John Maynard Keynes (right, with Henry Morgenthau) laid the foundations for the GDP metric.

The Great Invention: The Story of GDP and the Making (and Unmaking) of the Modern World
EHSAN MASOOD
Pegasus: 2016.

free online services, because the relevant statistics are not collected or do not fit easily into existing categories. There is even a mini-boom in books about economic statistics. A decisive coalition is shaping up in favour of moving away from GDP. The question is what to use instead.

In *The Great Invention*, Ehsan Masood, editor of policy peri-

odicals *Research Europe* and *Research Fortnight*, argues for an improved GDP. Into this single metric for economic-activity indicators — defined as the monetary value of all goods and services produced in a country — he would combine environmental impacts and human well-being. His book traces the history of GDP since its creation, as well as the calls for alternatives, mainly from environmentalists. Masood agrees with the sentiment of suggestions to use ‘dashboards’ that incorporate other economic data and supplementary indicators, but he concludes that GDP matters. As he writes of countries that adopted it: “The act of measuring their economies would ultimately determine how their economies would be managed.” And it matters despite, or because of, its flaws. GDP is too entrenched to be successfully replaced, he finds; instead, it needs radical reform.

FORMATIVE FACTORS

GDP began, as Masood notes, as an aggregate measure when the need arose for governments to manage economies during the Depression in the 1930s and the Second World War. Pioneers of the statistics involved, such as US economist and Nobel laureate Simon Kuznets, intended to create a metric to meaningfully capture a society’s economic welfare.

There were other formative factors at work. One was the need to avoid suggesting that the war effort was reducing welfare. Another was the thinking of influential British economist John Maynard Keynes, as set out in his 1936 *The General Theory of Employment, Interest and Money*. Keynes theorized that raising aggregate demand or total spending in the economy through government expenditure can avoid the sort of mass unemployment that was seen in the Depression by stimulating growth and improving stability.

He and his supporters were determined to make the new metric serve that government role by defining

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ECONOMICS

GDP in the dock

Diane Coyle savours a history of the long-standing economic measure and possible alternatives.

Since its invention during the Second World War as a thermometer of economic health, gross domestic product (GDP) has become a familiar incantation in claims and counter-claims about the well-being of nations. Some environmentalists and feminists were early critics, but until recent decades, few others questioned it.

Now, campaigners ranging from left-wing Nobel-prizewinning economist Joseph Stiglitz to the free-market *Economist* magazine want to replace GDP with direct measurement of human well-being. The technology industry has joined them, bemoaning the failure of GDP to account properly for digital technologies, including

federal spending as a key component of the equation, along with consumer spending and investment. Thus, GDP was born as a transatlantic effort, led by Keynes's assistants in the UK treasury, Richard Stone and James Meade. By the end of the 1940s, it was standardized through the United Nations, and the same international process is in place today.

Masood covers decades of challenges to GDP conventions that make for a fascinating institutional and human story. Those seeking an alternative included UN official Maurice Strong, a key figure in the 1972 UN Conference on the Human Environment and the 1992 Earth Summit. Other critics were Italian industrialist Aurelio Peccei and British civil servant Alexander King, who together established think tank the Club

"The act of measuring economies would ultimately determine how economies would be managed."

of Rome and published the influential report *The Limits To Growth* (Universe, 1972). Environmentalists, and the officials whom they influenced, were swift to point out that GDP doesn't

take into account how natural assets are depleted to generate current income and consumption. Several proposals for new models have underlined the need to account for the environment; Masood (an erstwhile *Nature* journalist) praises a 1997 paper on these proposals co-authored by economist Robert Costanza (R. Costanza *et al. Nature* **387**, 253–260; 1997). Economists James Tobin and William ▶

Books in brief

Code Warriors

Stephen Budiansky KNOFF (2016)

Code fiend and writer Stephen Budiansky's history of the US National Security Agency (NSA) and its intelligence battles with the Soviet Union opens in 2013, as whistle-blower Edward Snowden enacts his long-planned exposé. In a narrative laced with cryptanalysis, Budiansky then tacks back through the NSA's turbulent history, from the "almost insane logical disconnects" of the cold war stand-off to the fall of the Berlin Wall. This is a balanced, authoritative portrait of an institution in which brilliant innovation in mathematics, computing and technology has coexisted with gross invasions of societal privacy.

White Trash: The 400-Year Untold History of Class in America

Nancy Isenberg VIKING (2016)

Crackers, clay-eaters and "poor white trash": the white US underclass has endured crass labelling from colonial times. That marginalization begs vast questions about US democracy, argues historian Nancy Isenberg. Her powerful social and cultural history uncovers new facets of known stories, from class conflict in the American Civil War to the sterilization of destitute whites by interwar eugenicists (V. Nourse *Nature* **530**, 418; 2016). At once brutal and enlightening, this is the chronicle of a dispossessed people caught in rural stasis, and the social and political forces that keep them there.

