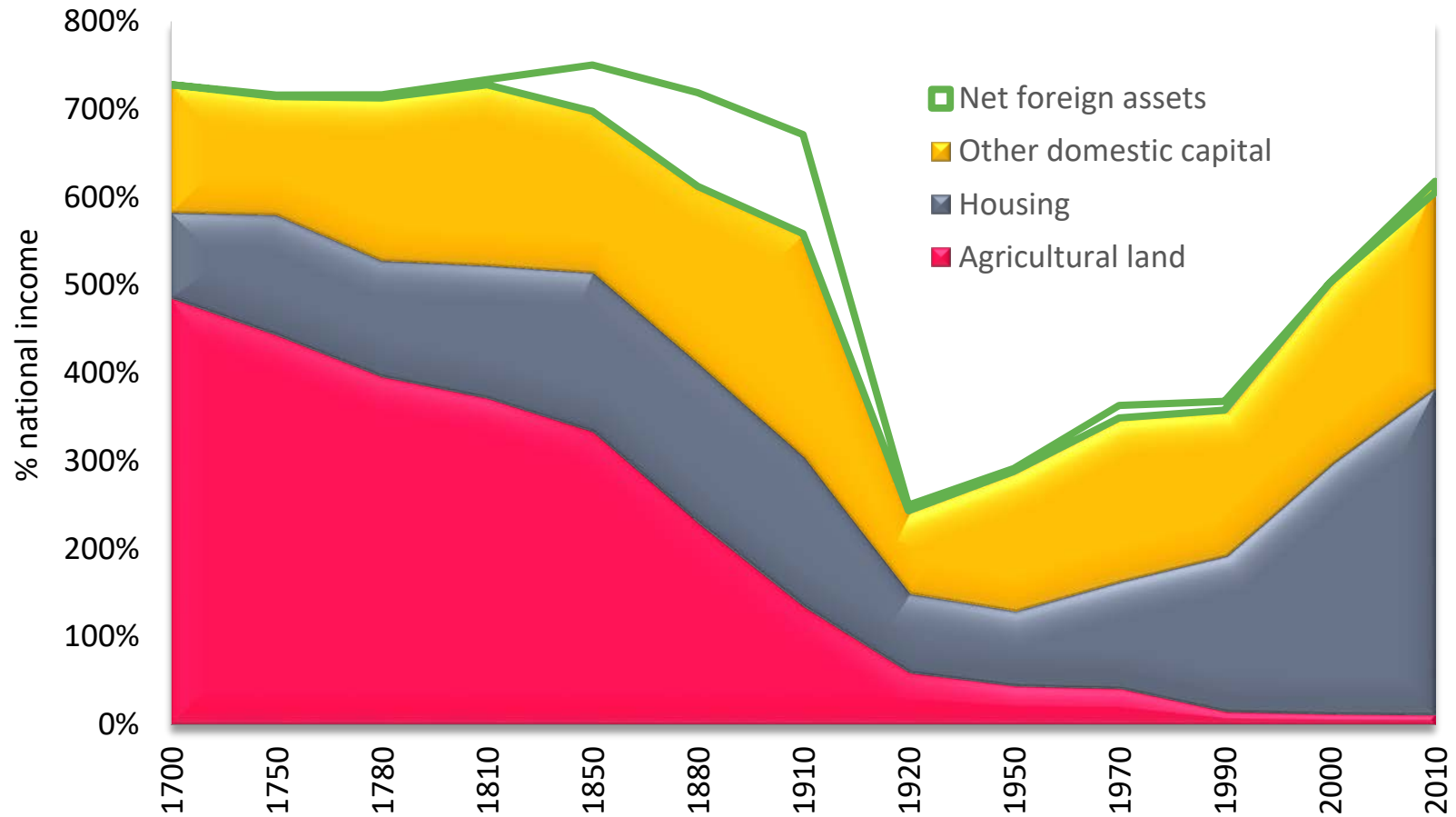
Imperfect but adequate
assumption in farm → factory
transition

... but becomes more imperfect
in face of information technology
goes and proliferation of zero-
sum activities

Imperfect but adequate
assumption as income grows
from \$1000 to \$20000 per
capita

