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Indigo Prize Entry

## Making the future count

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Words: 5000, including footnotes; excluding abstract, references & appendix

## **Abstract**

*GDP captures only market transactions at the price of exchange, and not the welfare gains, externalities, environment, distribution of wealth or innovation which occurs in an economy. Hence almost since its creation in the 1940s it has been criticised for its inability to capture economic welfare.*

*Now changes in the economy, being restructured by digital technology and paying the price for unsustainable growth, make the case for a new measurement framework more pressing than ever. GDP was never an ideal measure of economic welfare and its suitability has been decreasing.*

*We propose a two stage reform. The first involves three straightforward amendments to GDP: accounting properly for intangibles; removing unproductive financial investment; and adjusting for income distribution. These alone will make GDP a better measure of economic welfare. Official statisticians could implement this first stage relatively easily.*

*The second stage is a more radical replacement of GDP with a small dashboard recording access to six key assets: physical assets, natural capital, human capital, intellectual property, social and institutional capital, and net financial capital. This balance sheet approach to measuring the economy will embed sustainability, which GDP never can because it records only flows of income, output, or expenditure. Our proposed approach will also account for whether or not individuals have access to the assets they need to lead the kind of life they want; this, rather than being able to buy more goods now, is the key to economic welfare.*

*This is an ambitious approach requiring some new economic thinking and much data collection. But if we had adopted it earlier, there would have been no complacency about economic performance in recent times.*

## **Introduction**

“In the long run we are all dead.”

John Maynard Keynes’s famous statement<sup>1</sup> is often taken to mean that the future can take care of itself. While this grossly misinterprets him, unfortunately his work setting up GDP and the present System of National Accounts has resulted in seven decades of economic management prioritising growth now at the expense of the future. How much innovations contribute to welfare rather than current output does not figure in the accounts. There is no way to assess the sustainability of economic growth, either environmental or social. Non-market activities such as volunteering do not figure. Nor do externalities of any kind (environmental, digital network effects, public goods), because market prices do not capture their full economic costs or benefits.

The costs of our GDP-centric approach to measurement are becoming clear, and there are more and more suggested alternatives, including the Indigo index.

We propose a system of economic measurement that ensures the future gets due weight in present decisions. The emphasis is on individuals being able to lead the kind of life they would like through access to assets. Our system, rooted in economic theory, completely changes the framework for thinking about whether the economy is doing well or badly.

This is a big task so we also propose a transition pathway to improve current statistics in three key ways, drawing on our work on the origins and evolution of GDP: adding intangible investment, reflecting income distribution, and reducing the outsized role of finance – to make GDP, a 20th century metric, a better measure for the 21st century economy.

## **Why GDP? A good measure of the 20th century economy**

Statistics are creations of states, and the origins of economic statistics lie in governments’ desire to raise taxes and wage wars. In the early 20th century, as the democratic franchise was extended, a new aim was added: tracking economic progress – or rather, during the 1930s, tracking how much worse off people were. Measuring the economy to wage war and raise taxes focuses statistics on the availability of resources and the total flow of money or the tax base; measuring economic progress means focussing on economic welfare.

The pioneers of modern national statistics in the 1930s, such as Simon Kuznets and Colin Clark, were keen to measure welfare but with World War II the immediate imperatives of the state took priority. Keynes and others developed an aggregate to measure the total flow of money in the economy – production, incomes and expenditure, all valued at market prices. Guided by Keynes’s famous macroeconomic model, the Allies were able to calculate how much forced saving would be required of consumers to keep resources free for the war effort.<sup>2</sup> The aggregate that became

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<sup>1</sup> From the *Tract on Monetary Reform*, 1923

<sup>2</sup> The history is summarized in Mitra-Kahn (2011) and Coyle (2014)

Gross National Product (later Gross Domestic Product),<sup>3</sup> rather than a welfare-based approach, became the accepted international standard measure.

This measure, and the theory that relates the circular flow of income to GDP, was a very successful approach to the 20th century economy. The circular flow of income conceives of goods and services moving from a well defined production sector (including agriculture) to households, in return for consumers paying for goods, and working for a wage. In this world, measures of household expenditure, or output sales, or the total incomes earned, are conceptually identical. This was practical for keeping track of resources during the war, and also worked well enough for an economy with full-time wage earners using capital provided by a company, where the returns to labour were similar to those of capital. Unfortunately for GDP, in the 21st century, the economy has become more intangible, the labour force is increasingly self-employed or contract-based, the returns to capital and labour have diverged, and it is not companies but skilled people and financial markets that provide productive capital. All these changes means that what was a good measure for the 20th century no longer does the job in the 21st. (Stiglitz et al. 2011).

National statisticians still insist that GDP is nothing more than the sum of the nation's economic activity as defined by the circular flow of income, measured at exchange values. While technically correct, this is doubly wrong.

