SCIENCE, PEOPLE & POLITICS ISSN 1751-598X ISSUE ONE (JAN-MAR) 2021

Second edition Issue one, 2021.

Part one of issue one published 2nd April, 2021. Complete issue one published 10th May, 2021. Issue available freely until 30th June 2021. The issue will move behind a pay wall July—December 2021 via Amazon for **£4.80 inclusive of VAT**. This issue contains thumbnail sketches of Nobel Prizes 2015-2020. The other sketches of Nobel Prizes in economics will appear in issue 3, 2021. Our exploration of multilateralism via intergovernmental organisations continues in Issue 2, 2021.

ECONOMICS

Insight from Adam Smith 1723-1790

Insight from John Maynard Keynes 1883-1946

The Nobel Prizes in Economic Science 1969 to date

2015-2020 this issue. Remaining sketches will be in issue 3, 2021.

2021 Our natural capital and the search for meaning in missing nucleotides

This issue contains a speculative essay about how one could ground the concept of a universal basic wage for all in human biology. Other parts of the issue introduce ideas in economics.

CONTENTS

Part 1 published 2.4.21. This issue published 9.5.21 comprising parts 1 & 2 combined.

We are a scientifically literate humanities' title. All are welcome, but our primary audience are scientists and politicians internationally. Our aim is to enable, engage, inform and provoke.

As ever, I would like to thank the magazines editorial advisors for their patience, latitude and gentle hints.

Editor **Helen Gavaghan**

Deputy editor **Fred Pearce FRSGS**

Editorial advisers. **Professor Graham Dutfield, Dr Ferdinando Patat, Fred Pearce FRSGS, Martin Redfern.**

Front cover**: Circular and blue economy. Helen Gavaghan©**

Back cover**: The double helix by land and water. Helen Gavaghan. ©**

Published by Gavaghan Communications. 165 Longfellow Court, Mytholmroyd, West Yorkshire, HX7 5LG

Contact. info@gavaghancommunications.com **Content**. Font face Calibri.

Introduction to this issue by the editor.

A total economy is all economic activity within a political unit. All the buying, selling, lending, saving, taxing, disbursement, manufacturing, agricultural work, contracts signed, money printed, quantitative easing, bitcoin extravaganzas etc... All of the economic activity may not be in official figures, but it is a safe bet that if it is legal in a sense an ordinary woman or man would approve then it is highly likely that activity will attract the attention of treasury departments and tax authorities.

An economy's well being depends on deciding such matters as how much money should exist, on defining a labour market and how a labour market behaves in different historical and geopolitical setting. Economists explore resource management and/or production, incentives, what drives consumption, the balancing forces in the economy, transactions and transaction costs, accumulated wealth, rental for land or money (interest), progressive taxes and pooled resources. Economics is a matter for humanities, not science. It is served by mathematics, psychology, science and sociology. And, so that apples are not compared with pears across generations, one needs historical understanding of local, national and geopolitical history.

Economics differs from science. When science defines its central words and concepts it hitches those words to equations nailed to the fabric of the Universe via physical constants, such as the wavelength of light. What constitutes the meaning of words such as energy, power and force thus becomes immutable. An individual's understanding of the meaning of the words, be they professional scientists or not, will develop during their lifetime. But the meaning the individual will be striving to grasp is the meaning of the word energy which was set in stone by Albert Einstein. The same for the word force at the scales for which F=MA holds true. That is a relationship discerned by Isaac Newton, and it will not change between now and when the Sun engulfs our solar system. By contrast it is a fair bet that by then economics will have changed some at least of its ideas. The postulates of economics are open to debate and change. So, too, of course are those of science, but in science there will eventually be something constrained by nature itself. Economics borrows from science and maths. It is science which will help economists monetise nature. For fair dealing internationally monetisation is essential. At its professional level economics is rigorous and disciplined. It works with statistics, logic, stochastics and Set Theory. It has created, discarded and made new underlying postulates, and then turned to maths for modelling tools to explore if its ideas are correct given the data sets available. Economics is always looking to further determine appropriate measurements and datasets.

At a conceptual level the fun of economics is that anyone can take its ideas and play with them. And having done so one could go to an economist/econometrician and ask, "does this make sense in your discipline"? As with physics, economics occasionally remakes itself. In physics quantum theory was a paradigm shift in understanding nature. The sequencing of genomes has led to a paradigm shift in physiology. Yet in science these paradigm shifts may well not kick out earlier knowledge. The latest Gray's anatomy is not diminished by genetics. Quantum theory has not replaced Newton at those scales for which Newton's insights hold true. By contrast a paradigm shift in economics can lead to a revolution—literally and figuratively. Classical economics was thoroughly shaken when John Maynard Keynes analysed the labour market's behaviour and upended the idea that the disutility of labour sets the real wage, and vice versa. His crucial observation, which Is hard to argue against, is that there is an aggregate comprising involuntarily unemployed people. That was a revolutionary theoretical economic thought at the time. Keynes, just as a scientist does, worked with observation. The events on which he spent, and from which he gained his professional capital, were the first and second world wars. Events from which he could deduce, infer and adduce were the general strike of 1926, The Treaty of Versailles, and the crash of the New York Stock Exchange in 1929. He had some national statistics he could work with, and he had maths training enabling him to set up equations which could be tested for closeness to measured reality. The same need for useful data is very much a current focus of economics.

The General Strike probably coloured Keynes thinking about the importance workers attach to money rather than real wages. A Court said the General Strike unlawful. It so it was a technicality, not immorality, and the law was behind the times. A Roman Catholic Cardinal in London called the General Strike a sin. Such an accusation from a Cardinal who should have known better was unacceptable interference by a cleric in the matter of to whom one hands over ones coinage bearing the monarch's head. My point is there is latitude in the meaning and relationships of the language and concepts of economics. The words of economics are defined by human understanding, not the physical nature of the Universe. There is still a space for the non-specialist to usefully explore their world through discussion of words like utility, value, cost, price, benefit and resource. This issue is a mixture of news aligned with economics, strict adherence to formal economics and exploration of words common to us all, and which are important in all our transactions. The difference between formality and exploration are clearly signalled. I hope the content engages your interest. **HG**

Supply chain deglobalisation does not increase national resiliency to labour supply shocks.

Lockdowns and the degree of stringency of those lockdowns reduces gross domestic product (GDP) in part because of the impact of those infection-control measures on supply chains. However, theoretical analysis shows that shifting the source of production inputs from overseas to domestic does not necessarily make countries more resilient to labour-supply shocks resulting from pandemic responses. Public health measures restrict access of domestic suppliers to labour as much as to those of overseas suppliers. These conclusions appear in a discussion document published in April 2021 on the website of the Gerald R Ford School of Public Policy at the University of Michigan. The researchers were aware of speculation that the economic shock of infection control might be lessened by de-globalising supply chains. Currently the international world of trade is a vast web of interconnecting chains between suppliers and manufacturers, often with many intermediate steps.

To undertake their analyses the researchers constructed mathematical models and worked with data from 64 countries across 33 industrial sectors on all continents. They incorporated data from the financial sector, through health to mining and construction. Labour supply was weighted according to the percentage of the work which could be done from home by different groups of employees, depending on their sector and role within an organisation. Sector and trade data came from the 2015 Inter-country Input-Output figures from the Organisation for Economic Co-operation and Development (OECD). In their abstract to the paper, the researchers flag that a unilateral end of stringent public health control measures by a large economy can add as much as 2.5 percent to the economy of small countries. **HG**

Global Supply Chains in the Pandemic

http://www.fordschool.umich.edu/rsie/workingpapers/Papers676-700/r683.pdf **Accessed 9th May, 2021.**

Assessment of Columbia's entry to the renewable energies' auction market.

Renewable energy auctions have become popular in Latin America as a way to grow the sector. Columbia's first foray into such auctions in February 2019 was a failure. The country's intention was to encourage renewable energy development other than hydro power. A second attempt in October 2019 succeeded, and 1.3 gigawatts of solar and wind energy were contracted for. That should see the percentage share of installed capacity of these two power generation methods increase from 1 percent in 2019 to 22 percent by 2022. Altering the mix of its renewable energy sources is important to Columbia because hydropower is vulnerable to natural events such as El Nino. Additional installed energy capacity will take pressure off hydropower dams. With a 66 percent reliance in 2019 on hydro power Columbia needed to find a market mechanism attractive to generators, regulators, distributors, government and consumers both in households and in industry. Auctions seem to be the answer—at least for now. **HG**

Renewable energy auctions in Columbia. A report by the US Agency for International Development and by the IGO, the International Renewable Energy Agency (IRENA). Published in March 2021.

https://www.irena.org/publications/2021/March/Renewable-energy-auctions-in-Colombia **Accessed 9th May 2021.**

G7 science academies spotlight research to fight climate change.