... but becomes more
imperfect as incomes rise
and basic needs satiated

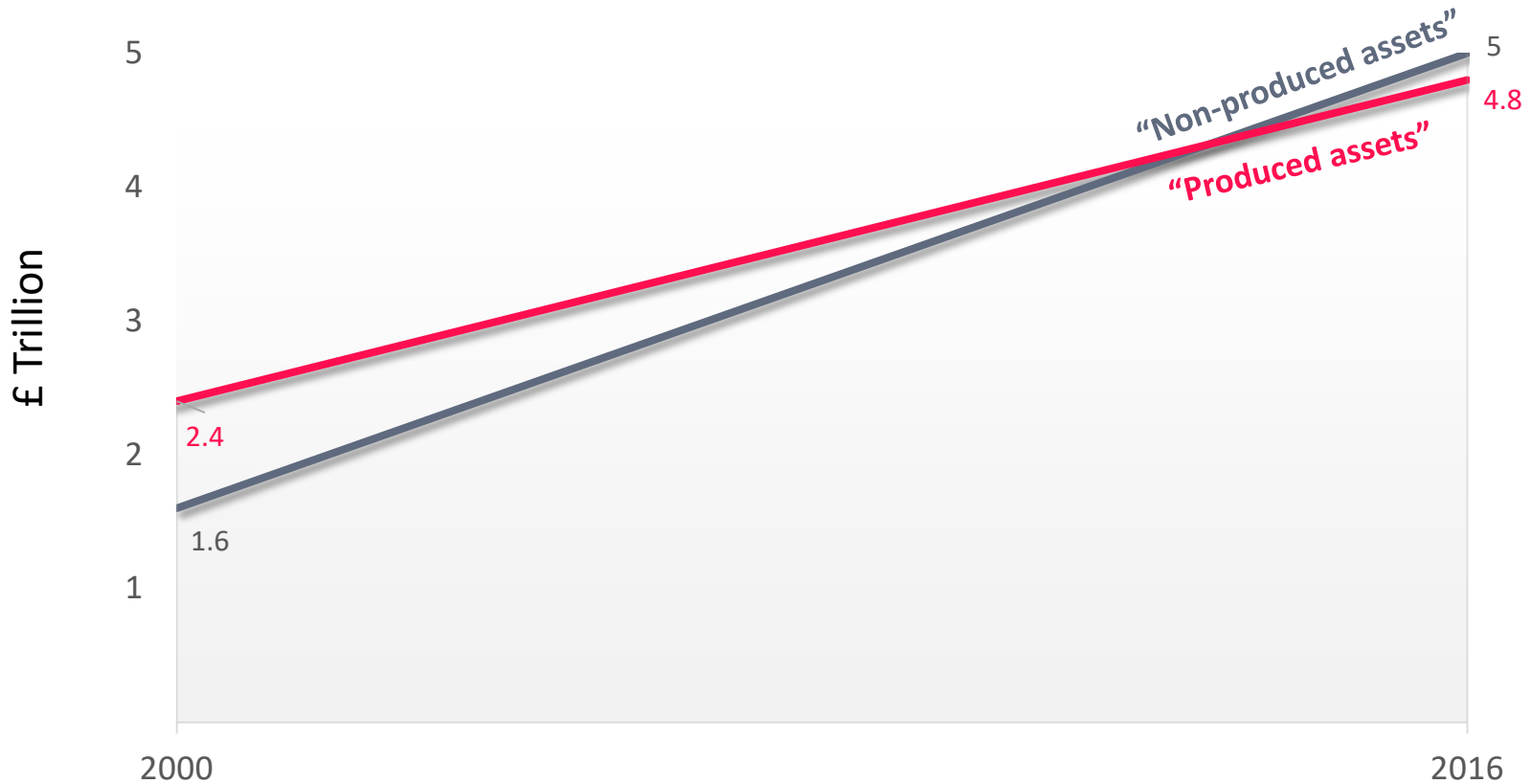
Capital in France 1700 – 2010



Source: *Capital in the Twenty First Century*, T. Piketty (2013)

