

***The Rise and Fall of American
Growth:
Should We Buy the Argument?***

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Gordon's Claims

- Since 1870, the standard of living of Americans has increased much faster than real GDP/P
- TFP growth since 1870 follows an inverted U-shape which peaked in the 1940s; it's a 'great-inventions' story
- In future, American growth will be much slower; the 'special century' (1870-1970) will never be repeated
- **NB:** this would be bad news for UK

Gordon's Claims: More Detail (1)

- Real GDP/person understates the growth of living standards especially in the 'special century' because
 1. It leaves out many important aspects of the quality of life including leisure, working conditions, and crucially increased life expectancy
 2. Price increases are overstated by conventional index numbers because of new goods, quality change and other Boskin (1996) issues

Gordon's Claims: More Detail (2)

- The 'great inventions' were made in the '2nd industrial revolution' located in clusters around the internal combustion engine, electricity, chemicals and communications
- The ICT revolution has made a relatively small contribution to productivity growth
- The future economic impact of technological progress, including robots, will be very modest

The Most Important Addition to GDP

- Many reasons to think real GDP per person underestimates 'true growth'
- Even so, **lower mortality risk** is very likely the most important on the basis of VSL, as in Nordhaus (2003)
- Surely more important than reductions in market-work hours (which dominated 1970s' discourse) using Usher (1980)
- Life expectancy: 45.4 in 1870, 70.8 in 1970

Growth of Augmented Real GDP/Person

- Implement Nordhaus method using current 'best practice' assumptions (Viscusi, 2013)
- Mortality imputation is huge and much larger than that for work hours
- However, the 'special-century' chronology is a bit misleading; post-1970 looks better than pre-1900
- A surprise: the **'golden age'** was the **1930s and 1940s**

Growth of Augmented Real GDP per Person, United States 1870-2007 (% per year)

	<i>Real GDP /Person</i>	<i>Lower Mortality</i>	<i>Reduced Work Hours</i>	<i>Total</i>
1870-1900	1.93	0.52	-0.08	2.37
1900-1929	1.65	3.01	0.02	4.68
1929-1950	2.38	4.68	0.71	7.77
1950-1970	2.30	1.46	0.19	3.95
1970-2007	2.17	2.16	-0.22	4.11

A New Productivity Paradox

- Productivity growth has slowed down yet technology seems to be advancing rapidly
- **Possible explanations** include:
 - measurement issues
 - aftermath of crisis
 - declining business dynamism
 - low economic impact of innovation
 - technology impact high but not here yet

U.S. Slowdown is Not Mis-Measurement

- **Consensus** in recent papers (Aghion et al., 2017; Byrne et al., 2016; Syverson, 2017); but growth continues to be underestimated
- Significant fraction of welfare gains from digital economy are household production and won't/shouldn't be captured in GDP (Ahmad and Schreyer, 2016)
- **NB:** 'Missing output' = \$2.7 trillion but estimates of omitted consumer surplus <5 per cent of this (Syverson, 2017)

But Could Reflect Declining 'Business Dynamism'

- An **accounting decomposition** says slowdown due to smaller contributions from entry and from covariance of employment shares and productivity growth among continuers (Decker et al., 2017)
- Business start-up rate, employment share in young firms, job reallocation rate in USA a lot lower than in 1980s (Haltiwanger, 2017)
- **Explanation not clear** nor is the direction of causality
- What roles do competition and regulation play?

OECD Estimates of Trend Productivity Growth (% per year)

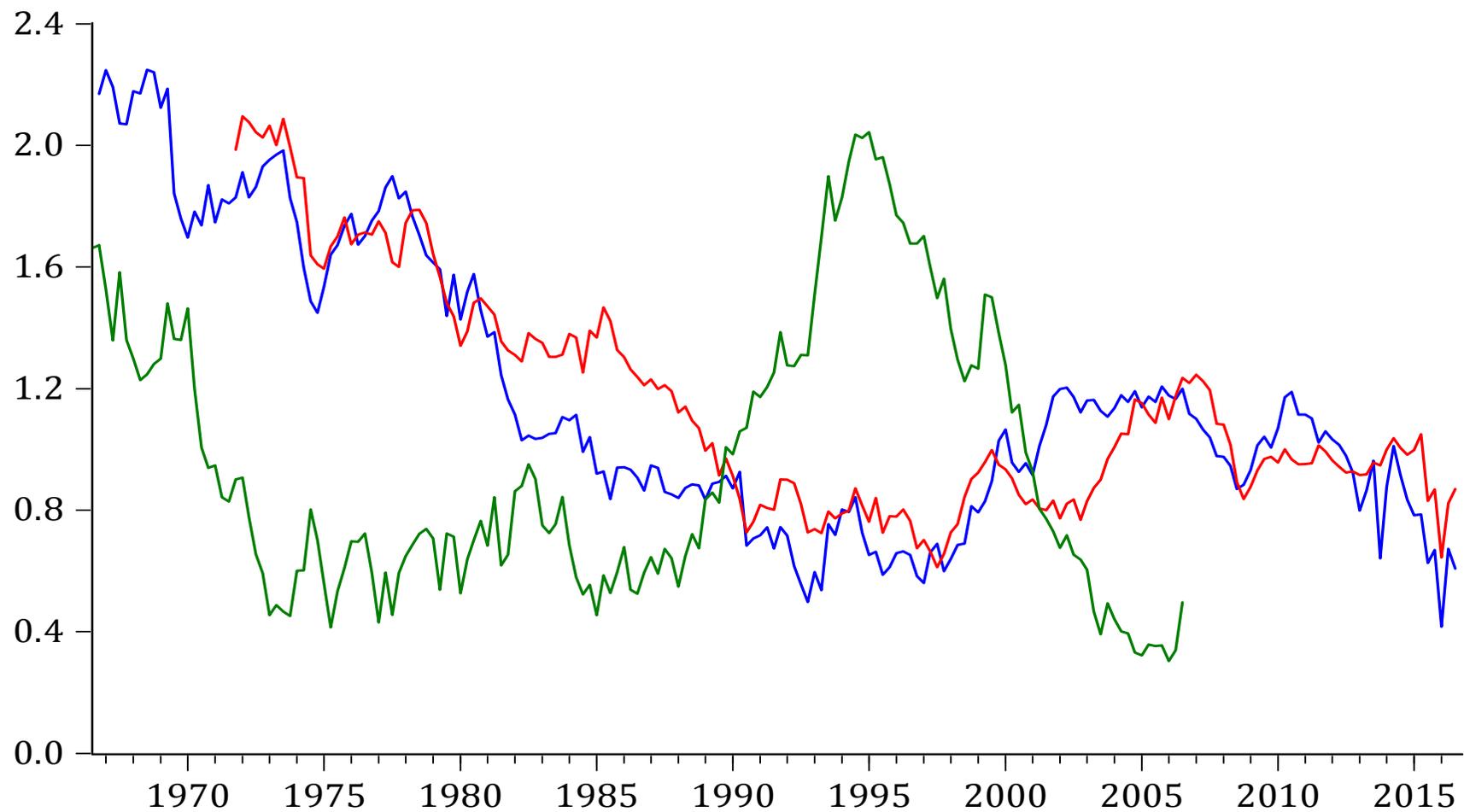
	<i>TFP</i>			<i>Y/L</i>		
	<i>2000</i>	<i>2007</i>	<i>2015</i>	<i>2000</i>	<i>2007</i>	<i>2015</i>
France	0.7	0.3	0.3	1.1	0.8	0.5
Germany	0.7	0.5	0.5	1.1	0.6	0.2
UK	1.1	0.0	0.4	2.1	0.9	0.9
United States	1.1	0.9	0.7	2.0	1.5	1.0