The G7 countries of Canada, France, Germany, Italy, Japan, the UK and the US contribute roughly half the world's economic output. At the end of March this year science academies of the G7 released a science agenda they want the UK government to promote via its presidency of the forthcoming climate conference to be hosted this November* in Glasgow by the UK.

Three broad areas are singled out for special action: reversing biodiversity loss, data for international health emergencies and stepping up efforts to reach a net zero global carbon future by 2050 or earlier. Specific ideas are research into novel, possibly synthetic types of fuel to decarbonise sectors like aviation, marine and heavy goods vehicles. In parallel they want governments to back R&D in battery technology for light goods and passenger vehicles. To protecting biodiversity while ensuring food security, improvements are also needed in soil management, they write. To enhance both mitigation and resiliency the academies argue that a better understanding of the Earth-system and its cycles from carbon to hydrological is needs, as well as new ways of monetising biology. Pricing into goods the impact of production on biodiversity throughout the supply chain is needed. The G7 academies urge international co-operation and data sharing for health emergencies. **HG**

G7 science academies agenda. 31st March, 2021.

https://royalsociety.org/news/2021/03/royal-society-partner-academies-launch-g7-agenda/ **Accessed 9th May, 2021.**

I apologise to readers that issue one of this issue incorrectly said June, rather than November, of this issue.

The Dark Genome.

It is hard enough to think about how to monetise the biodiversity we can see, but imagine trying to put a price on what does not exist. I do not mean how can one assign cost to an extinct species, though that might become a question of tort. Rather I mean how can one value the dark genome? Those sections of DNA which statistically could exist within a genome, but do not. They go by the names of primes, nullomers and missing absent words (MAWS). These short polynucleotides (oligomers), possibly as short as only one nucleotide, of the dark genome have attracted modest scientific attention since shortly after the human genome was first sequenced twenty years ago. They were not initially a priority for geneticists. Then the question became were these missing short nucleotide sequences a real phenomenon or a statistical aberration. In April 2021 researchers published a computational biology study in *Nucleic Acids Research* suggesting that the MAWS are a real not a statistical phenomenon. Analysis reveals MAWS which stand out against a background of random absent sequences. An open question is how can one classify whether these words in the dark genome are deleterious or beneficial. Some work has been undertaken to artificially synthesis MAWS, and cross species analysis suggest that evolution has deselected some of the MAWS. This is a field in which there is still a lot of work to do. Identifying genuine MAWS, tracking through cross species studies their departure from evolution and exploring whether MAWS like real genes could be biomarkers and analytic tools is still in its infancy.

Significant non-existence of sequences in genomes and proteomes. Published 6th April 2021 in *Nucleic Acids Research*.
https://academic.oup.com/nar/article/49/6/3139/6166853 **Accessed 9th May, 2021**.

Human path to economic sophistication

I HAVE INCLUDED THE FOLLOWING ITEM BECAUSE OF ITS RELEVANCE TO THIS ISSUE EXPLORING ECONOMIC MATTERS. CLEARLY JULY 2020 IS NOT NEWS.

Scientists are turning economic models into tools to help them identify precursor traits in other species that are relevant to human economic behaviour. The aim is to acquire insight into how human beings evolved the ability to conduct a life in economics. Clearly, to live a human economic life one needs complex thinking, altruism, the spirit of competition, willingness to co-operate, long-term planning, the ability to balance long- and short-term returns, insight into risk and binding contracts and ways of distributing what is accumulated. For all of these a sophisticated language for the exploration of relevant concept related to transactions and valuations is needed. Joseph Schumpeter thought the complexity of the human brain evolved in the context of solving economic problems. In work published by the Royal Society in 2020, scientists spoke of turning to the economic literatures of trade and co-operation for tools for their work. As yet their findings are not definitive.

What behaviour in economic games tells us about the evolution of non-human species' economic decision-making behaviour.
4th July 2020. Philosophical Transactions B.
https://law.yale.edu/sites/default/files/area/center/corporate/spring2021_paper_brosnansarah_3-11-21.pdf Accessed 9th May 2021.

opinion by Helen Gavaghan

The search for truths in economics

That it is harder to push a heavy mass than a lighter one is a truth which existed before it was conceptualised as such: either the observation itself or realisation of the observation's meaning. That truth was there before the relationship between the strength of the push and the mass of the thing pushed and its subsequent movement was formulated. The truth was there before a hefty push was defined as a force, and before means were known to measure accurately the components of the force. The concept, relationship, definitions, and standard measurements for one unit of each term in the relationship between a push and the consequence continues to exist at all scales for which the relationship holds true. Even now when we know that technology can operate at scales where F=ma applies, yet where also uncertainty of the world the technology is within and attached to via gravity is, we trust F will equal ma. We know force equals mass times acceleration will hold true at the scales for which it applies. And we know the uncertainty principle which dominates the inferred and immeasurable world of particle physics and entanglement exists within a Universe from which F=ma coalesced. Two truths co-exist within the same set of co-ordinates at scales for which F=ma applies.

F=ma does not acquire a different meaning in socialist, communist, or capitalist worlds. Scientists working with observation, definition, measurement, prediction and error bars would eventually all reach or recognise the same formulation. I think that conclusion is a reality which holds as true in indigenous science, as in modern or prehistoric science. One can recognise what is a reality without the maths! Though without the maths reality can be ungovernable.

Nor does it matter whether the thinker believes in God or is an atheist. F=ma quite simply holds true at those scale of measurement for which it is intended by the laws of physics to hold true. It is self-defining. Adopting standardised measurements for a single unit of mass and time - both needed in the calculations of F=ma - has been a long hard slog, which reached a culmination for all fundamental physical measurements only in 2019. That coming to fruition happened within the internationally harmonised framework of the SI (Système Internationale). Making sure that all units have their basis in a fundamental physical constant of the Universe was the last nail which hammered F=ma to the fabric of space, time and spacetime. Not all science is as clear. Little else is as universally accepted, and as irrefutable across time and place, such that someone would have so much trust in the relationship as to stand beneath the lowest point in the swing of a heavy pendulum, knowing the pendulum would only part their hair. Yet that is what Richard Feynman did.

So, the question in my mind is, can economic sciences proffer concepts or relationship holding as true in any place and time for which it or they exist as does F=ma, or as Schrödinger's equation does at scales when F=ma is subject to such uncertainty that it breaks down? The closest I can think of is labour, in the sense of meaning work undertaken by a person. Ideally the work should be paid for, but that is a question of morality and justice and basic decency—not of economics.

Clearly, there is a school of thinking open to the idea of economics as a science, because the Swedish Bank Prize for economic sciences in memory of Alfred Nobel was established in 1969. I think the words economic and science will have been coupled with deliberate intent. Like economics, science can be messy, but does economics hold irrefutable truths? We know Mathematical constants exist and are co-opted to establish economic relationships. Are those formula true across time and space? Do the relationships continue to apply in a world in which the human factor exists, and the value of natural capital is coming to be understood? Are DNA, RNA and knowledge of Earth and Universe the economic resource of our time? I would argue yes. If one has not lived one cannot think or inspire the thought which could save the World or humanity.

This issue (part two was completed and incorporated by 9th May, 2021), including some short summaries of economic science Nobel Prizes, is meant to give scientists, politicians and others something to take as a trampoline to spring from. Criticism from economists is welcome, especially if the magazine has misunderstood important ideas. Somehow economics needs to escape Davos and reach the people. If there are certainties in economics as sure as that F=ma then, as with nuclear physics, people can choose to do good or ill with them. And to me the definition of work and of labour as work which is paid for are as good a starting point as any. Society and politics can then explore what is work, what can be an unpaid voluntary contribution to creating the wealth of a nation, and how that interacts with welfare, age, enabling inclusivity and simply existing. How does this connect to economics? It takes labour, be that of slave or freewoman, to push a heavy object up a hill.

Enter Adam Smith. □

> "The annual labour of every nation is the fund which originally supplies it with all the necessaries and conveniences of life which it (the nation) annually consumes, and which, either in the immediate produce of that labour, or in what is purchased with that produce from other nations."
>
> ***An Inquiry into the Nature and Causes of the Wealth of Nations***. by Adam Smith (1723-1790). Published 1776. P1.
> *https://political-economy.com/wealth-of-nations-adam-smith/* Accessed 06.05.2021.