It is wrong simply because GDP is universally used as shorthand for national wellbeing. Economic policies are justified, or lobbied for, on the basis of whether or not they will increase GDP growth. Politicians and commentators do not focus on how things are going in terms of what the Victorians might have called 'moral statistics' (Cook 2017) – such as homelessness, youth suicide rates or educational results. It is the GDP figure that has the moral weight in policy debates.

The statisticians' claim is also wrong because they deflate nominal GDP to translate it into 'real terms'. This seems reasonable. Surely it makes sense to adjust for changes that are no more than the result of inflation, because nobody is better off if the price of everything doubles.

However, as Thomas Schelling (1958) put it, "[O]nly the money magnitudes are real. The "real" ones are hypothetical." Deflators aim to help measure how much better off someone is in the present than the past; and if there is no innovation, no change in relative prices and no change in people's preferences that would be easy. But in reality the statistician has to ask, if buying the same goods as in the past, how much better off is someone with today's prices; or, if buying today's goods, how much better off would they have been with yesterday's prices?<sup>4</sup> There is no satisfactory way to take into account for innovative new goods. There is a vast literature discussing the resulting 'biases' in price indices due to the introduction of new or significantly improved goods and services. But deflators, while appearing to be mechanical adjustments, cannot avoid judgments about changes in economic welfare as people substitute new goods for old.

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<sup>3</sup> GDP aggregates over everybody within the national boundary. GNP aggregates over national citizens wherever they are located.

<sup>4</sup> These correspond to the Laspeyres and Paasche indices.

### ***A flawed measure for the 21st century economy***

The gap between GDP growth and the increase in economic welfare will therefore increase at times when there is more innovation than usual – like now. Digital technology is creating new goods and services directly and is leading to business model innovation across the economy (streaming music services, accommodation platforms, servitisation of manufacturing, volunteer production of digital goods such as open source software, and much more). There is a lively debate among researchers about the possibility that an increased pace of innovation (especially in digitally-based technologies and business models) may be one of the factors contributing to the slow growth of measured productivity at present, in a reprise of Robert Solow’s famous 1987 observation, “You can see the computer age everywhere, but in the productivity statistics.”<sup>5</sup> A key reason is that innovation and intangibles are not measured. For instance, simply capturing innovations in telecommunications services could add significantly, perhaps as much as 1.5% points a year, to UK real GDP growth in 2010-2015 (Abdirahman et al, 2017).

National accountants accept that consumer surplus, thanks to innovation, has increased, while insisting there is nothing conceptually wrong with GDP (Ahmad and Schreyer, 2016). Their solution to this, and the many other well-known economic welfare omissions from GDP such as environmental externalities or ‘home production’ of services like childcare, is to produce ‘satellite’ accounts. These apply a national accounts methodology by applying relevant market prices, such as valuing household services at wage rates for similar jobs. The ‘satellites’ – the name reflects their status – feature not at all in the GDP figures or policy debate and are little used by researchers.

So the GDP and national accounts statistics in use now, are past their usefulness. An explicit economic welfare measure is needed instead. Modern democratic governments in digital economies do not need a statistic designed to measure physical productive capacity in wartime.

### ***A long term welfare framework***

The present national accounts framework conceives of welfare in terms of utility, depending only on the flow of production and consumption. This inherently rules out measuring sustainability: for example, past and current generations have damaged biodiversity, to an extent more than consideration of the UK’s resource balance sheet would have justified. Future generations will have to pay more for ecosystem services such as pollination (Helm, 2011). Similar arguments apply to all economic assets. GDP cannot answer the question about the extent to which current consumption and production leave the nation’s assets able to sustain future consumption that is at least as high as now.

Nor can GDP answer the question about the extent to which people are able to lead a life that is meaningful and satisfying to them, including being able to consume goods and services.

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<sup>5</sup> If the price of technology-enabled goods and services is being over-stated (or decline in price under-recorded) in the statistics, this would translate into an under-estimate for real output and productivity.

We propose an alternative framework based on Sen's concept of capabilities, or people's opportunities to lead the kind of life they value (Sen, 1999, Basu & Lopez-Calva 2011). Income and consumption are important, but the relevant capability metric is the extent to which people can earn the income they need.

This implies a profoundly different approach to measuring the economy.

Rather than looking at GDP or any of its components this quarter or this year, adjusted for changes in the 'cost of living', the key measure is access to the range of economic assets people need to lead a meaningful life as they conceive it. This requires measurement of access to six types of economic asset:

- Physical assets and produced capital, including access to infrastructure such as transport, energy networks, communications networks, and other public assets, and to new technologies
- Net financial capital (including contingent debts)
- Natural capital, the renewable resources provided by nature, and either demarcated by property rights or commons (such as clean air)
- Intangible assets such as intellectual property and data
- Human capital, accumulated adaptable skills and physical and mental health
- Social and institutional capital, the degree of trust affecting the transactions costs of economic exchange and the viable provision of public goods

Without a balance sheet approach to statistics, the economy cannot be managed for broad sustainability or economic welfare. Assessing sustainability means giving the future a voice in the present. This requires looking at stocks of assets – how much has been depleted, how much remains for future use, and who can access them?

