

Cogs and Monsters¹

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Thank you Helen for such a generous introduction, and to all of you for coming here this evening. This is an opportunity for me to say thank you to my colleagues in the Bennett Institute, in POLIS, in Churchill College and in across the university, for the warm welcome I've been given since arriving here. And to thank Peter Bennett, too, not only for his generosity enabling the creation of the Institute, but also because it could not be more timely given the obvious challenges of these turbulent times.

The purpose of an institute like ours is to contribute to the understanding and practice of public policy. This purpose raises two fundamental questions. What makes one policy better than another, what counts as progress? And how can the desirable outcomes be brought about?

Often people pose the first, the 'what', question in relatively narrow terms: anti-trust policy should increase or maintain competition; monetary policy should achieve stable inflation. But that just puts it at one remove: what ends are these narrow goals serving? Often the aim is implicitly something like faster economic growth or higher productivity. But others could include distribution, or sustainability.

So the first issue I will be discussing in this lecture is how we know whether or not things are getting better.

The metrics we use are inadequate, partly because of technological change, but partly because policymakers (especially economists) have forgotten that social metrics unavoidably embed values. Economic data are made as well as 'given'. Devising a statistical framework for a technological and economic structure profoundly changed since the mid-20th century will have to involve revisiting the basics about what kind of society is desirable.

The second question is the 'how': how can policy bring about inclusive, sustainable growth in a globalized, complex, interconnected economy, facing some tough, even existential, questions

¹ Cogs and Monsters is the title of a Radio 4 Analysis programme I presented in 2001, produced by Michael Blastland. It was transmitted in August, a month before the world changed. It ended with the words: "Complexity is upsetting the orderly world of economics; maybe politics is next." Analysis: Cogs and Monsters, tx 9 August 2001.
http://news.bbc.co.uk/1/hi/english/static/audio_video/programmes/analysis/transcripts/cogs.txt (All links accessed 18/11/18)

and yet riven by fractures between rich and poor, city and small town or village, old industries and new, educated globalists and less educated left-behinders?

Although we economists might now mock the Phillips machine representation of the economy as a minimal set of mechanical links, machine metaphors are deeply embedded in our language, thinking, and policy advice.²

The Phillips Machine



Faculty of Economics, Cambridge.

We still speak of policy levers, of linkages, of cause and effect. When asked to reflect on their discipline, economists often reach for comparisons to engineers,³ or if feeling more modest, plumbers – both mechanical trades.⁴ This is dangerously misleading mental furniture.

The world was never as mechanical as our metaphors suggested, but the continuing technological, economic, social and political transformations are, paradoxically, making our increasingly machine-run, AI-run world ever *less* linear and predictable – as I will go on to explain.

The changes associated with digital technology, which I have been exploring for more than 20 years,⁵ the changes that might yet lie ahead as we wait fretfully for the robot overlords, are continuing to transform society. The benefits are unevenly distributed; the transformation can

² George Lakoff and Mark Johnson, *Metaphors We Live By*, Chicago 1980, 2003.

³ Roth, Alvin E. 2002. The Economist as Engineer: Game Theory, Experimentation, and Computation as Tools for Design Economics. *Econometrica* 70 (4) (July): 1341–1378. doi:10.1111/1468-0262.00335.

⁴ Esther Duflo, 2017. [Richard T. Ely Lecture: The Economist as Plumber](#), *American Economic Review*, vol. 107(5), pages 1-26, May

⁵ Diane Coyle, *The Weightless World*, Capstone, 1997, MIT Press 1998.

only be glimpsed through current statistics; the cautious evidence-based policy consensus is palpably inadequate; and the rage against the elite is widespread.

Politicians who disdain expertise are voicing this. Phenomena like Brexit, Trump, Five Star or Bolsonaro are complex, with many contributory factors. My focus is on the failure of the technocrats to deliver improvements in life for too many citizens for too long, linked to the invisibility of important phenomena and groups in standard policy success metrics. Expertise is a claim to authority over the lives of others so if it fails to deliver, it is not surprising that people challenge the constraints it imposes on them.

So I am going to explore these twin questions. First, what kind of society do we want and how do we measure progress toward it?

Secondly, in this non-linear, complex world, ever less predictable, how can people in positions of authority – experts – deliver that progress?

Defining and measuring progress

Economic statistics fit the world into an ordered framework of theory and classification. Since the end of the second world war, there has been a broad technocratic consensus about the framework for understanding and measuring progress. This is economic growth, captured in the System of National Accounts and GDP.

The current System of National Accounts has been described as the ‘among the great inventions of the 20th century’.⁶ Its invention has even been credited with helping the Allies win the second world war by providing them with a more accurate estimate of their nations’ productive capacity and consumption needs.⁷ The framework co-evolved with Keynesian macroeconomics – the model given physical form by the Phillips machine with liquid flowing through pipes and valves. The philosophical basis of GDP is utilitarianism. It measures current period flows of income, consumption, investment and trade. Assets contribute to economic welfare only when the services they provide are consumed. Natural wealth, including land and sources of energy, is absent. Indicators of social change such as women joining the paid workforce from the mid-1960s, or the spread of higher education, or increasing income inequality, are absent from headline figures and often indeed put into what are actually called ‘satellite’ accounts.

⁶ Paul Samuelson, William Nordhaus, *Economics*, McGraw Hill, 1948, 2009.

⁷ James Lacey, *Keep from all Thoughtful Men: How US Economists Won World War II*, Naval Institute Press, 2011.

The System of National Accounts is nevertheless a beautiful construct of logic and elegance. This framework is implemented by the United Nations, advised by committees of official statisticians and economists, in a highly technical debate. Every decade or so, the system is incrementally updated. Only recently has there been much scholarly investigation of the process, and its politics – documenting for example the transition to measurement of the growth rather than the level of GDP as an artefact of the Cold War,⁸ or the progressive extension of the measured scope of the financial sector.⁹

Most of us are unaware of the debates and judgments involved. The statistics are part of the nuts and bolts of policy debate, given little thought. And yet there is a growing belief among the public and even the professional community that the measurement framework is no longer meaningful – hence the public reaction voiced during the UK's Brexit campaign, “That's your GDP, not mine!”¹⁰

This is partly a matter of the framework's age, as it was established in the late 1930s and early 1940s for an economy heading toward the heyday of uniform mass production of goods. As Simon Kuznets wrote early in the GDP era, “It is hardly surprising that the definition of national product used for measuring modern economic growth embodies the accepted notions of means and ends of economic activity, reflecting the main features of modern society.”¹¹ The economy is thus defined as what firms and the government do, not households or civic organisations. The industrial and occupational classifications provide startling detail on manufacturing industry and almost none on the services that make up four fifths of the modern economy. The UK's Labour Force Survey, the main source of detailed statistics on employment, has missed the casualization of the labour market that long pre-dates the ‘gig’ economy, because the survey was devised on the assumption of permanent full time jobs being the norm. The statistics do not account for modern production in extended global supply chains. Until recently we have had too few regular statistics of the kind easily available to politicians and commentators on the incomes of different groups or the economic fortunes of different regions.

It is inevitable that official statistics, which have to use consensus definitions, will lag changes in the structure of the economy. The 1885 Annual Abstract of Statistics for the United Kingdom has 120 pages of agricultural detail such as crop prices in different market towns or imports and exports of specific seeds or livestock. It has a dozen pages on the totems of the Industrial

⁸ Matthias Schmelzer, *The Hegemony of Growth*, Cambridge University Press, 2016

⁹ Brett Christophers, *Banking Across Boundaries: Placing Finance in Capitalism*, Wiley Blackwell, 2013.