Insight from Adam Smith, a father of economics

There is probably not a mother (or in these days in some countries—a primary care giver) or coal or gold miner who would disagree with what Smith wrote in the quote above. Sadly, the job of motherhood (primary care giver—male or female) is unwaged. A few weeks of paternity or maternity leave is not a wage. Yet it is hard to see how the combined roles of cook, cleaner, on-call care giver, educator of infants and toddlers, provider of child care etc… , which is undertaken solo by some women (or men), does not count as above minimum-wage work. Imagine the size of the global economy if looking after babies and a home was waged work, with holidays, and sick pay, and other benefits. Of course in developed economies we have divided aspects of the work of motherhood/child care across society as a whole, and we balance this division of labour with the well being of the labourer undertaking that work. These days we do not, at least in the UK, lawfully tie women to the kitchen sink. So, the question becomes, have we parsed correctly and valued correctly the resultant division of labour? These are some of the questions of microeconomics. They are events happening within a household and interactive with welfare economics. The tasks in this conceptualising across a society would include pre-school educators, and providers of outsourced tasks, such as sellers of take-away food. Smith is an unrivalled master of such microeconomics, and there is much to be gleaned from the care he takes in parsing the steps in manufacturing pins. In his disquisition on labour in "The Wealth of Nations" Smith argues persuasively that dividing specialised tasks can lead to streamlined workflows, productivity growth, and open a space for innovation. A trade unionist would see in Smith's examples that the consequences could also be disruptive, and lead to redundancies, and restructuring of a work place, or of an entire industrial sector. Smith sees these perils and advantages very clearly. He also addresses wages and deductions which happen when labour becomes more than in support of self-sufficiency, and moves into an employer's work place. If a nation's wealth is built on labour, one's own and labour one buys, which is Smith's central thesis, then, in Smith's world, one pays for work.

Though slavery and the slave trade existed when Smith was writing, his work reads as a modern essay on wages, employment, stocks, land rights and the profit-maximising benefits of innovative technology. Profit does not have to be a dirty word. We have an inkling now of the human cost of unwaged work. For example, half of the **1993 Nobel Prize in economics** went to US economist, Robert Fogel. Some of Fogel's work examined the economics of slavery. I would take the concept of labour further, though, and argue there are times when the only thing a human being is in a position to do is to be alive or to have lived. The life of an individual might lead to the thought that saves the world or humanity. So I propose being alive, which is a matter or Will and consent, should be included within Smith's concepts of labour. Labour must be paid for. This is a thought others also are groping to articulate. Most starkly, my point that being alive is labour can be seen in slavery.

Fogel's research into the economics of slavery in the US was controversial. His findings of the historical and theoretical values are disputed. But the topic is worth researching. The maths and concepts are developing which should deepen calculations monetising slavery. That way should descendants of people who were enslaved seek compensation for the fact that the State allowed degrading treatment of their forebears can look for a lawyer able to do the maths. The grandfather of someone who today is 100 might well, when a child, have known first hand of a previously enslaved person. This topic matters because it may give partial insight into how such an institution, which never should have existed, came to survive.

But, to return to Smith: his work is descriptive, qualitative, detailed about the industrial practises of his day, and thoughtful about different types of economy. Only labour, he says, can assign value to the price of a commodity. To him there is labour in acquisition of skill and knowledge and in employing that human capital. And for a man to have wealth, defined by the ability to enjoy those things in life which matter to him, then that man will need to rely also on the labour of others. Thus a total economy opens up. Even today, when we see the value of the natural world, labour was needed to acquire the knowledge enabling that insight. □

> "Labour, therefore, it appears evidently, is the only universal, as well as the only accurate, measure of value, or the only standard by which we can compare the values of different commodities, at all times, and at all places."
>
> **Adam Smith, The Wealth of Nations.**

Insights from John Maynard Keynes

The man and his ideas

Who would have thought that to John Maynard Keynes there was a future world in which money was disgusting. In fact, it might even have been that he was not particularly enamoured of money in the 1930s. That emerges in an essay Keynes wrote about what might be possible for the grandchildren of him and his contemporaries[1]. He was looking ahead by 100 years. There is a barrier to entry to this short text for me, and possibly for others also, in that it uses words and examples which are uncomfortable for us today. Reading of wives of wealthy men in developed economies as having little to do with their time is miserable, given those women were often not allowed to take degrees, welcomed as equals in the work place, nor as participants in affairs of State. Yet Keynes' actual point is not about gender politics. It is that if humanity is to grow up, it needs to pass beyond money for the sake of money. Four things are needed, he write, for economic nirvana. These being: a will to control population, to avoid War, to entrust to science what may be entrusted to science, and for the rate of accumulation to be fixed by the margin between production and consumption. In such a new world, writes Keynes,

> "We shall honour those who can teach us how to pluck the hour and the day virtuously and well, the delightful people who are capable of taking direct enjoyment in things, the lilies of the field who toil not, neither do they spin."

Once I discovered this short text, as I did in early May 2021, I had a better sense of why Keynes specifies that he wrote what became his masterpiece, "The General Theory of Employment, Interest and Money" for fellow economists. I strongly suspect Adam Smith and John Maynard Keynes would have enjoyed each other's company, and understood each other.

The "General Theory …" acknowledges there is a world in which one might not be able to work for recompense. Keynes means people unemployed not because they are on strike, or between jobs, or unwilling to work for the wage on offer. The involuntary unemployed to Keynes are willing to work at the prevailing rate, but the work is not there. In this Keynes was challenging classical assumptions about how labour markets work and how real wages emerge from those markets. Real wages are what the individual can buy with their money. Money wages is the money in your hand irrespective of what it buys. Keynes' ideas were revolutionary.

If Keynes had lived beyond 1946 what might he have thought now of his most famous work? Death fixed the thinking of Keynes in aspic in the minds of readers of his work, even though Keynes when living updated his own ideas with time and acquisition of greater knowledge and experience. The General Theory was published in 1936, and it was conceptualised during the great depression. The spectacular stock market crash of 1929 had taken place only a few years earlier. How could there have been in the political zeitgeist of many thinkers at that time anything other than a desire for government intervention to alleviate suffering. And what Keynes writes is suffused with an air of common decency.

In the latter years of World War II Keynes played an important role in establishing what has evolved into what is still a work in progress, namely the international economic world order of the United Nations. These are the institutions humanity has created to serve as bulwarks against global war.

Keynes wrote for living fellow economists. They would have had the shared unspoken assumptions and the conceptual and theoretical thinking and knowledge of their discipline. They would have known where the intellectual "bodies were buried" of their colleague, and what, in their most private moments, their aspirations for economics were . Much as Keynes wanted to be understood also by the public, shared knowledge sets — with the best will in the world — cannot always be made transparent in a manuscript written primarily for fellow specialists.

Smith and Keynes lived 100 years apart, in different social settings, against different economic backdrops, knowing of hugely different current affairs. Yet Keynes knew Smith had existed. It is hard to argue against a notion that without labour a nation has no wealth, though there is a deep philosophical discussions to be held about the meaning and constitutive parts of labour and wealth. Keynes and Smith each had a key idea transcending time: labour as the source of wealth and involuntary unemployment. These are words and problems with longevity in macro and microeconomic. Keynes also engaged in lively debate with Jan Tinbergen, a contemporary economist, who in 1969 won with Ragnar Frisch the first Nobel Prize for economic sciences for co-founding econometrics. That is the field of study which puts Smith and Keynes to the test.

1. Economic possibilities for our grandchildren.
https://www.marxists.org/reference/subject/economics/keynes/1930/our-grandchildren.htm

2. The General Theory of Employment, Interest and Money.
https://political-economy.com/general-theory-of-employment-interest-and-money/

CONNECTING THE NATURAL WORLD, HUMAN LIFE AND SOCIETY TO CONCEPTS ECONOMICS

By Helen Gavaghan

WHAT FOLLOWS PP 9-13 IS A SPECULATIVE ESSAY. THE WORDS AND CONCEPTS ARE FAMILIAR IN ECONOMICS AND I TRY TO MAKE CLEAR WHEN I AM USING STANDARD DEFINITIONS AND WHEN I AM EXPRESSING MY THINKING. THIS IS NOT A TEACHING TEXT.

In economics, perhaps more than any other discipline, words and their meaning matter. In some cases not finding a common understanding for a word qualitatively, and having the specific data sets substantiating the qualitative, can result in war. Only after millions of deaths, as in World Wars I and II, might combatant nations realise fully what one of their problems was. A lack of conceptual understanding, a lack of well-characterised financial data, an agreement not made which could have been made, unfair price at auction, commodities not where they are needed, a misunderstood equation or mathematical relationship, a lack of transparency, or factor unknown at the time as being important, might lead to war. Here are some of the words of economics. Their arrangement came partly from my head, and sometimes I might not be using the word in exactly the same way as taught in a school, but many of the concepts are those of the great theorists in econometrics and economics. So, I won't be offended if you put the concepts in your own set of interactive juxtapositions and flows of events, or shuttle them because you think an alteration in one at a given time or over a time period would lead to new juxtapositions. Such time series and dynamic models are the business of economists.