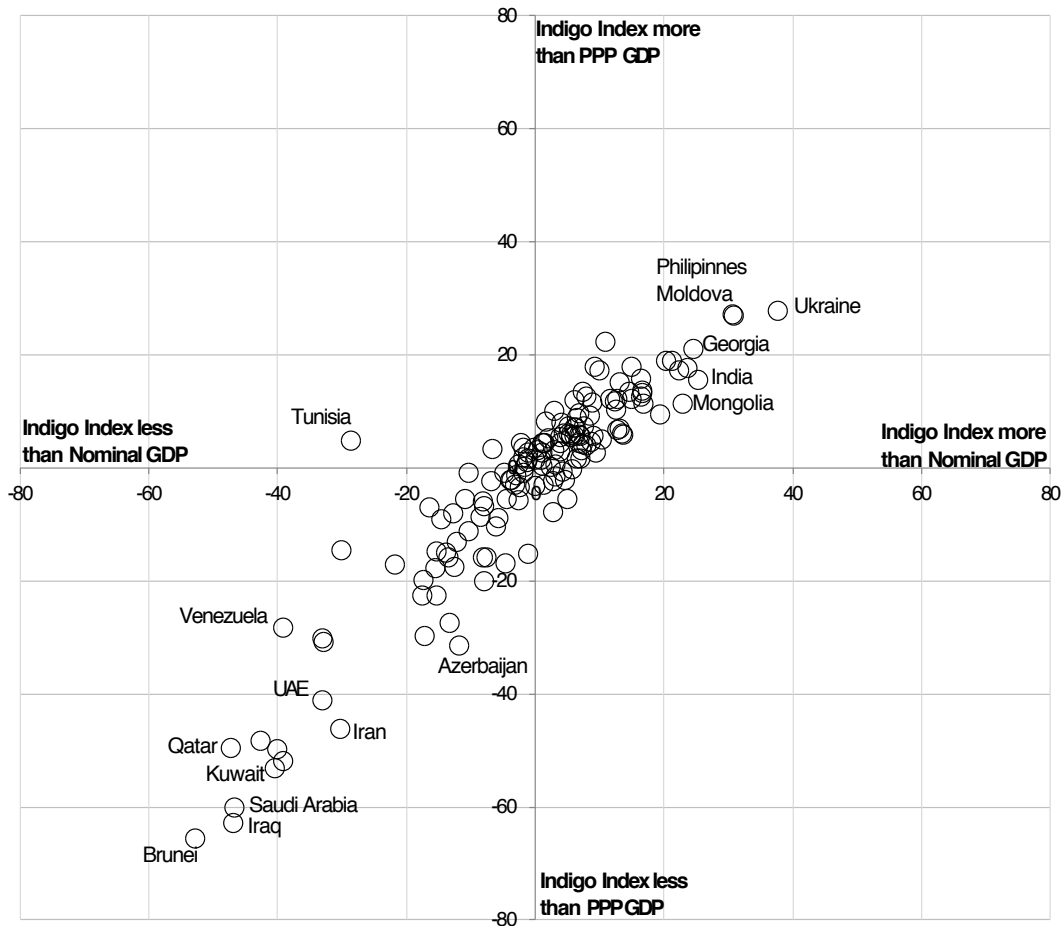
Access by individuals or groups to these different assets determines their ability to earn, to spend, and to engage in any other activities they need to lead the kind of lives they want. Access to these assets – in which new technologies will be embedded – measures their capabilities, affected by economic policies.

### ***A two-stage pathway: immediate improvements to GDP***

Making the transition from the current measurement framework centred on short-run activity flows to one based on sustainable wealth is a big change, which can not occur quickly. But there are some immediate improvements to make to GDP.

The divergence of the Indigo index from GDP per capita contains some important clues. The Indigo Index is a composite indicator of future potential, incorporating measures of Stability, Legal Framework, Creativity, Innovation, Economic Diversity, Digital Economy and Freedom. Most indices proposed as alternatives or supplements to GDP tend to rank countries quite similarly to GDP (e.g. McGillivray 1991, Ravallion 1997). Many of the top performers on the Indigo index are therefore countries with the highest GDP per capita (both in nominal and purchasing power parity (PPP) terms). Figure 1 compares the percentile ranking of countries' GDP per capita with their Indigo Index ranking. So a country in the top 20th percentile of the Indigo Index but in the 10th percentile for GDP per capita would score minus ten in figure 1.