¹⁰ Tim Harford, ‘Metropolitan myths that led to Brexit’, *Financial Times*, 20 July 2016.

<https://www.ft.com/content/5608a798-4e03-11e6-8172-e39ecd3b86fc>

¹¹ Simon Kuznets, *Modern Economic Growth* p22 1967 ed (2nd printing)

Revolution, the mines, railways, cotton mills and canals. By this time, Dickens had died and it was eighty years since Blake had written of the dark satanic mills.

It wasn't that nobody knew what was happening. The gap was filled by parliamentary reports for instance, the Blue Books. In a recent history of economic indicators in the United States, Eli Cook describes such ad hoc investigations as 'moral statistics'.¹² Investigations of this kind can form the justification for policy changes; but they do not provide the machinery for everyday policy in the same way as regular, bureaucratized official statistics.

It took the pressures of Depression and war to shape the statistical framework we fundamentally still use today.¹³ The history of GDP as a contested indicator of the state of economic progress has become quite well-known in recent years, following a growing body of work on the sociology and history of economic statistics.¹⁴ The very idea of 'the economy' as a distinct domain at all dates from the 1930s, and for a decade there was considerable debate among economists about how to crystallise the idea in statistical form. The Keynesian structure prevailed against the explicitly value-laden concept of aggregate economic welfare previously developed by Simon Kuznets. The concept of GDP has many flaws when compared to any explicitly welfare-based measure, all much rehearsed over the seven decades since its invention. The most obvious are the absence of any accounting for the depletion of natural resources and environmental externalities, and the exclusion of unpaid although economically valuable work in the home. Hence we have absurdities like the inclusion of an estimate of the illegal drugs trade (as money changes hands) but the exclusion of unpaid care for dependents. These shortcomings have been widely acknowledged – and then largely ignored when the conventional GDP statistics are used in day to day policy-making.

However, the challenge goes in the other direction too. A different set of critics, including many in the tech sector and financial markets, believe intangible benefits of digital and other innovations are being obscured by the GDP numbers. They are also right.

Technological change is bringing matters statistical to a head because even the producers of statistics are unable to ignore the fact that the dramatic changes in the fabric of everyday economic life appear almost nowhere in the statistics. The 2016 *Independent Review of*

¹² Eli Cook, *The Pricing of Progress: Economic Indicators and the Capitalization of American Life*, Harvard University Press, 2017.

¹³ Diane Coyle, *GDP: A Brief But Affectionate History*, Princeton University Press, 2014, 2015.

¹⁴ See Christophers, Cook, op cit; also Benjamin H. Mitra--Kahn, "Redefining the Economy: How the 'Economy' Was Invented, 1620" (Ph.D. dissertation, City University London, 2011), <http://openaccess.city.ac.uk/1276/>; Daniel Hirschman, *Inventing the Economy Or: How We Learned to Stop Worrying and Love the GDP*, <https://deepblue.lib.umich.edu/handle/2027.42/120713>.

Economic Statistics in the UK highlighted the need to measure digital change in the economy,¹⁵ and I have been leading a research programme on this in the Economic Statistics Centre of Excellence set up in response to the review. My co-authors and I have looked for example at the prices of telecommunications services; at the scope and price of businesses' use of cloud computing; at shifts from market activity to unpaid household activity thanks to digital innovation; and at the sharing economy.¹⁶ In every case, the absence of the underlying data has been a barrier, and the Office for National Statistics is gradually adjusting its surveys and other forms of data gathering.

Innovation has always been a challenge for measurement. In my youth in the 1970s – which doesn't seem all that long ago – the digital revolution had not started: there were no personal computers or tablets or smartphones, and none of the services they afford us such as web search, streaming movies, email, text messaging. Phones were tethered to the wall, usually in a cold hall as central heating was far from universal and few houses were insulated, and phone lines were often shared as a party line with a neighbour. Vinyl was still on its first run although cassette tapes were available as an alternative. Banking transactions meant going to the high street and queuing. Cars used leaded petrol, less efficiently, had no radios or electric windows, none of today's safety systems, still less built-in GPS and air conditioning. MRI scanners had not been invented, nor Tamoxifen; cataract and varicose vein surgery were not straightforward outpatient procedures. As well as obviously significant innovations like the internet or medical or pharmaceutical advances, we have enjoyed a multitude of incremental improvements in everyday life: outdoor gear made from fabrics that really do keep out the wind and rain, disposable contact lenses, tights that don't immediately ladder, the ability to watch TV programmes when you want, energy-efficient light bulbs.

This is to describe only the consumer goods and services. Equally pervasive and significant innovations have occurred in the equipment used by businesses and the ways they operate, including the automation of production processes and the just-in-time production system. Like earlier general purpose technologies, digital and now AI are reshaping economic production. Without the post-1980s developments in information and communication technologies there would have been no possibility of economic globalization in the shape of extended supply chains, no reorganisation of business through outsourcing and delayering, no business model

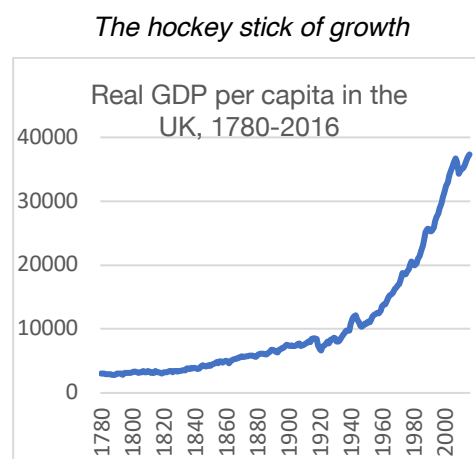
¹⁵ Charles Bean, *Independent Review of Economic Statistics*, <https://www.gov.uk/government/publications/independent-review-of-uk-economic-statistics-final-report>

¹⁶ Coyle, D. (2018), Do-it-yourself Digital: the Production Boundary, the Productivity Puzzle and Economic Welfare. *Economica*. . doi:[10.1111/ecca.12289](https://doi.org/10.1111/ecca.12289); Abdirahman, M et al, 'A Comparison of Approaches to Deflating Telecoms Services Output, ESCoE Discussion Paper 2017-04, <https://www.google.com/search?q=escoe+telecommunications+services&ie=utf-8&oe=utf-8&client=firefox-b-ab>.

innovations such as digital platforms, on-demand services and e-commerce, no social media.¹⁷

The lesson of the whole of the past quarter of a millennium is that innovation is the engine of economic progress. Adam Smith pinpointed the division of labour as the dynamo, its extent depending on the scope of the market, and on the invention of machines that turn complex processes into progressively simpler steps. Schumpeter argued that constant innovation, large and small, was the defining economic characteristic of capitalism, the way most firms compete against their rivals for survival.¹⁸

Real GDP growth as the headline indicator of progress does paint this very broad brush picture. Economic historians have constructed a millennium's worth of GDP statistics, projecting today's conception of 'the economy' onto the past. This shows living standards (in our terms) creeping up slowly for many centuries, a little faster during the Renaissance, and then a lift-off at the end of the 18th century. The chart has come to be known as 'the hockey stick' of growth.



<https://www.rug.nl/ggdc/historicaldevelopment/maddison/releases/maddison-project-database-2018> (18/10/18)

However, it is probably not possible to represent statistically the quality of life gains from better health care, or the ability to speak to a child across the world for free via an online video call. Or, on the other hand, the loss of species in once-pristine nature or poisoning of the oceans. This is a fundamentally different kind of calculus. GDP tells part of the story, as it is correlated with measures such as life expectancy or infant mortality. But it falls short when technological changes are particularly profound, fundamentally restructuring the system of production and allocation.