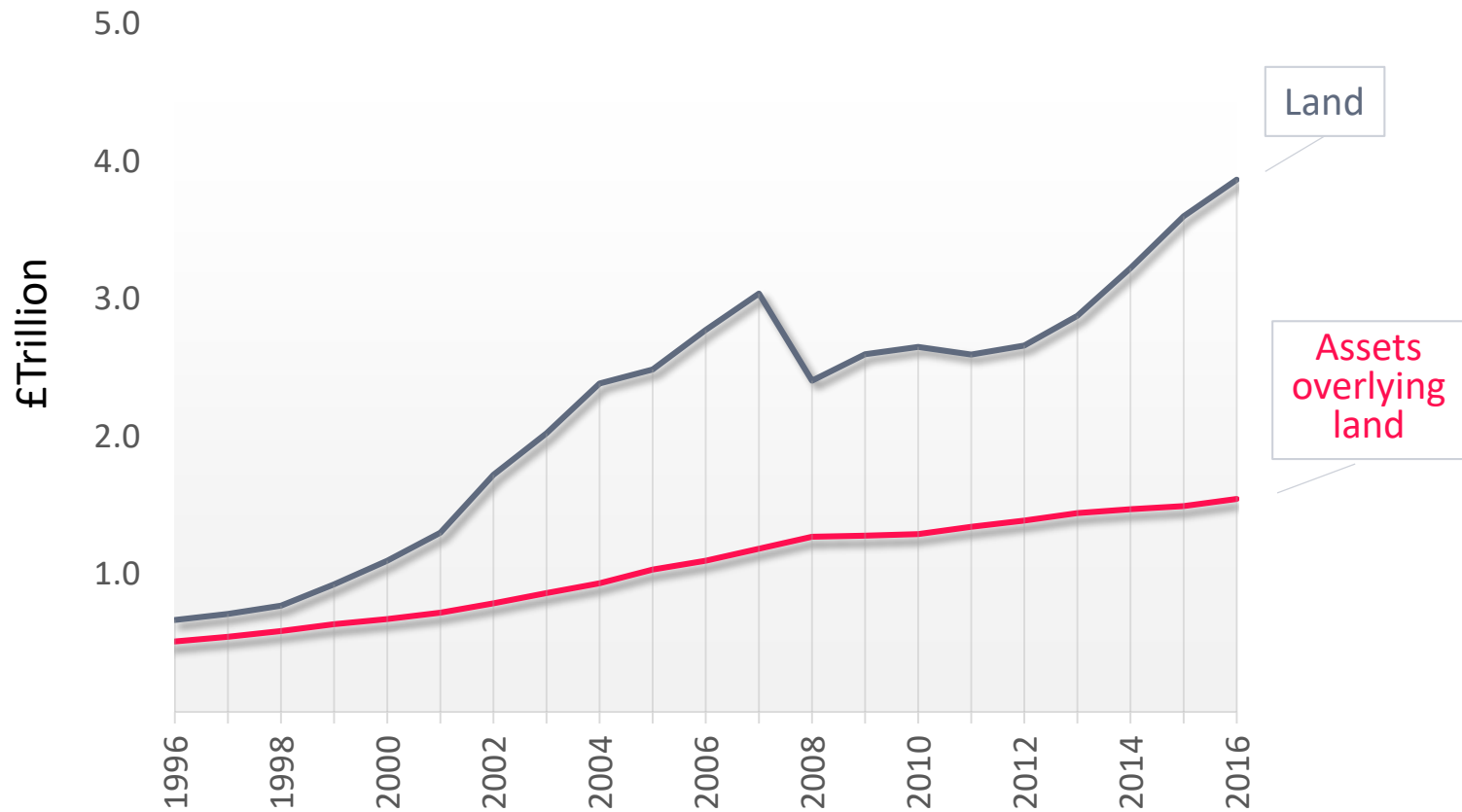
The rising importance of non-produced assets

UK National Balance Sheet 2000 – 2016



Source: UK Office for National Statistics: *Statistical Bulletin on the UK National Balance Sheet*