Figure 1: Percentile comparison of Indigo Index and GDP per capita



Source: IMF Yearbook GDP Figures (2016) and Indigo Index

The outliers whose Indigo Index rank is much lower than their GDP per capita rank are mainly countries with large natural resource assets, and uneven income distribution. For example Brunei – the most extreme outlier – is ranked 103 on the Indigo Index (67th percentile) but 28 and 4 on GDP per capita (nominal and PPP) in the 15th and 3rd percentiles. Where the Indigo Index rank is better than GDP per capita would suggest, these are either large and populous countries, or smaller ex-Soviet states which actively promoted innovation and the financing of science and social programs.

Hence there are some dimensions that are obviously important omissions when it comes to tracking 21st century progress, and incorporating these should be a priority. The three key elements are: measuring better intangible investment, the engine of economic progress; correcting the excessive prominence current definitions give to the finance sector; and reflecting the destabilising unequal distribution of growth since the end of the 20th century. Each is relatively straightforward to implement in the short term.

*Intangible assets*

Innovation, Schumpeter’s (1942) creative destruction, is central to economic growth. New ideas and inventions are hard to measure however, despite a growing list of

indices aiming to capture innovation and intellectual property performance.<sup>6</sup> The current national accounts count innovations reasonably well in terms of their revenues and profits, but much less well when it comes to the investment needed to innovate and the associated labour markets.

Investing in innovation is a crucial part of the 21st century economy, and it is under-represented in the national accounts. National accountants began to recognise this in the 1993 revision to the System of National Accounts definition, by including investment in research & development (R&D), software and copyright content creation in the national accounts.<sup>7</sup> In the UK, these additions were only fully implemented long after 1993, with software introduced in 2006 (Chamberlin et al. 2005) but the national accounts still miss the majority of investment in innovation. The measured investment in R&D, software development and copyright content, which added approximately 1 percentage point to nominal GDP when introduced,<sup>8</sup> only accounted for approximately a third of the investment in intangible assets in the UK in 2011 (Goodridge et al. 2014). In both the UK and the US private firms have invested more in intangibles, that is ideas and skills, than in tangible capital since the mid-1990s (Corrado et al 2009, Haskel et al 2016). This is while an estimated 87% of US stock market value is due to intangibles (Ocean Tomo 2015).

Intangible investment in a broader set of categories has now been estimated by a number of scholars (e.g. Jäger 2016). This additional investment should be included in GDP, accounting better for the intangible 21st century economy. Other categories of intangibles now need to be considered too, notably the massive investment in machine learning, artificial intelligence, and data being undertaken by businesses (Goodridge & Haskel 2015).

#### *Productive and unproductive finance*

The national accounts recognise investment in a form that follows the original circular flow of income, where money is saved in banks, and banks in turn invest that money in the real economy. This investment adds to GDP, but the current treatment is inadequate.

GDP was defined in the context of currencies pegged to a gold standard and a reasonably clear measure of money supply. Since countries came off the gold standard and moved to a fiat basis for floating currencies, the process of lending and money creation has changed. International capital markets creating money, and while savers still put their money in banks, the banks are able to create their own credit instruments and can leverage their assets in new ways. Lending has increasingly been moving away from traditional business banking (Bezemer et al. 2017).

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<sup>6</sup> E.g. *The Global Innovation Index* published by the World Intellectual Property Office, The U.S. Chamber of Commerce's *International IP Index*, The Property Rights Alliance's *Intellectual Property Rights Index* the Economist Intelligence Unit's *Intellectual Property Protection Index*, or the more academic Ginarte-Park Indices for patents (Ginarte and Park 1997).

<sup>7</sup> The relevant change from SNA1968 to SNA 1993 is that "Produced assets (AN.1) in the 1993 SNA include not only tangible fixed assets (AN.111), but also intangible fixed assets (AN.112) such as mineral exploration (AN.1121), computer software (AN.1122), and entertainment, literary or artistic originals (AN.1123)" (UN 1993: 62)

<sup>8</sup> Chamberlin et al. (2006: 26) estimated that 0.7 percentage points would be added to nominal GDP over the period from the updates to software investment, while Goodridge et al (2012) estimated an additional 0.3 percentage points would be added to Gross Value Added by properly capturing copyright investment.