¹⁷ Richard Baldwin, *The Great Convergence*, Harvard University Press, 2017.

¹⁸ Joseph Schumpeter, *Capitalism, Socialism and Democracy*, 1942, 1994.

But the advance of the new technologies presents a paradox, one greatly exercising economists. This is the so-called ‘productivity puzzle’. GDP per hour worked, or the multifactor productivity measure of the increase in GDP not attributable to the use of additional quantities of capital and labour, have flatlined since the financial crisis.

The productivity puzzle



Source: ONS

Some economists, notably Robert Gordon, see no paradox, dismissing the technology as all hype.¹⁹ Although there is certainly plenty of hype, others (including me) are burrowing into the statistics to try to understand better how an increasingly weightless economy of zeroes and ones is being reflected, or not, in the standard measurements. It is a true puzzle: why are the dramatic changes in the way businesses operate not being reflected in the productivity figures?

One way into the puzzle is to unpick the measure being used – ‘real’ GDP adjusted for general increases in the price level. Even some of its critics make the mistake of conceiving of real GDP as a measure of something, well, real. Far from it. As Thomas Schelling wrote: “[W]hat we call “real” magnitudes are not completely real; only the money magnitudes are real. The “real” ones are hypothetical.”²⁰

For ‘real’ GDP is calculated by dividing money GDP by a price index. Price indices – constructs combining all the individual prices in the economy at any time into a single number – cannot cope with innovation. When we say something like, ‘Average income in 1978 was equivalent to £5000 in today’s money,’ this usually means a 1978 Ms Average would have £5000 to spend

¹⁹ Robert Gordon, *The Rise and Fall of American Growth: The US Standard of Living Since the Civil War*, Princeton University Press, 2016.

²⁰ Schelling, T.C., *A Critique of the United States Income and Product Accounts*; Design of the Accounts, Princeton University Press for NBER 1958. P332. <https://www.nber.org/chapters/c0554.pdf> (accessed 18/10/18)

today, *on the goods available in 1978*.²¹ The concept of a price index is that it measures the change in prices that would keep the consumer's utility constant, which implies a comparison over the same sets of goods and services. But there was no price for the iPhone in 1978 and Ms 1978 could not have economised on clothes and bus fares to buy one. Economic theory now conceives of an ideal price index consisting of the bundle of goods and services that would keep constant the utility level of an abstract consumer, disembodied in time and space. In practice, statistical offices use a variety of pragmatic techniques to bring new goods into the price index, and drop old ones.

Even when the goods are merely improved rather than important and exciting innovations, calculating the price change is a challenge. Two indicators are observed – sales price and quantity sold – but three things are changing, the third being quality. If you can buy fewer bricks for your money, it is clear their price has gone up. But you would not want the size or weight of a car to be the only criterion for assessing its price – do you get more or less steel and rubber for your money? The embedded technological improvements have changed greatly for the better the character of the transportation service it provides.

How can the price index reflect the fact that you get a much better car, or computer, or washing machine, for a given amount of money? In principle, statisticians can estimate the value that specific improvements (such as electric windows, power steering, airbags, and so on) contribute to the price.²² In practice, this is done for only a few products such as computers. What we mean by 'real' GDP is therefore unclear in principle and murky in practice.

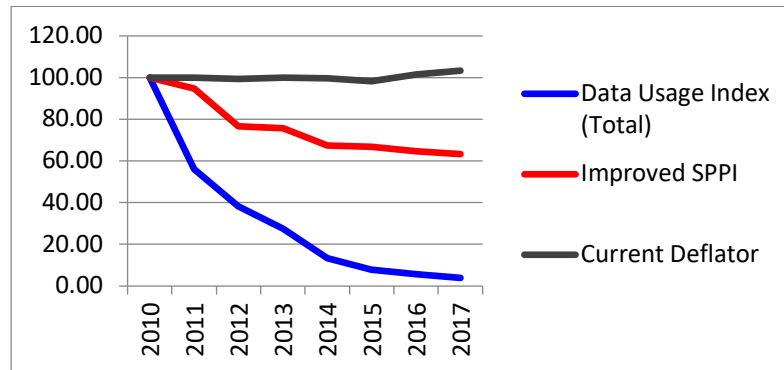
To give one example from our recent work, consider the price you pay for telecommunications services. The productivity statistics have been suggesting this sector has seen among the smallest improvements over the past decade.²³ To a telecoms engineer, thinking about the increases in bandwidth and advances in compression, decreases in latency, rollout of fast networks and exponential growth in traffic volumes, this looks absurd. The price index used to deflate nominal revenues in the sector to a 'real terms' quantity turns out to be the explanation.

²¹ With a Laspeyres index. With a Fisher Ideal index and chained GDP it would be a conceptual basket of goods, but still not the 2018 basket.

²² Using hedonic regression techniques, introduced by Zvi Griliches, (1961), Hedonic Price Indexes for Automobiles: An Econometric of Quality Change, p. 173-196 in *The Price Statistics of the Federal Government*, National Bureau of Economic Research, Inc, <https://EconPapers.repec.org/RePEc:nbr:nberch:6492>.

²³ <http://www.euklems.net/>

Alternative price indices for UK telecommunications services



Source: Abdirahman et al

The official figures (until we did this work) suggested the price had been flat for some years. Our adjusted figures indicated it had fallen by at least a third, and perhaps by as much as 90%.²⁴ In the domain of digital innovation, any adjustment to a particular price index to get a quality adjusted measure of ‘real’ output leads to corrections of this order of magnitude in the relevant price index.

Among national accountants, the instinct is to try to patch up the various deflators. This is unlikely to solve the fundamental problem of measuring progress at a time of significant structural change, however.

The economy of mass production reached its peak in the 1960s, and the turning point became evident with the economic crises of the 1970s. By the mid-1980s Paul Romer had started publishing his work on the role of knowledge in economic growth for which he was jointly awarded this year’s Nobel memorial prize, underlining the way knowledge changes economic phenomena.²⁵ In this world of weightless or intangible value-creation, the dynamics of growth are like a snowball gathering ever-greater mass as it rolls downhill: increasing returns to scale are pervasive; small changes in the starting point lead to very large differences in outcomes; there are tipping points as things that start small suddenly become very big indeed because of the feedback loop dynamics; and also path dependency or lock-in – it is almost impossible to switch trajectories once the direction of change has been established.

More goods and services, based as they are on ideas, are non-rival – software, for instance, can be copied, once created, more or less for free for many users without limiting the first user. This makes them in the technical sense public goods, although intellectual property law is being

²⁴ Abdirahman et al, op cit.

²⁵ Romer, P.M. (1986), ‘Increasing Returns and Long-Run Growth’, *Journal of Political Economy*, 94(5), 1002-1037; ‘Endogenous Technological Change’, *Journal of Political Economy*, 98(5), S71-S102.

widely deployed to constrain the free use of intangible goods and so is limiting their present social value in order – it is argued – to safeguard the creation of future value by rewarding innovators. The balance between present and future is one of the key questions in the domain of innovation, just as in the domain of the environment; both ideas and clean air are public goods, and markets cannot be expected to deliver socially desirable outcomes.

In general, more goods now involve spillovers or complementarities making them more useful when they are produced and consumed collectively rather than individually. For example, data are more valuable when different sources are combined, as Facebook and Google well understand, but governments struggle with when it comes to delivering the public good. In fact, none of this is well embedded in policy analysis.