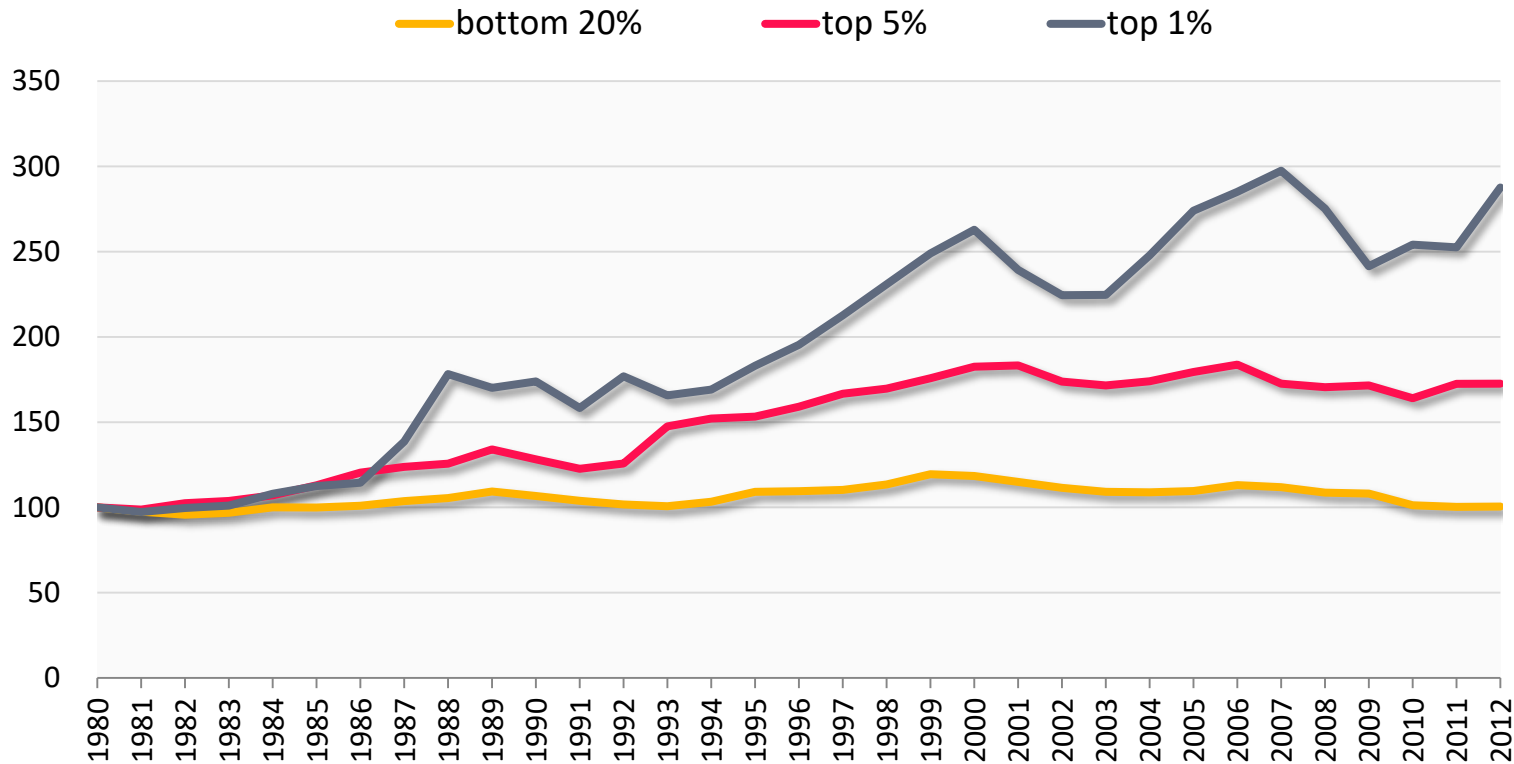
UK Household land and buildings



Source: ONS, *Statistical Bulletin on the UK National Balance Sheet: 2017 estimates*, Fig. 3






Average income increases US

(1980=100)



Source: US Census Bureau; World Top Incomes Database

Wealth and employment in ICT businesses

	Market Value (\$bn) (27 Apr 2018)	Employees (000s) (2017)
	736	~ 124,000
	716	~ 72,000
	502	~ 25,000
	455	51,000
	472	45,000

Population aged 20-64

Millions

	2000	2015	Projected 2050	Projected 2100
Japan	79	71	50	35
China	774	928	733	482
Europe	441	454	382	325
Americas	459	582	684	610
India	532	736	1029	867
Africa	352	536	1298	2485

Source: UN Population Database: Medium Fertility projection: 2015. un.org/popin

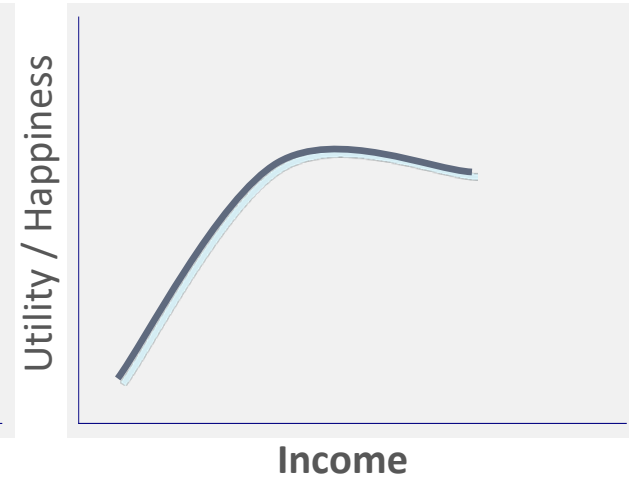
Different marginal utility of different “goods”



Good health?



Branded fashion goods?



Congestion and environmental damage?