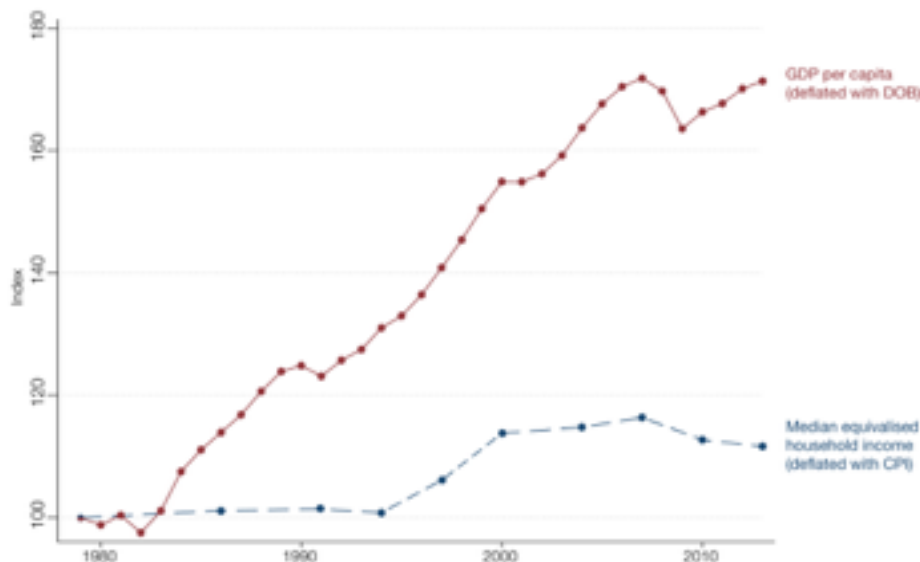
This is problematic for measuring economic performance, as the profits that banks earn on this intra-bank lending are counted as part of GDP – yet these are not investments in productive capital, but in financial capital. In the 1993 revision of the national accounts, financial transactions of this nature entered GDP, inflating the size of economies with large financial sectors, such as the US and UK, by 20-30% (Assa 2016).<sup>9</sup> This change to the national accounts definitions should be reversed as it is hard to see financial institutions' activity among themselves as productive. They should be treated as intermediate costs netted off GDP. Non-financialised GDP would measure better the extent to which businesses raise capital and invest it productively.

### *Unequal societies*

The public debate about the economy currently focuses on growth in total GDP, or occasionally per capita GDP. A focus on distribution is needed. Statistical agencies could easily make media per capita GDP the standard headline figure in regular press releases.

The use of the median figure would quickly remove the biases from reporting economic growth in countries with an uneven distribution of income. This would be particularly stark in the extreme cases, such as the example of the biggest outlier between the Indigo Index and GDP per capita: Brunei. There, nominal GDP per capita was US\$26,424 in 2016, but the median income was only US\$1,826 in 2010/11 when the last distributional data was published (DEPD 2013: 2). Median and mean incomes have diverged significantly in some developed countries, such as the US (Figure 2).

Figure 2: Real GDP/capita and median equivalised household income, US, 1979=100



Source: Nolan et al 2016

Publishing the median per capita figure is a simple way to change how the national accounts are reported, which would itself shift the focus of policy debate. A slightly

<sup>9</sup> The measure is Financial Intermediation Services Indirectly Measured (FISIM)

more complex but feasible alternative is to follow Dale Jorgenson (2017) in publishing GDP income distribution-adjusted GDP.

### ***A new long-term framework***

These transitional steps could be adopted quickly as either statistical offices already gather the data needed or researchers have started laying the foundations. Moving to an asset-based sustainability framework to measure capabilities is a much bigger task, although one started by the World Bank's wealth project (World Bank, 2011; Hamilton & Hepburn 2017). National statistics offices publish some of the components needed for a national capabilities balance sheet. The 'Beyond GDP' initiative of the OECD and European Commission has encouraged statistical innovation, as has the follow-up in the UK to the Bean Review (2016). However, much data collection and statistical innovation will be needed.

Given the real possibility of creating a new long-term framework the question is whether all of the information relevant to economic welfare can be combined into one statistic or whether a dashboard is needed. This is a political economy question: does the debate between politicians and people have to be conducted on the basis of a single number, as some authors have argued (Masood, 2016; Lepenies, 2016)? Or can that political conversation extend to a richer framework of information, perhaps even one that discusses trade-offs? On balance, we advocate a high-level dashboard for each individual asset category, and behind that, in layers of increasing detail, estimates for their components and of people's access to each type of asset.

Figure 3: An assets dashboard



A project to estimate and quantify these assets, their interactions and accessibility is feasible, but there are lots of gaps and some difficult conceptual and practical challenges.