One debate, for instance, is how to even conceptualise valuing big data. One response to the concern about big digital companies harvesting our data and using it to make money at our expense is the suggestion that the data farmers should pay us – providing personal data is a form of labour and should be rewarded, the argument goes.²⁶ But Facebook's annual profits last financial year spread over two billion users amount to an average of \$8 per person, so nobody should get the idea they can give up the day job for a life of social media surfing. Our individual attention just isn't worth all that much to advertisers. It is worth a bit more when a digital company aggregates it. However, the balkanising of personal data within the servers of individual companies fails to crystallise all the potential social value. If I were the aggregator of all my own data – my shopping habits, health status, web browsing, exercise routines – I would gain more individual welfare; if individuals' data can be aggregated, collective value could be increased.

People sometimes speak of a data commons but this is misleading. A commons is a type of good that is rival in use and non-excludable. Data is the opposite, non-rival in use but excludable, formally a club good. Indeed, in some digital markets the non-rivalry is turbocharged by the presence of network effects: the more other users there are, the greater my individual benefit. This is the case up to a point with data – more is better for identifying meaningful patterns – and seems to be true without limit for some digital matching markets.

These characteristics are very different from Fordist mass production with every car the same. Massive economies of scale can combine with increasing variety and personalisation. Through digital matching platforms people are able to find the counterparty to transactions reflecting granular individual needs or preferences. In some cases, no money is involved, as in the case

²⁶ Arrieta-Ibarra, Imanol, Leonard Goff, Diego Jiménez-Hernández, Jaron Lanier, and E. Glen Weyl. 2018. 'Should We Treat Data as Labor? Moving beyond "Free".' *AEA Papers and Proceedings*, 108 : 38-42. Eric Posner & Glen Weyl, *Radical Markets*, Princeton University Press, 2018.

of Al Roth's famous kidney exchange; and similarly the numerous non-profit sharing economy platforms.²⁷ Yet enormous value is being created.

It is not much of an exaggeration to say these phenomena verge on the invisible in the current framework of economic statistics.

This matters. John Hicks claimed: "Economics studies facts, and seeks to arrange the facts in such a way as to make it possible to draw conclusions from them. ... Facts, arranged in the right way, speak for themselves."²⁸ Far from it. Facts do not speak for themselves. "Quantitative records can help us to see farther, but only if we remember what the numbers make visible and what they erase."²⁹ We see what we measure, as well as measuring what we see.

To be sure, data have a relationship with reality; but they are structured in specific ways by the historical outcome of political choices shaping analytical constructs, definitions and classifications. The existence of conventional definitions itself acts as a focal point for the behaviour of the many individuals who constitute society. As Alain Desrosières put it: "Conventions defining objects really do give rise to realities."³⁰ The statistics can thus inform further political contestation, which ultimately perhaps brings about a new framework and set of conventions for defining and so creating data.

Some examples can make clear the political and ethical content of economic statistics.

Defining and measuring inflation is always one of the most inflamed statistical debates, because it affects directly the distribution of resources between different groups in society. As I described, there are profound technical and conceptual difficulties in creating a price index when consumer habits and the production of goods and services change so much over time. But it is also a matter of political economy. As historian Thomas Stapleford has traced in the case of the United States, the search for an 'objective' cost of living index was an attempt to depoliticize the political, to provide a bureaucratic, rules-based distribution of the social surplus.³¹ Should a union demand for a pay increase be met? Should pensioners receive higher social security payments? A price index could provide apparently impersonal, objective answers.³² Stapleford

²⁷ Roth, Alvin E., Tayfun Sönmez, and M. Utku Ünver. 2005. 'Pairwise Kidney Exchange.' *Journal of Economic Theory* 125 (2) (December): 151–188. doi:10.1016/j.jet.2005.04.004.

²⁸ John Hicks, *The Social Framework*, first pub 1942.

²⁹ Caitlin Rosenthal, *Accounting for Slavery: Masters and Management*, HUP, Cambridge MA 2018.

³⁰ Alain Desrosières, *The Politics of Large Numbers: A History of Statistical Reasoning*, Harvard University Press, 2002.

³¹ Thomas Stapleford, *The Cost of Living in America*, Cambridge University Press, 2009.

³² For a broader discussion of the role of statistics in bureaucratization, see for example Theodore Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life*, PUP 1995; and Adam Tooze, *Statistics and the German State 1900-1945: The Making of Modern Economic Knowledge*, CUP 2001.

presents a history of increasing use of official price indices, punctuated by period methodological reviews when the actual statistics failed to satisfy one side or another in a political contest.

One of the best-known reviews was the Boskin Commission. Its 1996 report, "Toward A More Accurate Measure Of The Cost Of Living", drew on the concept of the quality adjusted price index I described earlier to conclude that the rate of inflation measured by the CPI was overstated by 0.8 to 1.6 percentage points a year due to a failure to take account of quality improvements.³³ The implication was that consumers needed lower income increases to maintain a constant level of utility, as they were able to substitute to new and better products. The report was immediately seen as a political document. "The commission's findings are being used as a cloak for an economic agenda that will injure lower- and middle-income households," wrote one prominent commentator, adding: "Revising the CPI would get the Republicans off the hook of deficit reduction, while simultaneously advancing the interests of business. This, however, would occur at the expense of working Americans and the elderly."³⁴

A similar contest over the distribution of resources is under way in the UK today, in the debate about the use of the Retail Price Index (RPI) rather than the Consumer Price Index (CPI) to uprate certain prices and payments. The two have diverged steadily, mainly due to differences in their methods of construction. Economists believe the CPI to be a more accurate measure, but the RPI is enshrined by tradition and in some cases (such as payments on index-linked gilts) by contract. Chancellors have switched some benefit payments previously uprated by RPI to CPI indexation, saving themselves some expenditure, while keeping revenues or prices such as student loan rates and beer duty linked to RPI. The debate is as bitter as it gets in the gentle world of statistics. There cannot fail to be winners and losers.

Another example of the inherent conflicts of interest in technical statistical constructs is discounting. The choice of discount rate to use pits the interests of the future against those of the present; the higher the rate, the more the present prevails. The idea of discounting was a conceptual innovation of the early 18th century, introduced explicitly into political debate in the context of calculating 'the Equivalent', the English payment to Scotland to bail out its economy at the time of the Act of Union; William Deringer writes: "It placed almost no value on anything that happened beyond one human lifetime. This peculiar claim clashed violently with many Britons' intuition about what the future was worth to them."³⁵ The debate about how to calculate

³³ <https://www.ssa.gov/history/reports/boskinrpt.html>

³⁴ Thomas Palley, How to Rewrite Economic History, *The Atlantic*, April 1997
<https://www.theatlantic.com/magazine/archive/1997/04/how-to-rewrite-economic-history/376830/>
(19/10/18)

³⁵ William Deringer, *Calculated Values: Finance, Politics and the Quantitative Age*, Harvard University Press, 2018.

discounted cash flows became highly polemical, one of the fronts in the political battle between Whigs and Tories – in much the same way that politicians in Leave and Remain camps trade statistical claims about imports and exports without necessarily knowing or caring about the technical detail. Bitter partisanship reveals the political character of statistics, so carefully ushered into the background by technocratic expertise. In his day, David Hume was sceptical about the usefulness of quantitative debate about the balance of trade for exactly this reason: “Every man who has ever reasoned on this subject, has always proved his theory, whatever it was, by facts and calculations.”³⁶ Admirable efforts to scrutinise partisan claims and present ‘the facts’ may thus be missing a key point.