Macro economics (Business cycle)

The business cycle is the simultaneous expanding and contracting across many or all of the economies activities. It is the part of the world of economics in which there is economic boom and bust, inflation, mass unemployment, deflation and the monetary policy of central banks. See business cycle papers from the National Bureau of Economic Research. https://www.nber.org/search?page=1&perPage=50&q=business%20cycle **Accessed 9.5.2021**.

Microeconomics

By contrast microeconomics deals with households, companies and their actions. Adam Smith paid close attention to such actors in the economy of his time. Behaviour economics, incentives and what drives consumers collectively and individually impacts their decisions to buy, sell, save and invest. In aggregate such consumer behaviour might be a useful macroeconomic value enabling the economies of nations to be compared. By such comparison and negotiated adjustments global war can be avoided. Both macro and microeconomics are linked to welfare and development economics. In both macro and micro economics barriers to doing business—friction, in the language of economists—are important areas of study. Only by understanding tariffs, regulations, employment and resource distribution can one look for tipping points into a business cycle.

Resources.

To economists, its seems, resources are things like labour, human capital (how much useful stuff people know and how much they know how to do things with the stuff they know), and markets. Allocation of such resources, nearly always called "scarce" in economic literature, is a major topic in both macro and microeconomics. It seems to me, though, that the world is full of resources, though I am not using the word yet in quite the same way as an economist would. To me resources are leaves, fruit, berries, and animals (including human), oxygen, water (fresh or salty), sulphur, salt, rock, wind, ocean or sunlight. It seems to me also these things do not become resources in an economic sense until a biological organism (which does not have to be human) expends its own energy on that resource and acquires a reward, such as sustenance, or existence, or heat, or the manufacture of GTP or ATP, or respiration, in return. Theoretically then, **expending energy counts as employment.** Yet I do not think breathing counts as employment because I cannot do other than breath, unless I commit suicide. But breathing, because it enables me to exist, does count as labour, which, also by definition, should be paid for. The product of my breathing, and thus my labour, is my thought or the thought my existence may inspire in another, even if they do not know me, and which thought might be the thought that saves the world, nature or humanity. **In this conceptualisation, resources become a resource because of the benefit gained, irrespective of whether one has a choice in expenditure of energy to turn the object considered into a resource.** When I have choice the acquisition of benefit from the resource is employment as well as labour. When I have no choice in acquisition of the benefit, other than by suicide, my action is not employment. Yet while I choose to stay alive I am labouring. There is thus labour in being. If labour is not paid for it is slavery, and Lord Mansfield has created the case law against slavery.

Employment.

In this conceptualisation of resource my body asserts a desire for oxygen whether I will or not. That makes oxygen a resource. Bird build nests. Does a bird have the ability to strike, as I may end my breathing by suicide? Is a bird employed or labouring?

Nest building provides safety and a home for the bird's chicks. The bird creates a resource through nest building and confers the meaning of being a resource on the twigs it selects for its nest, given that the twigs are essential to the product of the bird's employment—namely building a nest. Is the bird employed only, or employed and labouring? If the bird is by choice building a nest protected by us to protect chicks we eventually eat, then the bird is employed and it is employed without pay on our behalf, and without choice, because we confer benefits in kind on the bird. These benefits in kind might be protection from predators, provision of food, veterinary care, respite care and the equivalent of hospice care when the bird is ready to die. For birds, of course, we permit assisted dying. The benefits make the birds chose employment into labour.

In other words, any biological organism may confer on anything the meaning of being a resource if the biological organism has gained benefit via expenditure of energy by, for example, deployment of its beak or eating. The benefit accrues to the bird, not to owners of the bird, though owners of the bird, predators, and bird thieves might and do transfer the accruals to themselves. Native and invasive species also engage perforce in the business of breathing, and thus in the act of conferring benefit. Can they be, and the question is not rhetorical, also employed? They do not seem to have the choice of ending their life. Without that choice, their choice becomes ours. Human dominion and governance thus assume significance, and again the questions of morality enter the equation.

By contrast, to an economist employment is work undertaken within a society in return for a cash or cash equivalent reward. Nobody is going to pay me simply to breath. But perhaps they should? I am not responsible for evolution, reproduction and genetics, yet here I am. Perhaps this reality could be the basis for assigning a cash amount from national coffers to each person born, irrespective of any work undertaken for pay? The idea of a basic universal income, which would need adjusting for purchasing power parity in a fairly sophisticated way, is one which has begun to surface more frequently. For such an idea to come to fruition armies of human beings will need to become economists. In such an economic structure there would need to be incentives to encourage the resilience of a mixed economy, otherwise everyone might choose philanthropy.

So, in this conceptualisation the thing the biological organism interacts with for a benefit such as sustenance or warmth is a resource only after the biological organism has benefited in some way. My question is, what sort of a society do we build if the biological organism's interaction with a resource is dictated by biology, not Will? If one were paid for the act of being, irrespective of where born, as a matter of global policy, we would create a human resource, not as an intelligent being to employ, but as one whose value lies only in the fact of their existence. Further, the whole of biology, is naturally employed (except the act of breathing, which is involuntary), and labouring for free, and is possibly also enslaved.

In the context of human economy all could receive the same basic pay, subject to adjustment for purchasing power parity. There would still be the option to earn more, and thus for incentives to exist. Indeed without labour for additional reward one would have only an existence equivalent to subsistence farming, but one would have enough to pay for basic shelter, water and energy needs. In this conceptualisation one is recalibrating the base line with the intent of further removing fear. The new baseline would not remove benefits from those unable to work for whatever reason.

It is hard to see how such a model can work if it is not global. The underlying assumption is that oxygen is a resource of equal value to all human beings, and that the body's automatic engagement of its respiratory system is a Universal. The respiratory system conferred by evolution could be the individual's ticket to payment for being alive. Additional labour within the economy would then be for most people a matter of Will and choice.

If the interaction between organism and thing has utility to the biological organism beyond sustenance (exclude breathing because of the involuntary biological drive to breath) then employment becomes something closer to what an economist means by the word employment, and Adam Smith meant by labour. That is, one does work for pay and produces something which can be sold competitively, not merely shared. Adam Smith opened the territory, while John Maynard Keynes and others entered as explorers.

The biological organism may turn its employment (which does not include breathing) on its own behalf into work for gain beyond its own needs — namely labour (employment which is paid for). Labour and utility are two words common in economics, but, again, I am using each word in a subtly different, though not necessarily incompatible way than how an economists would. Utility is an abstract idea to economists with its own unit of measurement, known as a util. How one measures that I have no idea. And to economist the more utils one has the less utility one gains per util. My thinking is that breathing has utility *ad perpetuity*. And now we live in a world where humanity has deepened understanding of nature.

We are learning how the world interacts within itself, and how it has polynucleotides in common across all parts of the tree of life, from deep in rocks, oceans, lakes, sulphur vents, forests and towns. Biology itself is now a resources for economists as well as being the thing which confers by benefiting the status of resource on both the organic and inorganic world. Misjudge the nature and value and distribution of biological resources and biologically-conferred resources, and their potential for sustainable development, and war and exploitation could break out. The misjudgement might be at a local, or regional, or global level, but global wars can happen because unknown unknowns mean people do not understand one another, and because what is visible on the surface of things may not be how they are in practise. One can look at an aspect of nature and see its potential, but the people owning that potential may not know it has potential, nor have the knowledge, infrastructure and resources to turn that aspect of nature into a product with economic utility. Now that scientists are coming to understand there may be value in what does not exist in a genome (see page 4 of this issue) this question of what constitutes a resource, and what its benefit/price/value may be has become exponentially more complex. To assess the importance to economics of the dark genome in the natural world I would suggest opening a thesaurus and letting your mind run riot.

The unknown unknowns of this conceptualization are not what economists mean by asymmetric information, which is when both parties have different information. Rather I am saying that at a given moment both or all parties might not know the factor which, when it does become known, could start a war. Such events, to an economist, are intertemporal. They can be modelled theoretically. War can make a mockery of the model.