### ***Physical and Produced Capital***

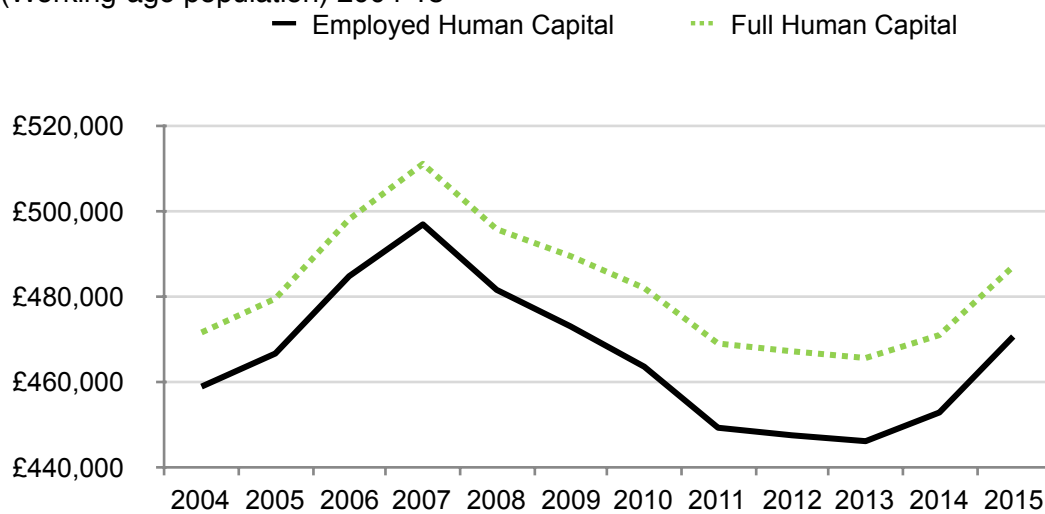
No countries have an adequate assessment of the extent and quality of infrastructure and its maintenance, but only partial estimates or maps. In the UK the Victorians and Edwardians built much of the current network infrastructure; we have no idea how

much maintenance or new investment has been undertaken since and how much reinvestment to stand still will be needed in the near future. Economists' tools for assessing infrastructure needs are inadequate as they omit the public good characteristics and potentially non-incremental character of much investment in physical infrastructure.

### *Human Capital*

Future income distribution, and social sustainability, depends on human capital. Human capital measures look at educational qualifications – quite a crude measure of relevant skills and attributes – and use market earnings to value the human capital represented by a given level of qualification, as a starting point for accounting for people's skills, abilities and access to training.

Figure 4: UK employed and full human capital per head, (Working-age population) 2004-15

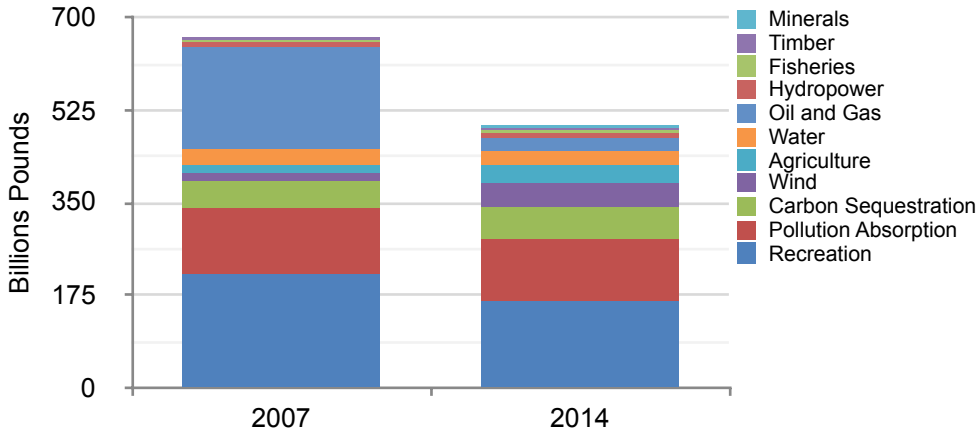


Source: ONS Annual Population Survey (2016)

### *Natural Capital*

At present measurement of natural capital is very incomplete and uses current market values; there are many missing components, no measurement of physical volumes, and the use of market values omits externalities. The available figures are nevertheless not encouraging: natural capital in England & Wales has been in decline over several years. Enhancements would benefit public physical and mental health, and could avert the need for investment in concrete infrastructure for flood defence.

Figure 5: Partial estimate of UK natural capital



Source: ONS Environmental Account (2016)