A more recent manifestation of the politics of discounting followed the publication of the 2006 Stern Review on climate change.³⁷ It introduced a far lower discount rate than had been typical in estimating the costs of future climate change damage, with the result that much higher future costs warranted more urgent action now. Stern, explicitly for the reason that there is no moral basis for discounting the well-being of future generations, used a rate of 1.4%; in the apparently highly technical subsequent debate, other economists favoured the 6% that was more typical. The discount rate is a key technical and ethical decision in current statistical challenges too, such as valuing data assets or natural or human capital. The value of an asset today depends on the stream of benefits it is expected to deliver over its remaining lifetime. If we want to embody sustainability in the economic measurement framework by incorporating assets in a social balance sheet, pricing the future through the discount rate is an unavoidable moral choice.

These examples show that statistical constructs are never merely technical, always embedding values.

Achieving Progress

This being the case, it should be even more obvious that it is not possible to model or analyse the economy in a value-free way. Yet economic policy advice is often presented as technical: politicians have a target, such as 2% inflation, or reducing obesity rates, and the economic analyst must work out the most effective means of delivering the desired result. Economists of course understand that policy choices are value-laden, and yet at the same time strive to separate the normative from the positive, claiming the latter as their domain of expertise.

³⁶ David Hume, *Of the Balance of Trade*, in *Essays Moral Political and Literary*, first pub. 1752.

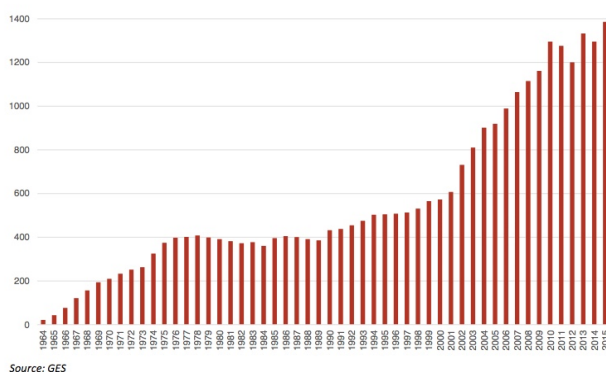
³⁷ https://webarchive.nationalarchives.gov.uk/20070222000000/http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.html

This separation protocol is deeply embedded in modern economics. In 1932 Lionel Robbins published his famous manifesto on the nature of economic science, under the influence of logical positivism, itself a response to ‘demented times’.³⁸ Economics has hamstrung itself ever since by its inability or reluctance to discuss values.³⁹ Robbins was explicit: “Economics is neutral as between ends. Economics cannot pronounce on the validity of ultimate judgments of value.”⁴⁰ The task of the economist is to pronounce instead on the efficiency of the use of resources allocated to whatever ends society deems, by whatever process, to be appropriate. This was a significant break from the earlier tradition of welfare economics, exemplified by Pigou, who said: “Ethics and economics are mutually dependent.”⁴¹ Robbins was fundamentally wrong. Economics cannot *not* pronounce on the validity of judgements of value. But the discipline today remains Robbins-onian.

Given their influence on policy, there is also real merit in economists’ efforts to distinguish technical advice as if given by a neutral expert from value judgments that depend on the advice-giver’s ethical or political beliefs. Indeed, this claim to objectivity has probably helped make economics so influential in policy making. There are economists in all central government departments; there are powerful economic regulators too, not to mention the central bank; and the number of government economists has been on an upward trend.

Number of members of Government Economic Service

GES members in economist posts 1964 - 2015



Source: GES

HM Treasury. The total reached 1600 in 2018.

³⁸ Karl Sigmund, *Exact Thinking in Demented Times*, Litte, Brown, 2017.

³⁹ Diane Coyle (2018) *Homo Economicus*, Als, humans and rats: decision-making and economic welfare, *Journal of Economic Methodology*, DOI: [10.1080/1350178X.2018.1527135](https://doi.org/10.1080/1350178X.2018.1527135)

⁴⁰ Robbins, L., *The Nature and Significance of Economic Science*, Macmillan, London , 1932, 1952. P147.

⁴¹ A C Pigou, *Economic Science in Relation to Practice*, Macmillan, 1908. Quoted in Ian KumeKawa, *The First Serious Optimist: AC Pigou and the Birth of Welfare Economics*, Princeton University Press 2017.

Businesses employ economists to lobby government, so in effect modern capitalism is organised as a result of the outcome of a conversation among economists. One could argue, looking at the world today, that the outcome is not pretty.

The influence of economics is without question being challenged as it has not been for decades. “People in this country have had enough of experts,” said Michael Gove during the referendum campaign, referring to the economists’ solid anti-Brexit consensus; and it was one of the truest things he said during the campaign.⁴² Plenty of others have joined in the criticism, rattling economists to the extent that a distinguished group started the hashtag *#whateconomistsreallydo* in a bid to convince social media and the world beyond that what we really do is really useful.

The financial crisis and its lingering unpleasant legacies mean growing doubt about economic advice is not at all surprising. But as if that near-catastrophe were not enough, bequeathing high debt burdens, low wage growth, zombie banks and food banks, there is growing concern about the next economic challenge: the robots. Advances in digital technologies, robotics and AI are coalescing to bring about further significant changes in the structure of the economy and society. At this stage it is impossible to predict exactly what these changes will be, but there are terrifying shapes looming through the mist. Will the robots take half of our jobs in 20 years?⁴³

In this context of fear about the future and resentment about the recent past, the separation protocol is less and less viable. Western societies are polarising politically and in terms of people’s fundamental sets of values and beliefs. Mr Gove’s economist-fatigue was a statement about values, rather than about expertise.

This seems to me a more fundamental challenge for economists, rather than the any of the other often-heard critiques such as our supposedly implausible assumption of rational, self-interested choice. Critics of economics often assert that people do not behave like *homo economicus*, but they sometimes do – as do all kinds of other creatures from fish to birds to other primates.⁴⁴ The choice context seems key to understanding how humans and other animals make decisions. What’s more, behavioural economics (in either its initial form focusing

⁴² <https://www.ft.com/content/3be49734-29cb-11e6-83e4-abc22d5d108c> (accessed 18/10/18)

⁴³ The future of employment: How susceptible are jobs to computerisation? *Carl Benedikt Frey* and *Michael A. Osborne* *Technological Forecasting and Social Change*, 2017, vol. 114, issue C, 254-280

⁴⁴ Hurley, S., & Nudds, M. (2006). *Rational Animals?* Oxford: Oxford University Press; Herbranson, W., & Schroeder, J. (2010). ‘Are birds smarter than mathematicians? Pigeons (*Columba livia*) perform optimally on a version of the Monty Hall Dilemma.’ *Journal of Comparative Psychology*, 124 (1), 1-13.

on lists of psychological 'biases' in choice or in the alternative that considers modes of choice to be rules of thumb economising on brain energy) can fall even harder into exactly the same technocratic trap as rational choice economics. Even if you accept that it is or can be more 'realistic', it too regards the economist as the expert standing outside the economy claiming an objective perspective on how it operates.

Behavioural economics at least recognises there is an issue, as there has been debate about so-called libertarian paternalism, and the question of psychological biases on the part of the experts themselves.⁴⁵ However, this debate does not get to the point of recognising the consequences of the impossibility of economists standing outside their models.⁴⁶ As Alice finds to her dismay when playing croquet with the Queen of Hearts, with flamingos for mallets and hedgehogs as balls, the tools of the game are all too alert to her play.