Benefit

A good starting point for thinking about resources is that they confer benefits. I think of benefit as being something known only to a user/purchaser. I think economists might use a different word, but that is irrelevant here because it is the concept of what I call a benefit which I am exploring. I am thinking of benefit as a Universal concept, but it is not a Universal which could be assigned a useful monetary value. What to one person might be trivial, to another might be the difference between life and death, despite having the same monetary value. Take, for example, a 35 pence packet of generic Paracetamol. The lack of 35 pence for a person pushed to the limits of long-term chronic pain could be what leads to a suicide. To someone else the 35p packet of Paracetamol might help them recover from a mild hangover, which they might anyway be able to cure with water and exercise. I argue that error bars in such circumstances would be meaningless because, even though an abstract mathematical concept could be worked out, the limits would not have true meaning, and so would not be valuable as a means of predicting citizen behaviour. Yet that citizen behaviour could have significant economic impact if governments aggregated behaviour within error bars on the grounds of a meaningless generalised monetary value assigned to benefit.

Self-perceived benefit might prompt an individual to take out a loan for interest, where the interest rate accepted by the borrower relates to the value of the loan to the borrower. That value is given only in part by the perceived benefit to the individual. The rest of the value comes from the business and risk calculation of the seller of the product. In this example the product is the loan, and the interest is the price. The benefit to the purchaser is unknown to the lender, and the lender has decided a value for the thing sold. State-regulation and strict definitions of terms can protect an individual from allowing a self-perceived benefit of a loan purchase from distorting a total economy, as it could if self-perceived benefit differed much from the price set by the seller of the loan, or meaningless error bars on the concept of benefit were permitted to impact national decisions.

Value

I am using value as intrinsic to items, goods or services, having nothing to do with the concept, in this article, of benefit. Value could comprise the price attached to constituent parts of the entity sold, plus the price of the labour needed to create the entity. Or it could be the what a bank thinks it should receive for letting its property, or the property it is managing, be assigned for a short time to a third party. The same number would be attached to the labour irrespective of whether the work was undertaken on a voluntary basis or as part of employment for earnings or as a slave.

Price and Cost

By price I mean the amount of cash changing hands for a transaction, where a transaction is said to have taken place when goods and or services exchange hands. One could barter with goods and services to acquire goods and services, but that adds layers of uncertainty and complexity to negotiation of what is given in exchange for goods and/or services purchased. I am defining costs as the cost to the buyer of the thing bought. So the cost would be the price paid plus or minus an amount which could be valued in money terms. If the seller says they want £10 for a meal they are selling and the buyer has received a gift of £10, then the cost to the purchaser in this definition is zero. Or the cost might be £15.00, because in addition to the

price of the meal the purchaser was willing to forgo £5.00 or earnings. In traditional trade, cost might also added to the price of goods or service plus transport or use of digital infrastructure plus tariffs and local taxes applied on the product or service.

In summary my definitions are that a **resource** confers a benefit on a biological organism, and until that benefit is conferred the thing is not a resource. **Employment** is any act that turns a thing into a resource. Employment might be voluntary or involuntary, where involuntary might be slavery or unwaged, or voluntary. If one has a biological given such as breathing, the status of resource is conferred on oxygen, but the act of breathing which confers the benefit is not employment. However it is labour, because life is the product of the exercise of breathing. If **Labour** is undertaken it must by definition be paid for. So breathing, being involuntary is not employment, but it is labour, because human beings can choose through suicide not to breath. **Benefit** is something which a biological organism gains from employment or involuntary action.

The rest of this article uses employment as a word in a way closer to how an economist might. I envisages labour as something with economic purpose only if it is paid for and it results in utility for a consumer. So, I am not thinking labour has as its purpose consumption. But I do think Adam Smith is right to think that value can be assigned in part because of the labour in the thing to be transacted. I think of consumption as a by product of the economy. The thing created by labour needs enough utility in the sense of what the thing does that from their individual or joint income or bequeathed financial resource that group or individual (company, charity, government body, or family) will disburse financial resource for that product because of its utility to the purchaser.

Employment defined as useful work for pay is what makes this imaginary world of mine go round. But that employment is additional to the basic pay for the common labour of choosing to stay alive. That is employment and labour are additive when it comes to the money one gets.

Then, with employment being for income additional to the pay one earns for existing, and labour needing utility, production can begin where value can be assigned, interest earned against future use, and price set in a market. If one is successful in the market, and the resource being turned into product is not the only one of its kind, and demand continues to exist, then employees and employers may — if they can find common cause — want productivity to increase. At this point one country may not provide a sufficiently large market for the product, given its production costs. Or the product is attractive in another country, and the transaction costs of selling (or buying components of the finished product) mean it is worth selling overseas. That leads to supply chains. See page three of this issue for a short news report on the interaction of global supply chains within the context of a global supply chain. Global trade means that without transparent data and fair dealing war may ensue.
NOTE on my use of suicide in the above article. When we loose people through suicide it seems to me that we have in some way as a society failed — not as individuals— one of our co-workers in the business of living. That failure is usually because of something we were ignorant of or had not yet learned how to do.

FORMAL ECONOMICS

Enter gross domestic product (GDP) and gross national income GNI) and international trade. These terms currently have specific meanings to the international order. Up to this point in this article I have weaved between how I think about the world economists inhabit, but now, because of the World Wars that have been fought, I am going to use the definitions the great minds of economics have devised so that nations and employers and employees can speak with one another and create or elect systems of government within which economic systems from different political structures can exist and do business with one another.

Gross domestic product (GDP) and gross national income (GNI).
The United Nations does business via a system of national accounts (SNA). Within the SNA, households are economic entities falling into a group known as resident units. Other resident units include financial corporations such as banks, non-financial corporations, government, and non-profit bodies. Together what these five groups buy and sell within a given time period comprises a country's total economy. For international comparison and national/international planning in different circumstances the total economy can be described by its gross domestic product (GDP) or gross national income (GNI). GNI has replaced the term gross national product. Conceptually GNI and GNP mean the same thing.

The Organisation for Economic Co-operation and Development's (OECD) definition of GDP centres on "resident units". To work out GDP first add up the purchase price of all goods and services used by resident units in a country. Together those goods and services are product. Do not include things consumed in the process of making the final goods or services. For example, if making a quiche for sale, do not include as a separate item the price of the eggs which went into making the

quiche. From the aggregate product price of goods bought subtract the total value of imported goods and services. The result is the gross domestic product. Taxes on the goods are included in the aggregate, while subsidises on production are subtracted. To be classed as a resident unit, that unit usually has to have been in a country for a year. Economists do not always think like border-control officials.

By contrast with GDP, gross national income (GNI) includes transactions of resident units with non-resident units. In this situation the definition of primary income becomes important. A resident unit's primary income comes from what it produces and from income earned as a result of assets owned for production. In a publishing enterprise, for example, the sale of its physical or electronic books and magazines generates primary income, as would payment received from overseas for use of a company's website needed for production of its electronic publishing products. So GNI is GDP minus what needs to be paid to non-resident units such as employees, and including what non-resident units pay to the resident unit, for example for use of the website or resident employee wages. GNI captures an international perspective and international corporate activity.

Transaction cost economics (TCE) is about how to add value to a product for sale. Included in TCE is analysis of how to avoid waste, what should be outsourced, or bought in, or created or made by the seller. Questions include what are the costs of servicing and managing the transaction within a given legislative setting? How much after sales loss or support might occur or be needed to support the profit-generating transaction. How well do the outsourcing or in-house production methods fit within the scale of a business. Is there waste and redundant duplication?
See. Transaction Cost Economics as a Theory of the Firm, Management, and Governance
by Mikko Ketokivi and Joseph T. Mahoney (2017)
https://oxfordre.com/business/view/10.1093/acrefore/9780190224851.001.0001/acrefore-9780190224851-e-6

Time series
Economic data presented over time, either in discrete packages or continuously, constitute a time series. For example, the number of containers carrying machine parts for wind turbine which pass through the Panama Canal in a single week would make a time-series datum if data were collected over, say, a six month period. The time series could be analysed by planners so that further business research or institutional involvement or purchasing and ordering decisions could be made to understand the variations, and the direct and indirect factors impacting the pattern observed.

Equilibria
Economists look for balancing points between opposing economic forces. Identifying such equilibria and analysing their context and what might disturbs such equilibria is why Work Bank reports are issued for immediate publication, why it costs such a lot of money to attend Davos, and why policing the G7 is expensive.

Further reading.