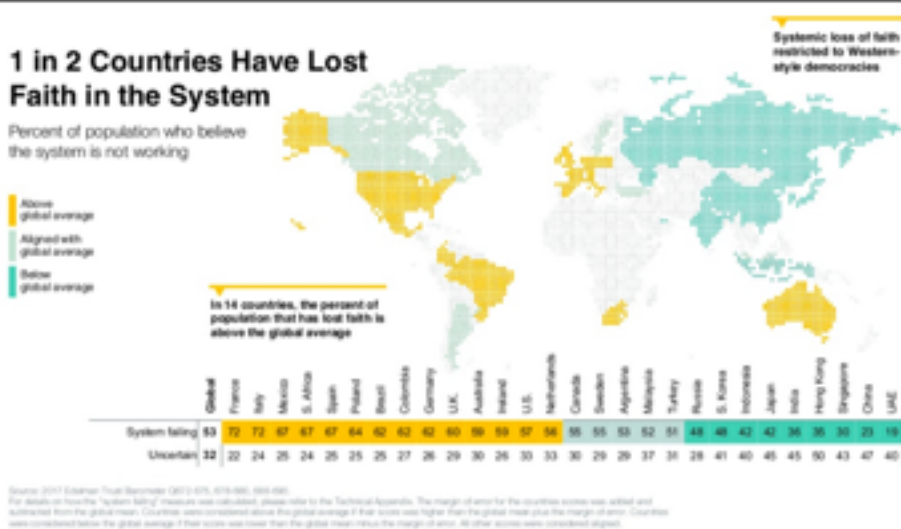
*Intellectual Property & Data*

There is scant collection of data on data, or on the total value of intellectual property, although companies spend large sums on these investments. The gaps are starting to be filled but research on measuring these and other intangibles is clearly vital. A pressing policy issue is the distribution of ownership of such assets, the returns they generate, and the power their ownership creates. To provide an example of scale, when the UK Intellectual Property Office (2012: 10) assessed the value of copyright materials unavailable for re-use and display due to permissions not being accessible, it found hundreds of millions of items held in public archives, libraries and by the BBC which were not digitised or used, and estimated a long term net benefit in excess £400m.

*Social and Institutional Capital*

Social capital is an abstract concept and there are no systematic attempts to measure it, although surveys ask people how much trust they have in institutions and in other people in general. Some of these surveys make dismaying reading.

Figure 6: Deterioration of trust in ‘the system’



Edelman Trust Barometer, 2017.

*Net financial assets (including contingent assets)*

The government balance sheet does not include the government's contingent liabilities from future promises such as pensions, or public financial liability payments. A National Audit Office report estimated large and rapidly growing contingent liabilities in a limited number of categories (NAO, 2016); an estimate of 'generational accounts' looking at state pension liabilities estimated these as equivalent to a tax increase of 6-7% of current GDP (McCarthy et al, 2011).

*Access*

Above all, few of the available statistics are concerned with 'access', or in other words distributional aspects. The measures that exist mainly focus on national aggregates or averages. There is a vacuum in terms of understanding the distribution of these elements of national economic wealth. Yet distribution is everything when thinking about aggregate economic welfare. Economists have always known that the aggregate value depends on distribution, as it is one of the fundamentals of welfare economics, but this has largely been forgotten with the focus on conventional statistics such as GDP. GDP takes as a given the current income distribution in the economy. Distributional questions have only recently come to prominence again thanks to the work of a few economists such as Thomas Piketty (2014) and Anthony Atkinson (2015).

The statistics available now offer a dismaying glimpse of the direction of travel total economic welfare. Several are heading down and the chances are some of the missing elements, such as contingent public financial liabilities, would be deteriorating too. The increases in welfare due to innovation are clearly an exception; they are augmenting economic welfare, and possibly to a large extent – but there is a big question mark about distribution. If there had been a comprehensive presentation of a systematically-constructed set of estimates of national assets, there can be little doubt any complacency about how the British economy is benefiting its people would have been swept away years ago.

***Putting it into practice***

There is a new wave of interest and research into economic statistics. In the UK, the ONS has created a data science campus and is funding a new research centre, the Economic Statistics Centre of Excellence. The Alan Turing Institute is exploring the application of data science techniques to economic statistics. There are many initiatives in other countries and organisations too, as well as initiatives such as Indigo.

Turning the vision of national statistics as a comprehensive measure of economic welfare, in the form of assets delivering capabilities, into a reality, does face some conceptual hurdles.

One big challenge is how to value each asset.

Conventional statistics use market prices. This has the severe drawbacks described earlier: the omission of externalities, the implicit welfare judgments. But it is also an advantage, in that the source of the values is absolutely clear, resulting from the interplay of demand and supply in all the markets that compose the economy. If

these markets are not competitive, the resulting valuations are not a good measure of economic welfare, but they are still not entirely arbitrary.

For many of the capability-giving assets, there is no clear answer in theory about how to value them, still less in practice. Take the example of natural capital. Nature is a system. Its elements have tipping points when they can deteriorate catastrophically. Intrinsic value is important. It is not surprising that ONS uses market values in its current estimates of natural capital. But this has counterintuitive results. If the price of oil falls, this translates into reduced natural capital, but intuitively a lower price causing more oil not to be drilled conserves the asset. This means physical estimates of natural capital assets are important, but also that there is an important research challenge in considering valuation methods.

Calculating the present value of assets also requires assumptions choice of a discount rate and projections about the future, as sustainability is a concept linking present and future. A first step would be to consider the depreciation of assets from current levels.

Meanwhile, the transition could start quickly as we propose above. There are some straightforward steps on the pathway to a better System of National Assets.

### **Conclusion**

What the state does not see, because of the absence of statistics, is invisible in policy making. Statistically invisible phenomena do not feature in political debate until they become unsustainable.

The radical changes in the structure of the economy and innovation, involving intangible assets, data, and revolutionary changes in production, have been invisible. Policymakers have been caught on the hop by the social consequences.