This self-referential character, although very familiar to some other social scientists, is alien to economists.⁴⁷ Indeed, this is clearly a difficult point for many people to grasp.

One example is the recent resurgence of the debate about the Y2K phenomenon, or Millennium Bug. As the year 2000 approached, it dawned on the computer community that – to save on memory space – dates had generally been encoded as only the last two digits of the year. Many computer systems were going to interpret the year 2000 as 1900, with unpredictable and potentially dangerous consequences, as this feature was embedded in very many pieces of

⁴⁵ Gilles Saint-Paul, *The Tyranny of Utility: Behavioral Social Science and the Rise of Paternalism*. Princeton: Princeton University Press, 2011; Thaler, Richard, H., and Cass R. Sunstein. 2003. "Libertarian Paternalism ." *American Economic Review*, 93 (2): 175-179.

⁴⁶ Diane Coyle, The Public Responsibility of the Economist. Part 1: Dr. Frankenstein, I Presume? Part 2: Why is economics special?, Tanner Lectures on Human Values, Oxford 2012. <https://www.bnc.ox.ac.uk/about-brasenose/news/982-tanner-lectures-2012>

⁴⁷ Indeed, for all that it came out of the public choice literature, one could interpret the shortcomings of the New Public Management approach, particularly the gaming of behaviour to meet targets rather than deliver outcomes, as the result of a failure to remember that incentives affect the deliverers as well as the recipients of policy.

software across many systems that had become a palimpsest of layers of code over time. As the end of 1999 approached, every day brought screaming headlines about planes falling out of the sky at the stroke of midnight and so on. The clocks struck 12, Auld Lang Syne began to ring out – and nothing happened. Had it all been hype? Jacob Rees-Mogg thought so, tweeting recently that there would be no cliff-edge Brexit disaster just as there had been no Y2K disaster. The software engineers were outraged, for of course the reason there was no Y2K disaster was that they had spent years recoding the systems.

Another example is the Close the Door campaign. As you walk down a high street in winter, you will find many stores with their doors wide open blasting out heat in the entrance. This is not a desirable state of affairs either in environmental terms or in terms of the stores' energy bills. So why do they continue to do it? Their fear of discouraging ambling shoppers from entering their store, when every other door is open, outweighs their incentive to cut their electricity bill. No shop can shut the door unless most of the others do so. It is a classic co-ordination problem. The Campaign aims to co-ordinate actions, but will not succeed until a critical mass of door closers has been reached on every high street. A regulation banning open doors would achieve the same, faster and more effectively because government has strong co-ordinating power. But when I tried to explain this to economic analysts in the relevant Whitehall department, they were bemused. Yet there are many co-ordination problems in the economy: what technical standards should autonomous vehicles adopt? How can individuals be persuaded to acquire more skills and employers simultaneously be persuaded to adopt higher skill production methods?

Individual policy makers are not to blame for their bemusement. There is not enough in the policy tool kit for today's economy. Its dynamic characteristics mean outcomes are often self-fulfilling (or self-averting) and therefore indeterminate. This has always been the case to an extent – a recession is a self-fulfilling prophecy.⁴⁸ Now self-fulfilling or averting phenomena and co-ordination problems are pervasive because of the character of post-post-Fordist growth.

Some sociologists have emphasised the role of performativity in shaping the economy. This is most fully articulated for the financial markets. Donald Mackenzie has argued persuasively that the Black-Scholes option pricing model, combined with the enterprise of Fisher Black in selling calculations based on the model around the Chicago futures markets in the 1980s, created derivatives markets.⁴⁹ Previously, derivatives existed only on a small scale as there was no consensus about how to work out the prices. Not only are derivatives markets now vast, and

⁴⁸ Roger Farmer, *How The Economy Works: Confidence, Crashes and Self-Fulfilling Prophecies*, Oxford University Press, 2010.

⁴⁹ Donald Mackenzie, *An Engine, Not A Camera: How Financial Models Shape Markets*, MIT Press, 2006.

demonstrably able to destabilize the global economy, they are also prompting tunnelling through the Allegheny Mountains and the building of massive microwave towers on England's south coast to bring the speed of financial transactions between markets ever closer to the absolute limit of the speed of light.

It is arguable that the scope of economic performativity is much wider. In his Nobel Lecture, Herb Simon gave the example of the influence of operations analysis in microeconomic theory, introducing optimization techniques into business practice. Thus as the models' recommendations for inventory levels and re-order points diffused, businesses reduced their levels of inventory such that the reality came to match the theory. Holdings of inventories are far lower now than in the immediate postwar decades. For that matter, some would argue that the abstract idea of 'the market' advocated by 'free market' economists constructed a marketized society, acting through policies implemented by governments from the 1980s on, advised by economists.⁵⁰

Yet for the most part we continue thinking about policy in terms of levers and channels, of stable causal relations. There is extraordinarily little acknowledgement even of the entirely predictable – whether 'rational' or 'behavioural' – adjustments people will make in reaction to changes intended to constrain their actions. These are often labelled 'unintended consequences' and while that may be so, that there will be some is not 'unforeseeable'. Anybody doubting this has only to read classics like *The Blunders of Our Governments*.⁵¹

This kind of approach is becoming ever less useful as the technological transformation of the economy and society proceeds. When knowledge is part of the economic system, knowledge about the system changes the system.

This is moving up a gear. Even at this early stage in its application, AI is forcing confrontation with the question of what sort of society we want, in a way that highlights the limits of policy-making. The ever-increasing connectivity, feedbacks, and network effects – all at ever-faster speeds – are making outcomes more unpredictable and prone to sudden change.

The term AI is used in a rather general way in the policy debate. There is a key distinction between decisions that can be encoded and those generated by deep learning.

⁵⁰ Michael Sandel, *What Money Can't Buy: The Moral Limits of Markets*, Farrar, Strauss, & Giroux, 2012.

⁵¹ Anthony King and Ivor Crewe, *The Blunders of Our Governments*, Oneworld, 2014.

Some problems have an analytical solution which may need significant computational power but can be spelt out in step-by-step instructions to the machine. Decisions of this kind can be explained.

Other problems – far more widespread in the policy world – do not have known solution procedures. Why are students from certain schools underperforming? What is causing the obesity epidemic? Applied economists are learning more every day, but it is fair to say that in such examples there is no consensus pointing to a clear causal analysis and specific policy levers to pull.

The alternative AI approach is to use a large amount of data with minimal analytical structure; deep learning or neural net algorithms will produce decisions that are inherently hard to explain.

If we could have explained the model, there would be no point in taking the deep learning approach. It is most useful exactly where we don't know the solution, or where we may have the wrong model.

Policymakers naturally have a problem accepting black box solutions, and for some good reasons, including questions about the robustness of algorithms to change in the data generating process – and of course the fact that economic data is politically constructed. At least as important is the need to allocate legal responsibility or political accountability: are we really going to accept that autonomous vehicles can motor round the streets with occasionally lethal consequences if they are powered by neural nets and owned by limited liability corporate entities? Will a minister of justice ever be accountable for sentencing or parole decisions if most are made by black box AIs? How are the trade-offs between outcomes to be incorporated in the algorithmic decision process?

At the same time, these doubts focus attention on whether we have the right counterfactual: are policy decisions and outcomes *not* using AI taken in an analytically explainable way? Or is it in fact a messier process, itself complex and non-linear, in which policy analyses are post hoc rationalisations of the outcome? And if that is the case, should we place more trust in the imperfect human or the logically consistent machine?