Note: estimates obtained using an HP-filter methodology.

Source: Ollivaud et al. (2016)

Medium-Term U. S. TFP Growth

- Pessimism fuelled by (backward-looking) time series econometrics
- Unlike Gordon, many (forward-looking) commentators optimistic, e.g. Brynjolffson and McAfee (2014)
- Current 10-year forward **projections range from 0.4 to 2.0% per year**
- Forecasting this is really hard – for example, an econometrician in 1992 would have got it very wrong (Crafts and Mills, 2017)



- Fixed 20 year sample
- Fixed 25 year sample
- 10 year ahead projection of dtfp_util

Some Technology Pundits

- **47% American employment** has ≥ 0.7 chance of being computerized by 2035; robot prices will fall fast (Frey & Osborne, 2013)
- AI has the potential to raise average labour productivity by 30-35 per cent over the next 20 years (Frontier Economics, 2016)
- Although few jobs will be completely automated, over the next 20 years 35-45% have a chance of substantial automation (Arntz et al., 2016)
- So rapid productivity growth after the usual GPT delay

Is the 'Great Inventions' Story Really True?

- **Gordon (2016)**: U.S. productivity growth in the 20th and 21st centuries is dominated by the flow and ebb of 'great inventions' whose impact peaked following the 2nd industrial revolution

BUT

- These claims are not evidence based and may be misconceived
- **Harberger (1998)**: TFP growth is a 'mushrooms' process of many disparate real costs reductions rather than the pervasive impact of GPTs

A View from the 1930s

- A 'technologically progressive' decade; it is not just the 'great inventions' but **broadly based TFP growth**
- The 'great inventions' only outperform ICT if distribution is included
- It is 'other TFP' that is weak now but was strong then
- Harberger's mushrooms more important than Gordon allows

TFP Growth in the U. S. Private Domestic Economy, 1899-2007 (% per year)

1899-1909	0.93
1909-1919	0.64
1919-1929	1.63
1929-1941	1.86
1948-1960	1.98
1960-1973	2.21
1973-1989	0.48
1989-2000	0.97
2000-2007	1.44

Source: Bakker et al. (2017)

Contributions to TFP Growth in the U. S. Business Sector (% per year)

	<i>1929-1941</i>	<i>1899-1941</i>
TFP Growth	1.87	1.30
Great Inventions	0.82 (0.33)	0.51 (0.29)
Other	1.05 (1.54)	0.79 (1.01)

	<i>1974-1995</i>	<i>1995-2004</i>	<i>2004-2012</i>	<i>1974-2012</i>
TFP Growth	0.50	1.61	0.34	0.73
IT Sectors	0.36	0.72	0.28	0.43
Other	0.14	0.89	0.06	0.30

Note: 'great inventions' comprise technology clusters around electricity, internal combustion engine, re-arranging molecules, communications & entertainment. **Figures in parentheses re-classify distribution as other.**

Sources: Bakker et al. (2017); Byrne et al. (2013)

The New Productivity Paradox: Half-Time Score

- The **productivity slowdown is real but not necessarily permanent**
- Techno-optimists should not be too dismayed by current estimates of trend productivity growth
- Gordon's 'great-inventions' lens may not be the best guide either to the past or the future
- A worthy successor to the Solow Paradox

Conclusions

- *The Rise and Fall of American Growth* is much stronger on challenging ideas than quantitative evidence
- I do believe growth of real GDP/person underestimates the growth of living standards
- We do not understand the productivity slowdown but I am sceptical of the 'grumpy old man' view of technological progress