A massive data collection exercise is needed to make progress. It will have to use digital techniques and new sources and methods – and there are many experiments under way. For example, the Billion Prices Project scrapes web sites globally for prices,<sup>10</sup> and incorporates user-generated content. The vast amount of digital traces people leave will provide information, including for instance using machine learning to count trees in geo-tagged photographs of urban areas. Much of this can be provided privately if governments and official statisticians can agree with the private sector and data science community a legal framework and standards and protocols for creating a data commons. Then official statisticians could concentrate on filling in gaps – for instance there is a prevalence of user-generated content such as photographs, or digital exhaust traces such as mobile data use or e-commerce in affluent areas. Other areas would need augmented coverage. Official statisticians need to provide the discipline of their expertise. But they cannot do the job alone.

GDP never pretended to be a measure of economic welfare. In practice, however, it very much is used as one. So we should not be surprised that GDP does a bad job of measuring progress. Our proposed short term amendments to GDP would make it a better reflection of the current economic structure, but it cannot adequately measure welfare.

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<sup>10</sup> <http://www.thebillionpricesproject.com/>

GDP has focused the post-war western economies (and beyond) on maximising output of goods and services from the current use of resources. The future has zero statistical weight. GDP has ignored individuals, and geography. Many groups in society and places have been invisible in policy debates.

The long-term alternative we propose, motivated by the range of assets needed to maximise individuals' capabilities to lead the life they would like to lead, would have told a different story about the recent past. It would have painted a picture even more divided than our current one: great improvements, on balance, for people with degrees, and access to new digital services, living in areas well-served by infrastructure; deterioration, on balance, for those who left school with few qualifications, have no access to fast broadband or even fast trains, and live in areas near polluted roads with scant green space. For all the benefits of the new technologies, current and to come, there would be no complacency about the economy.

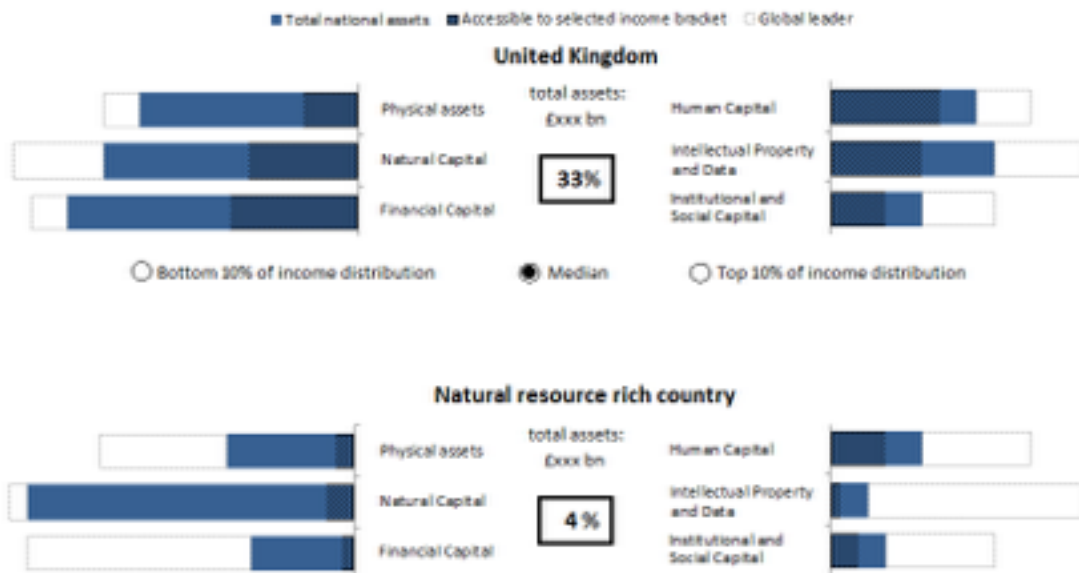
**Appendix: Creating a functional dashboard**

In proposing a dashboard we recognise that much work will have to be invested in gathering and presenting the statistics. We propose a high-level dashboard providing the national balance sheet for each category of asset (shown in blue below), an easy comparison to the global leader in each asset class (dashed lines), and a clear indication of which part of these assets are accessible to the population depending on their income (shaded area).

The example below of the UK and a hypothetical natural resource rich state is for illustrative purposes. It allows a quick comparison of the two countries. The total monetary value of the asset base is provided, while the intangibles would be composites of indices and non-monetary estimates (such as available data, content or AI computational power, under the IP and Data heading).

Central to the measure, and the diagram is the share of the national assets the population can access, and this provides a clear comparison both of access at different income brackets and the total assets available within each country.

**Figure 1A: Illustrative dashboard**



The dashboard approach tracks changes at the high level, both within each asset class, and also the share accessible to the population, and distances to the global leaders. This should allow comparison of national economic performance, and a snapshot of progress in each asset category – and for whom.



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