Above all, what objective functions should be coded? AI is urgently posing the question: what kind of society do we want? For the machines at present are rational, consequentialist maximisers, on steroids.

Algorithms are better than judges at predicting which prisoners should be denied parole because likely to reoffend, so 40% fewer people can be incarcerated and the crime rate reduced

simultaneously. If the AI disproportionately rejects parole for black prisoners, and yet at the same time reduces the black prison population significantly, is that a desirable outcome?⁵² The consequentialist computer says yes. Yet the question forces consideration of the aim of policy – what counts as a better outcome – and also of the wider social system within which decision-making is being progressively delegated from humans to machines.

AI and its consequences are shining an arc light on the values embedded in existing policies, because the machines do not hide social biases, do not fudge the answer, are not inconsistent in their choices. We are giving significant decision-making powers to mechanized *homo economicus*.⁵³ Do we want to encode and enforce the present social framework and thus ensure that future decisions ever more faithfully represent it?

Homo Economicus



Boston Dynamics

Conclusions

It is much easier to raise such questions than to answer them.

A lot of my work in recent years has concerned the measurement challenge, both the more technical issues and the broader concern about the values embedded in the statistical framework. The link between measurement and social values has to be made explicit.⁵⁴ Although other social sciences began to reconsider economic measurement earlier, this is

⁵² Jon Kleinberg, Himabindu Lakkaraju, Jure Leskovec, Jens Ludwig, Sendhil Mullainathan; Human Decisions and Machine Predictions, *The Quarterly Journal of Economics*, Volume 133, Issue 1, 1 February 2018, Pages 237–293, <https://doi.org/10.1093/qje/qjx032>

⁵³ David Parkes and Michael Wellman, 'Economic Reasoning and Artificial Intelligence', *Science*, 17 Jul 2015: Vol. 349, Issue 6245, pp. 267-272 DOI: 10.1126/science.aaa8403

⁵⁴ <https://www.bennettinstitute.cam.ac.uk/research/research-projects/practical-wisdom-complex-world/>

something economists must engage in, given our policy influence. It is fair to say there is now quite a large and a rapidly growing community of economic researchers looking at the measurement of progress. The hunt is on for an alternative framework and a system of representation that can compress the many dimensions of economic welfare into a form enabling public scrutiny and debate.

Amartya Sen's capabilities approach is an attractive alternative to the utilitarian System of National Accounts. The 2009 Sen-Stiglitz-Fitoussi Commission on the Measurement of Economic Performance recommended moving away from a single indicator of progress to a dashboard;⁵⁵ the report ignited significant work in the statistics and policy community to think about measurement 'Beyond GDP'. A number of countries now have well-being measurement and reporting, environmental accounts, well-being frameworks and the like. However, there is a proliferation of alternative indicators and dashboards, with no solid theoretical skeleton commanding wide consensus, so they have gained less traction than one might have hoped. The current System of National Accounts including GDP is in effect an international technical standard with lock-in, so there needs to be enough support for a single alternative to make the switch.⁵⁶ Policies, and politicians, are therefore inevitably still judged on their performance by the conventional metrics.

Giving the idea of Sen's capabilities statistical form requires measures of people's access to assets of different kinds. A focus on assets has the additional merit of embedding sustainability because valuing assets today requires taking a view about their future availability. Nascent work in this area divides the relevant assets into six categories of capital: financial, physical, natural, human, social and intangible.⁵⁷ But there is a long way to go before the broad concepts are pinned down in ways that can be counted, including measures of access on the part different groups, places or individuals.

For instance there are various ways social capital might affect economic outcomes. The literature tells us that social capital can mean the difference between life and death for vulnerable individuals during a heatwave.⁵⁸ A person's social network may affect their chances of finding employment.⁵⁹ Companies' stockmarket value, and hence their opportunities for investment and activity, depend on their reputation and their intangible capital, 'goodwill' being

⁵⁵ <https://ec.europa.eu/eurostat/documents/118025/118123/Fitoussi+Commission+report>

⁵⁶ Diane Coyle, 'The Political Economy of National Statistics' in *National Wealth: What is Missing, Why it Matters*, eds Kirk Hamilton and Cameron Hepburn, Oxford University Press, 2017.

⁵⁷ Diane Coyle & Benjamin Mitra-Kahn, 'Making the Future Count,' Indigo Prize 2017. <http://global-perspectives.org.uk/wp-content/uploads/2017/10/making-the-future-count.pdf>

⁵⁸ Eric Kleinenberg, *Heatwave: A Social Autopsy of Disaster in Chicago*, Chicago University Press, 2002.

⁵⁹ Granovetter, Mark S. "The Strength of Weak Ties." *American Journal of Sociology* 78, no. 6 (1973): 1360-380.

the major asset on many balance sheets.⁶⁰ Economists believe that what we label ‘institutions’, a shorthand for the forms of collective rules and norms in an economy, are the vital element in development and growth.⁶¹ Yet these concepts do not have a clear enough definition to enable them to be bureaucratized as everyday statistics for use in political debate and the policy process.

Similar gaps exist, to varying degrees for all the other types of wealth that seem to have an important determinative role for economic outcomes, from financial and physical capital to natural and human capital. For example, how do we account for the system properties and tipping points in natural and infrastructure capital?⁶² What are we trying to capture in measuring an intangible asset like data?

If we are to take any economic theorising about the importance of social capital, or of intangibles like data, seriously enough for policymakers to act on it, there needs to be supporting evidence – which means pinning down the definitions and developing the statistics. Otherwise they are empty concepts for all practical purposes.

It is possible to think of other approaches to measuring well-being. There is a large literature now on the direct measurement of subjective well-being or ‘happiness’ through surveys or diary methods, and a resulting body of econometric work on the determinants of well-being. These include some obvious results – people hate commuting and like having sex – and some less clear findings concerning the age profile of happiness or the impact of higher education.⁶³

An emerging interest in economics, occurring because of digital technologies, is the use of time, the ultimate resource constraint. Time is arguably a better metric than ‘output’ for productivity in services, which make up four fifths of the economy: sometimes saving time improves the service (a bus journey), sometimes extending the time spent (nursing provided in intensive care). Time saving is an important part, too, of improving production processes – we even call the system just-in-time production. So an obvious avenue to pursue is whether monitoring time use – currently only done in occasional statistical exercises and only for consumption and leisure activities, not production – can be combined with the well-being results.⁶⁴

⁶⁰ Jonathan Haskel and Stian Westlake, *Capitalism Without Capital*, Princeton University Press, 2018.

⁶¹ Much of this literature is summarized in Daron Acemoglu and James Robinson, *Why Nations Fail: The Origins of Power, Prosperity and Poverty*. 2012.

⁶² I am using the word capital in the specific economist’s sense of a stock enduring through time and delivering a flow of services, which can take many forms but we might try to attach a monetary value to, rather than the alternative sense used by (usually) critics of a monetized resource that has intrinsic non-monetary value.

⁶³ Summarized in Andrew Clark et al, *The Origins of Happiness: The Science of Well-being Over the Life Course*, Princeton University Press 2018.

⁶⁴ Diane Coyle & Leonard Nakamura, ‘Towards a Framework for Time Use, Welfare and Household-centric Economic Measurement’, working paper.

Pointing to different alternatives exposes the fact that I have been avoiding defining progress, although some aspects of a definition are implicit in my discussion of measurement.