Fundamental concepts of time series econometrics.
https://www.reed.edu/economics/parker/312/tschapters/S13_Ch_1.pdf

Introduction to time series.
https://www.stat.purdue.edu/~boli/stat420/lectures/lecture1.pdf

Glossary from the Roland Coase Institute. https://www.coase.org/nieglossary.htm

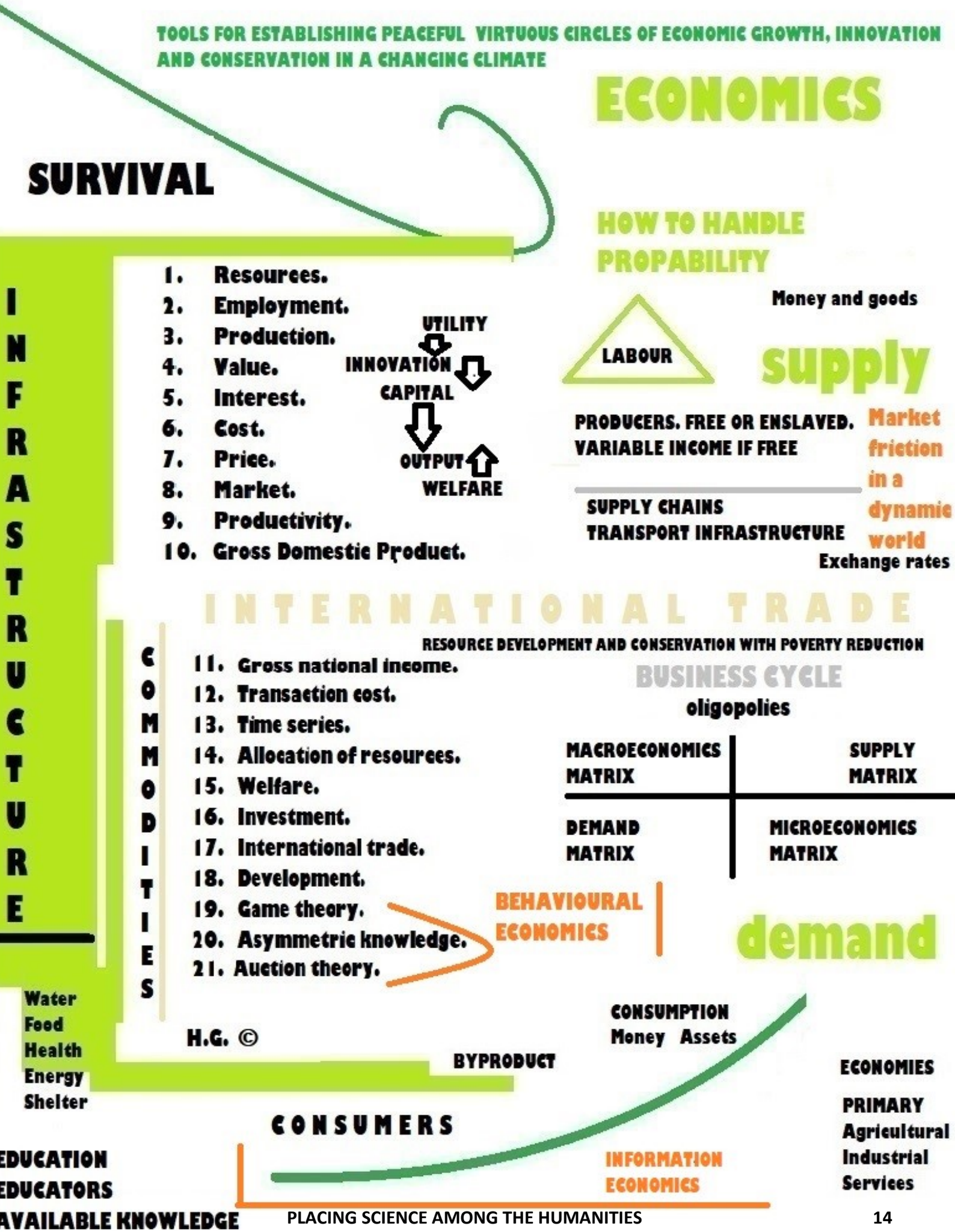
World Bank:
https://www.worldbank.org/en/topic/trade/publication/global-value-chain-development-report-measuring-and-analyzingthe-impact-of-gvcs-on-economic-development

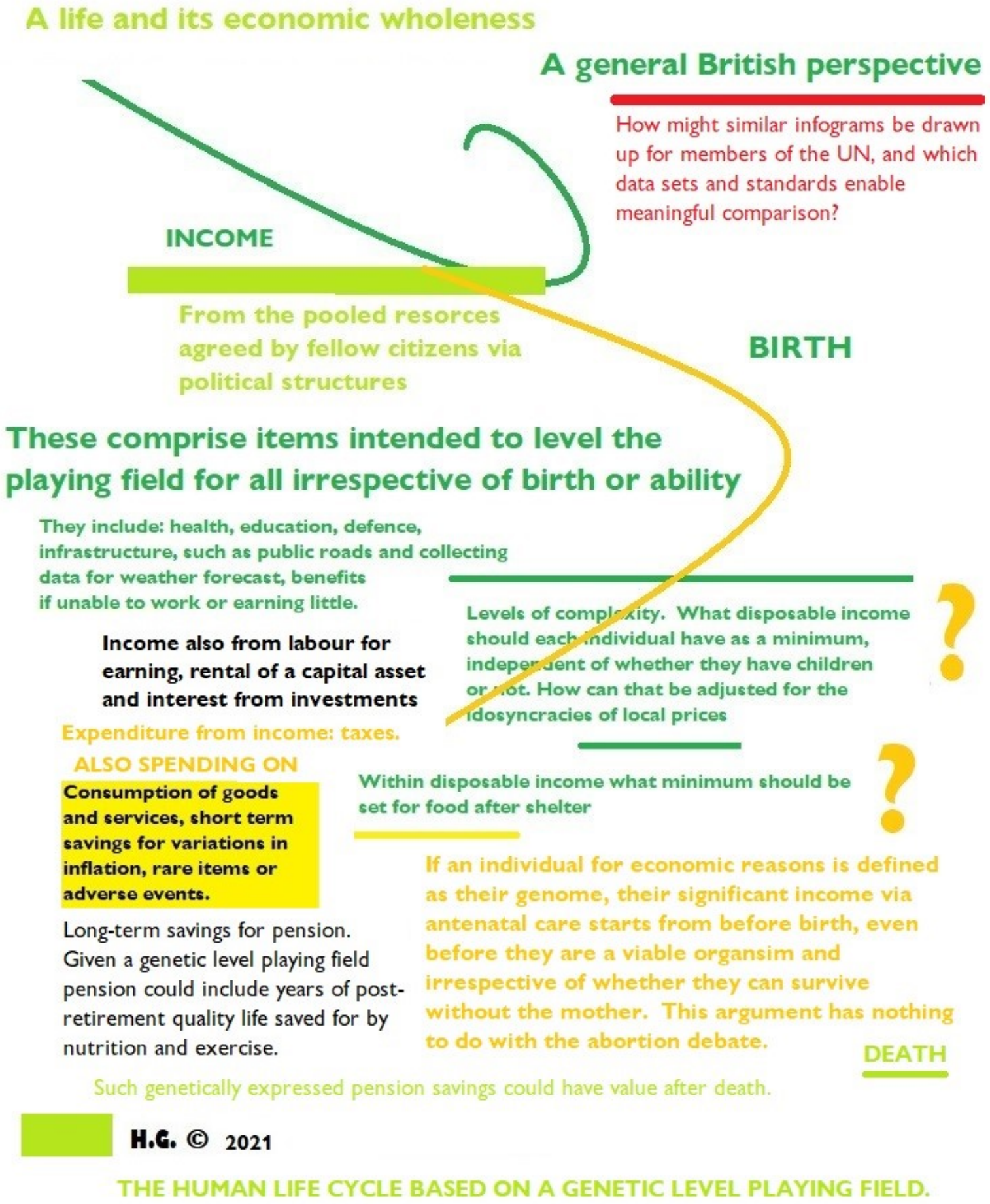
Non tariff measures Pakistan: https://www.pide.org.pk/pdf/Working%20Paper/WorkingPaper-2021-2.pdf

IMF Glossary: https://www.imf.org/external/np/exr/glossary/showTerm.asp#99

OECD Glossary: https://stats.oecd.org/glossary/

Eurostat: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Index_number


TOOLS FOR ESTABLISHING PEACEFUL VIRTUOUS CIRCLES OF ECONOMIC GROWTH, INNOVATION AND CONSERVATION IN A CHANGING CLIMATE
ECONOMICS
SURVIVAL
HOW TO HANDLE PROPABILITY
INFRASTRUCTURE
1. Resources.
2. Employment.
3. Production.
4. Value.
5. Interest.
6. Cost.
7. Price.
8. Market.
9. Productivity.
10. Gross Domestic Product.
UTILITY
INNOVATION
CAPITAL
OUTPUT
WELFARE
Money and goods
LABOUR
supply
PRODUCERS. FREE OR ENSLAVED.
VARIABLE INCOME IF FREE
Market friction in a dynamic world
SUPPLY CHAINS
TRANSPORT INFRASTRUCTURE
Exchange rates
INTERNATIONAL TRADE
RESOURCE DEVELOPMENT AND CONSERVATION WITH POVERTY REDUCTION
COMMODITIES
11. Gross national income.
12. Transaction cost.
13. Time series.
14. Allocation of resources.
15. Welfare.
16. Investment.
17. International trade.
18. Development.
19. Game theory.
20. Asymmetric knowledge.
21. Auction theory.
BUSINESS CYCLE
oligopolies
MACROECONOMICS MATRIX
SUPPLY MATRIX
DEMAND MATRIX
MICROECONOMICS MATRIX
BEHAVIOURAL ECONOMICS
demand
Water
Food
Health
Energy
Shelter
H.G. ©
CONSUMPTION
Money Assets
BYPRODUCT
ECONOMIES
PRIMARY
Agricultural
Industrial
Services
CONSUMERS
EDUCATION
EDUCATORS
AVAILABLE KNOWLEDGE
INFORMATION ECONOMICS