Innovation and Its Enemies: Why People Resist New Technologies

Calestous Juma OXFORD UNIVERSITY PRESS (2016)

From smart grids to new commodities, innovation disrupts by default — and if it is truly transformative, can trigger controversy and policy headaches. Sustainable-technologies expert Calestous Juma explores those tensions in this original study. He follows coffee from Ethiopia through Europe as it is embraced and denounced, shaping economies, technologies and industries. He looks at the advent of electricity and transgenic crops. For the pace of innovation and institutional change to synchronize, he concludes, both nimble leadership and rigorous, respectful public education must be brought into play.

Tide: The Science and Lore of the Greatest Force on Earth

Hugh Aldersey-Williams VIKING (2016)

More than 40% of humanity lives within 150 kilometres of a coast, yet a clear understanding of tides — that oceanic phenomenon driven by the gravitational lock of Earth and Moon — is rare. Science writer Hugh Aldersey-Williams's corrective meshes a history of the science (by way of Aristotle, Galileo and Isaac Newton, among others) with tide-related technologies and tidally sculpted events. It's an eloquent ebb and flow, from observations of a 13-hour tidal cycle in a Norfolk salt marsh to passages on the legendary maelstroms of Nova Scotia and California's body-surfing fish, the grunion.

The Radium Girls

Kate Moore SIMON & SCHUSTER (2016)

In the 1910s, radium was marketed as a cure-all, incorporated into drinking water, cosmetics and even jockstraps. Kate Moore's harrowing chronicle traces how a number of young US women, hired to paint military timepieces with radium-laced paint, paid the price: many succumbed to radiation poisoning and died hideous deaths. Ultimately, the landmark case won by five of them inspired globally important research into radiation and its impacts — including longitudinal studies with survivors. [Barbara Kiser](#)

Amartya Sen created the UN Human Development Index with Mahbub Ul Haq.

THE AGE/GETTY

UN PHOTO/YUTAKA NAGATA

Maurice Strong (front left, at the 1972 UN Conference on the Human Environment) sought an alternative to the GDP.

► Nordhaus also took into account environmental costs — and the value of work in the home — in their 1972 proposal for a metric called the Measure of Economic Welfare.

Another challenge to convention came from Mahbub Ul Haq and Amartya Sen, who in 1990 created the now widely used UN Human Development Index (HDI), which includes factors such as life expectancy and education.

More social scientists are now exploring the definition and use of economic statistics. There is also policy interest alongside the scholarly debate. In 2008, then-French president Nicolas Sarkozy set up a commission led by Sen, Stiglitz and fellow economist Jean-Paul Fitoussi to investigate the measurement of economic well-being. And UK economist Charles Bean's 2016 *Independent Review of UK Economic Statistics* (see go.nature.com/1tvadaj) raises fundamental questions about GDP's viability in a modern economy, for example concerning its mismeasurement of digital activity.

ONE OR MANY

The balance of opinion in economics currently favours supplementing GDP with a dashboard that incorporates measures of environmental impacts, health and social indicators, as Costanza neatly summarized in his 1997 article (see also R. Costanza *et al.*

Nature 505, 283–285; 2014). Economists are taking considerable interest in the measurement debate, although oddly, Masood claims that the profession is ignoring the issue. His own call for a nuanced metric that factors in natural capital and human well-being sticks to one indicator. He thinks that GDP is so tightly woven into the economic fabric that anything more complicated than a single number will put politicians and the media off. The solution, as he sees it, is “to value the things that matter and then incorporate this value into the GDP accounts”.

But single-indicator alternatives to GDP have a serious drawback. They hide relative valuations of their components, whereas GDP makes these explicit because it uses market prices. For instance, Martin Ravallion, former director of research at the World Bank, notes that the HDI implicitly values poor lives much less than rich ones. Because income and human life expectancy are combined into one index, there is an implied value of just US\$0.51 for an extra year of life in Zimbabwe, compared

“GDP is so tightly woven into the economic fabric that anything more complicated than a single number will put politicians and the media off.”

to several thousand dollars in rich countries (see M. Ravallion *Troubling Tradeoffs in the Human Development Index* <http://doi.org/d8d2cr>; World Bank, 2010). This flaw could be corrected, but the point is that any single index internalizes such trade-offs.

The debate over whether to use a dashboard or a single indicator is unresolved. Interest among economists, other social scientists and environmentalists has climbed in recent years, but there is much to research and discuss on how best to measure economic welfare, taking into account sustainability and the quality of life, before a new international standard is defined and adopted.

In hindsight, the original debate about GDP looks more compressed than it really was — some economists were still disputing it into the 1950s. A new shift will take just as long, but it is definitely under way. And about time too, for the reasons that *The Great Invention* explains so clearly. ■

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