Sustainability is essential, and our societies are at the limits of unsustainable economic growth. Linnaeus famously said nature's economy had to be the basis of the human economy: "An economist without knowledge of nature is therefore like a physicist without knowledge of mathematics."⁶⁵

Social sustainability must matter too, so given our starting point a fairer distribution of economic gains must be part of the definition. This includes the gains from innovation, the engine of progress, which requires reflecting on what determines the character of innovation in the first place: is it plutocratic or democratic? Public policy can help ensure it provides public as well as private value.

The other challenge I posed at the start is how to improve policy-making. In this world of self-fulfilling dynamics and performative outcomes, it is less possible than ever to believe economic expertise can stand outside society looking down with benign objectivity, pulling levers.

This is frustrating because there has been real scientific progress, particularly in applied microeconomics, the meat of so much policy. There are new data sets, better econometric techniques, and greater computational power than in the past. We are deploying big data advances, and agent based modelling. We have new insights from network theory and market design. We are using field experiments and randomized control trials. Many economists would argue that the basic textbook policy response to the crisis was effective.

But although I am a strong supporter of the contribution economics makes to policy, I do think its influence means the discipline needs to respond to current critiques.⁶⁶ It is a question of legitimacy.

The simple policy-design algorithm still prevailing is: specify a problem; gather rigorous evidence and analyse it; design a policy to correct the problem; introduce the appropriate regulation or legislation; evaluate the impact and tweak if need be. This algorithm has been enriched but not altered by the introduction of behavioural considerations.

⁶⁵ Quoted in Daniel Worster, *Nature's Economy: A history of ecological ideas*, Cambridge University Press, 1977.

⁶⁶ <https://www.bennettinstitute.cam.ac.uk/blog/courageous-policy-making-challenging-times/> (18/11/18)

Policy-making needs to become more reflexive, to recognise that the subjects of the analysis can, like Alice's flamingo, argue back. This means considering, across technocratic domains like economic regulation or monetary policy, how social norms change, how dynamic phenomena become self-fulfilling or self-averting, what triggers tipping points, and so on.

If the engineer or plumber metaphors are misleading, what about the economist as storyteller? Economic statistics are used to tell the story of the economy as a whole.⁶⁷ Small revisions in the figures – which occur frequently – can change the narrative.⁶⁸ One well-known example is the UK's emergency loan from the International Monetary Fund in September 1976, when Chancellor Denis Healey turned back on his way to the airport to deal with the crisis.⁶⁹ The trigger was yet more dismal statistics about the twin balance of payments and government borrowing deficits, the latest manifestation of Britain's long postwar struggle with a lack of competitiveness. The IMF insisted on large cuts in public spending as a condition of the loan. The austerity contributed to the troubled end of the Labour Government after the Winter of Discontent, and paved the way for Mrs Thatcher and Thatcherism. The latest figures show the current account and budget deficits were a smaller share of GDP than thought at the time, and also show the economic cycle to be less pronounced than did the contemporaneous statistics. The economy was without question in a mess so the statistics alone probably did not change the course of history by enabling Mrs Thatcher's 1979 election victory – but what if they did? The counterfactual is extraordinary to contemplate.

Of course, data can also be used to tell different stories. When the third quarter of 2014 GDP growth figure was published on the first day of the 2015 UK General Election campaign, 30 March, the *Daily Telegraph* headline was: "UK economy grew at fastest rate for nine years in 2014," while *The Guardian* went with: "Data shows slowest recovery since 1920s."⁷⁰

Still, the idea of narrative economics is gaining traction. Robert Shiller compares economic narratives to epidemics, infections of the mind.⁷¹ He writes: "The field of economics should be expanded to include serious quantitative study of changing popular narratives," adding,

⁶⁷ Coyle, D. (2017), The Future of the National Accounts: Statistics and the Democratic Conversation. *Review of Income and Wealth*, 63: S223-S237. doi:[10.1111/roiw.12333](https://doi.org/10.1111/roiw.12333)

⁶⁸ Successive revisions to the official GDP statistics between 1996 and 2012 in fact removed three out of the 10 recessions the 1995 vintage statistics had recorded between 1955 and 1995. Enrico Berkes and Samuel Williamson, Vintage Does Matter, The Impact and Interpretation of Post War Revisions in the Official Estimates of GDP for the United Kingdom, <https://www.measuringworth.com/datasets/UKdata/UKGDPS.pdf> (19/10/18)

⁶⁹ 'When Britain Went Bust: The 1976 IMF Crisis' by Richard Roberts

⁷⁰ <http://www.telegraph.co.uk/finance/economics/11505763/UK-economy-grew-at-fastest-rate-for-nine-years-in-2014.html> and <http://www.theguardian.com/business/2015/mar/31/uk-gdp-growth-revised-up-to-06>. (19/10/18).

⁷¹ Robert J. Shiller, 2017. "Narrative Economics," *Cowles Foundation Discussion Papers* 2069, Cowles Foundation for Research in Economics, Yale University. Presidential address delivered at the 129th annual meeting of the American Economic Association, January 7, 2017, Chicago, IL

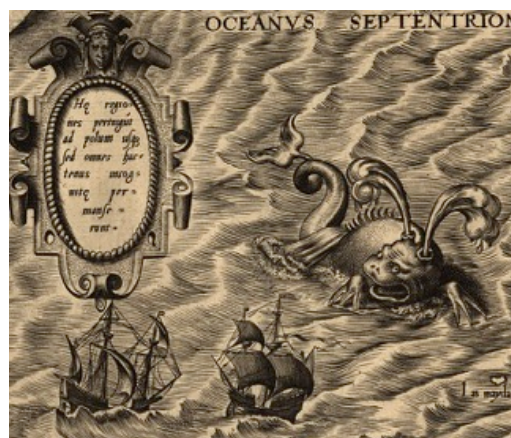
“Narratives can be based on varying degrees of truth.” Similarly, George Akerlof and Dennis Snower argue that neither conventional nor behavioural economics offer empirically valid general accounts of the way economies develop, whereas considering the role of narratives can account for the realisation of one among a number of indeterminate outcomes: narratives teach social norms, shape individuals’ identities and motivations, and prompt their decisions.⁷²

For those who are made a bit queasy by the idea that economists might set up as storytellers – or less provocatively as interpreters of narratives – there is a game-theoretic alternative. In his recent book *The Republic of Beliefs*, Kaushik Basu incorporates the rule-setters and enforcers as players.⁷³ This approach suggests that the task of policy is twofold: to influence the focal point of the game; and to include the incentives and behaviour of decision-makers and experts in policy design. This is in the spirit of Thomas Schelling’s early work on strategic policy design and self-enforcing interventions (such as the traffic light, a rule everyone has an incentive to obey).⁷⁴ Perhaps policy-makers need to think about co-ordinating individual decisions by setting focal points, and about how best to design the rules of the game, including themselves as players.

Whatever role we foresee for experts, the neatly classified world of the post-war economy is over. The statistics – numbers states gather to help them achieve their purposes – map the territory behind us rather than ahead of us. Monsters are looming in the machine-made world

. The engine of progress has stalled and the engineers have the wrong kind of tools. I do not know the answers to my twin questions; but the questions are urgent.

Here be monsters



⁷² George A. Akerlof, Dennis J. Snower, Bread and bullets, *Journal of Economic Behavior & Organization*, Volume 126, Part B, 2016, Pages 58-71, <https://doi.org/10.1016/j.jebo.2015.10.021>.

⁷³ Kaushik Basu, *The Republic of Beliefs*, Princeton University Press, 2018.

⁷⁴ Thomas Schelling, *Micromotives and Macrobehaviour*, Norton, 1978, 2006.