A life and its economic wholeness
A general British perspective
How might similar infograms be drawn up for members of the UN, and which data sets and standards enable meaningful comparison?
INCOME
From the pooled resorces agreed by fellow citizens via political structures
BIRTH
These comprise items intended to level the playing field for all irrespective of birth or ability
They include: health, education, defence, infrastructure, such as public roads and collecting data for weather forecast, benefits if unable to work or earning little.
Levels of complexity. What disposable income should each individual have as a minimum, independent of whether they have children or not. How can that be adjusted for the idosyncracies of local prices
?
Income also from labour for earning, rental of a capital asset and interest from investments
Expenditure from income: taxes.
ALSO SPENDING ON
Consumption of goods and services, short term savings for variations in inflation, rare items or adverse events.
Within disposable income what minimum should be set for food after shelter
?
Long-term savings for pension. Given a genetic level playing field pension could include years of post-retirement quality life saved for by nutrition and exercise.
If an individual for economic reasons is defined as their genome, their significant income via antenatal care starts from before birth, even before they are a viable organsim and irrespective of whether they can survive without the mother. This argument has nothing to do with the abortion debate.
DEATH
Such genetically expressed pension savings could have value after death.
H.G. © 2021
THE HUMAN LIFE CYCLE BASED ON A GENETIC LEVEL PLAYING FIELD.

A SEARCH FOR CROSS BORDER, CROSS CULTURAL COMMONALITIES IN THE COLLECTIVE HUMAN LIFE OF ECONOMICS

WITHOUT DATA COLLECTION, AGGREGATION, STORAGE, MONITORING OVER SET TIME PERIODS, TRANSPARENCY, AND NEAR IMMEDIATE COMMUNICATION, THE INSIGHTS WHICH HAVE WON THE NOBEL PRIZE IN ECONOMICS SINCE INCEPTION OF THE PRIZE IN 1969 WOULD HAVE LITTLE VALUE TO THE SAFETY AND QUALITY OF LIFE ON EARTH—FROM HUMAN TO THAT OF THE PLANET. THIS ARTICLE TRACES THE BARE BONES OF IDEAS THAT HAVE GAINED THE ADMIRATION AND SUPPORT OF ECONOMISTS GLOBALLY BY PRESENTING IN CHRONOLOGICAL ORDER THE YEAR OF THE PRIZES THAT HAVE WON THE NOBEL PRIZE EACH YEAR FOR ECONOMIC SCIENCE. I NOTICED IN THE NOBELS FOR CHEMISTRY AND PHYSIOLOGY OR MEDICINE THAT THE QUALITY OF THE SELECTING OF THE SCIENCE DESERVING THE PRIZES WAS OUTSTANDING, AND SO I DECIDED TO FOLLOW THE ECONOMIC NOBEL PRIZES AS AN INTRODUCTION FOR MYSELF TO THE DISCIPLINE. MANY SCIENTISTS WILL RECOGNISE THE ESSENCE OF THE MATHS RELIED ON, AND FOR THOSE POLITICIANS WHO ARE NOT SCIENTISTS, I PROVIDE REFERENCE URLS WHICH MAY HELP YOU OR YOUR RESEARCHERS TO ASK ERUDITE QUESTIONS NEXT TIME YOU REQUEST A BRIEFING!

FROM 2020 BACK TO 1969

BY HELEN GAVAGHAN

2020 IMPROVEMENT TO AUCTION THEORY

Paul Milgrom and Robert Wilson won in 2020 for independent work in the late 1970s exploring and analysing auctions as a resource allocation method and means of setting price/value. There is a bidder, the thing bid on, and the individual knowledge sets of the independent bidders, and their view of the thing's value, and the auctioneer. Given so many unknown parameters, and with individuals lacking knowledge of motives and values set by every other bidder, Bayesian Statistics is an analytic tool which can be applied. See following primer (https://www.nature.com/articles/nbt0904-1177) published in 2004 by *Nature Biotechnology* for biologists analysing results amid competing hypotheses. Though parameters with unknown probabilities in an auction are of a different character, they are, non-the-less, akin to competing biological hypotheses where the outcome depends on validity of the hypothesis. In auction theory the desired outcome is that aggregation via auction of independent knowledge will set the right price. And/or that the bidder wins her or his bid!

2019 DEVELOPMENT ECONOMICS

Abhijit Banerjee, Esther Duflo and Michael Kremer undertook empirical field studies to make sense of how to alleviate poverty. Their case studies identify localised elements impacting macroeconomic factors, as well as the phenomenon of poverty. Higher income countries, for instance, have more equitable application of more modern means of production, while in low and middle income countries the efficiency and modernity of the means of production is more patchwork. Intersectoral outmoded means of production are more common in less developed economies. There is a correlation between this latter microeconomic quantitative and empirical observation and a lower average per capita income in the low to middle income countries. The laureates applied and developed their methods also in the field of education. While the laureates are not the only ones working at the intersection of localised economic effect and interventions, The Nobel Prize committee says their works gives a developing understanding of specific mechanisms behind poverty, and of quantifiable interventions to alleviate that poverty. Though the work is at the leading edge of development economics it also rests on well established principles in economics, such as understanding human motives, and behaviour such as not turning up for work.

2018 CLIMATE CHANGE ECONOMICS & MODELLING HUMAN CAPITAL (KNOWLEDGE), LABOUR, INNOVATION AND GROWTH

Paul Romer showed from a mathematical model he designed that high levels of education and an economy well integrated into global trade result in more growth than if an economy trades solely with one large market. Romer's model has four inputs: labour, capital, human capital (knowledge) and some measure representing technological innovation, such as new designs. Inevitably Romer's work leads to examples involving rival and non-rival, excluded and non-excluded goods. Rival goods might be a box of chocolates which, once eaten, cannot be eaten by anyone else. Non-rival goods would include a book which someone else might also read. Excluded goods are those which cannot easily be exploited by someone other than the owner. They include patented products like drugs which, in the absence of a license or exemption, may not be exploited by someone other than the patent owner. Romer's work is theoretical and enables principles and relationships within the economy and amid economies to be explored mathematically.

Romer's work is described in "Endogenous Technological Growth" (1989).
https://www.nber.org/system/files/working_papers/w3210/w3210.pdf Accessed 1.4.21 and 2.5.2021.

2017 Integration of human behaviour into economics decision making

Richard Thaler's lecture gives a quick overview of the field of behavioural economics, then moves to the consequences for pension planning and choices people make when setting aside a portion of their income for retirement. Advertising and the way firms or governments present choices and opt-in schemes have an impact on economic decision making. Thaler's work in general highlights differences between decisions made by *homo economicus,* a rational and a theoretical being, compared with most of the human race. His nudge theory considers how certain comparatively simple changes in presentation of information to a decision maker can have long-lasting impacts on the choices people make about which funds one invests in. In his lecture, Thaler talked about how life events lead to deviations in personal pension planning from a theoretical norm—best suited to *homo economicus*.

2016 Contract theory within a firm and between organisations

Bengt Holmstrom's began work in Finland visiting outposts of the company he worked for. He found staff worrying about job loss if some new gadget came along. Communication with headquarters were not ideal because of the perception held of the centre by people employed distantly from HQ. Holmstrom's subsequent academic work examined incentives beyond pay, such as job structure, better knowledge of what the employer wants, and rules. Oliver Hart, who shared the prize with Holmstrom, is expert in ideas of incomplete contracts, which arise when contracts are written when all eventualities cannot be anticipated. https://www.lindau-nobel.org/oliver-hart-incomplete-contracts-and-the-theory-of-the-firm/

2015 Measurement for understanding the economics of behaviour, poverty and welfare (in the sense of wellbeing

Nobel Prize Lecture 8.12.2015, Stockholm. https://www.nobelprize.org/prizes/economic-sciences/2015/deaton/lecture/
Imagine the most important scientific paper of a generation is buried unpublished in somebody's drawer and that you well-nigh need to sneak in and copy the paper to get to read what a close group in the know are talking about. In this example, no-one is trying to cheat or steal an advantage, the paper is simply not published. That is the world of economic research which Angus Deaton entered, when, after a short spell on Bank of England's graduate scheme, he returned to Cambridge to take a PhD. Deaton, sole winner of the 2015 Nobel Prize in economic sciences, thinks measurement is crucial. Perhaps because he studied maths and physics before switching to economics. Early in his career, he became concerned some economic models needed measured rather that notional quantities. Often, too, the representative agent in models was one person whose behaviour was assumed to be representative of the economy of a whole, but aggregates, said Deaton, can disguise poverty and inequality. Measurement and the quality of data were a theme throughout the lecture. Conflicts in data lead to fruitless debate, with opposing sides relying on different irreconcilable data sets, and so making no progress. He cited India as an example, because at the time of his lecture national accounting data and household surveys gave different views of consumption. The data problem—at least in 2015—said Deaton is acute in Africa. Later in his career he and collaborators later branched into the economics of development. There is no shortage of well-meaning schemes, said Deaton, but measurement is essential to find out whether they work. His work with colleagues in this area has been characterised as science showing that poverty sucks. Deaton's career is stellar. He studied maths at Cambridge, then switched to economics. He briefly joined the Bank of England via their graduate recruitment scheme after graduation in 1967. He returned to Cambridge for a PhD, then took the chair in econometrics at the University of Bristol before moving to Princeton, where, in 2016, he became an emeritus professor. He has worked with The World Bank and Gallup. His teachers had worked with John Maynard Keynes.

THESE THUMBNAIL SKETCHES WILL BE COMLETED IN ISSUE 3, 2021 OF *SCIENCE, PEOPLE & POLITICS*.

THE 2021 NOBEL PRIZES ARE NOT ANNOUNCED UNTIL THE AUTUMN OF THE YEAR IN WHICH THEY ARE AWARDED

https://www.nobelprize.org/prizes/economic-sciences/ Accessed 2nd May, 2021.

2020	Paul Milgrom (1948- & Robert Wilson (1937-	Auction theory. A practical example would be tendering for contracts to supply renewable energy. See, for example, : https://www.oxfordenergy.org/wpcms/wp-content/uploads/2018/04/Renewable-Auction-Design-in-Theory-and-Practice-Lessons-from-the-Experiences-of-Brazil-and-Mexico-EL-28.pdf
2019	Abhijit Banerjee (1961- & Esther Duflo (1972- & Michael Kremer (1964-	Development economics.
2018	William Nordhaus (1941-) & Paul Romer (1955-	Nordhaus. Climate change and macroeconomics. Romer. Took technological innovation as an input to an economic model he developed, enabling exploration among that and capital, human capital (knowledge) and labour. https://www.nber.org/system/files/working_papers/w3210/w3210.pdf
2017	Richard Thaler (1945- http://www.nasonline.org/member-directory/members/41495.html	Contributions to behavioural economics.
2016	Oliver Hart (1948- & Bengt Holmström & (1949-	Contributions to contract theory.
2015	Angus Deaton (1945-	Analysis of consumption, poverty, and welfare. Deaton's work is measurement and data driven, and his expertise encompasses consumption on many scale. In the second half of his career he has explored development economics. See: (2009) Instruments of development. https://www.nber.org/system/files/working_papers/w14690/w14690.pdf This paper disputes the value of randomised control trials in the evaluation of whether development projects work.
2014	Jean Tirole (1953-	Jean Tirole: Market Power and Regulation. https://www.nobelprize.org/uploads/2018/06/advanced-economicsciences2014.pdf
2013	Eugene Fama (1939- Lars Peter Hansen (1952- Robert Shiller (1946	Empirical analysis of asset prices. https://www.uchicago.edu/features/nobel_awarded_to_fama_and_hansen/
2012	Alvin Roth (1951- & Lloyd Shapley (1923-2016)	Theory of stable allocations and of market design.
2011	Thomas Sargent (1943 & Christopher Sims (1942-	Empirical study of cause and effect in macroeconomics.
2010	Peter Diamond (1940- & Dale Mortensen (1939-2014) & Christopher Pissarides (1948-	Analysis of markets with search friction.
2009	Elinor Ostrom (1933-2012) Oliver Wiiliamson (1932-2020)	Ostrom. Property rights and management. Williamson. Economic governance and boundary of firm. https://www.berkeley.edu/news/media/releases/2009/10/12_nobel.shtml
2008	Paul Krugman (1953-	Analysis of trade patterns and location of economic activity.
2007	Leonid Hurwicz (1917-2008) Eric Maskin (1950- & Roger Myerson (1951-	Hurwicz. Developed math to analyses institutions implementing collective decisions. Maskin. Implementation theory. Optimising equilibria. Myerson. Simplifying search for feasible mechanisms.
2006	Edmund Phelps (1933-	Long- and short-term implications of macroeconomic. Intertemporal trade-offs in economic policy.
2005	Robert Aumann (1930- & & Thomas Schelling (1921-2016) I find the names game and folk theorem unhelpful as names for mathematical analytical tools incorporating assumptions, which is what they are. In the adjacent box I give them their less fanciful names and supply urls with content equally lacking in whimsy.	**Aumann**. Folk Theory. Which could also be called a "general feasibility theorem". See. http://self.gutenberg.org/articles/eng/Folk_theorem_(game_theory) **Schelling**. Game theory is another name for Multi-person decision theory. At this url MIT explains the concepts and presents the math in a nice straightforward way. https://ocw.mit.edu/courses/economics/14-12-economic-applications-of-game-theory-fall-2012/lecture-notes/ The importance of these theorems is application in such matters as oligopolies, cartels, and complex decision making in difficult situations. The general public have a right to know what lies behind these harmless sounding names. HG

THE 2021 NOBEL PRIZES ARE NOT ANNOUNCED UNTIL THE AUTUMN OF THE YEAR IN WHICH THEY ARE AWARDED

https://www.nobelprize.org/prizes/economic-sciences/

2004	Finn Kydland (1943—and Edward Prescott (1940 -	
2003	Robert Engle (1942- Clive Granger (1934-2009)	
2002	Daniel Kahneman (1934- Vernon Smith (1927-	
2001	George Akerlof (1940- Michael Spence (1942- Joseph Stiglitz (1943-	
2000	James Heckman (1944- Daniel McFadden (1937-	
1999	Robert Mundell (1932-	
1998	Amartya Sen (1933-	
1997	Robert Merton (1944- Myton Sholes (1941-	
1996	James Mirrlees (1936- William Vickrey (1914-1996)	
1995	Robert Lucas (1937-	
1994	John Harsanyi (1920-2000), John Nash (1928-2015), Reinhard Selten (1913-2016)	
1993	Robert Fogel (1927-2013) Douglas North (1920-2015)	
1992	Gary Becker (1930-2014)	
1991	Ronald Coase (2010-2013)	
1990	Harry Markowitz (1927- Merton Miller (1923-2000) William Sharpe (1934-	
1989	Trygyve Haavelmo (1911-1999)	

THE 2021 NOBEL PRIZES ARE NOT ANNOUNCED UNTIL THE AUTUMN OF THE YEAR IN WHICH THEY ARE AWARDED
https://www.nobelprize.org/prizes/economic-sciences/

1988	Maurice Allais (1911-2010)	
1987	Robert Solow (1924 -	
1986	James Buchanan (1913-20130	
1985	Franco Modigliani (1918-2003)	
1984	Richard Stone (1913-1991)	
1983	Gerard Debreu (1921-2004)	
1982	George Stigler (1911-1991)	Pioneering work in industrial organisation. He studied industrial structures, the impact of regulations and how markets work. https://www.chicagobooth.edu/research/stigler
1981	James Tobin (1918-2002)	
1980	Lawrence Klein (1920-2013)	
1979	Theodore Schultz (1902-1998) & Sir Arthur Lewis (1915-1991)	
1978	Herbert Simon (1916-2001)	
1977	Bertil Ohlin (1899-1979) & James Meade (1907-1995)	
1976	Milton Friedman (1906-2006)	
1975	Leonid Vitaliyevich Kantorovich (1912-1986) & Tjalling Koopmans (1910-1985)	
1974	Gunnar Myrdal (1898-1987) & Friedrich non Hayek (1899-1992)	
1973	Wassily Leontief (1906-1999)	The title of Wassily Leontief's lecture is "The World Economy". https://www.nobelprize.org/uploads/2018/06/leontief-lecture.pdf Development of input and outputs needed to model the world economy. Interestingly Wassily included pollution.

THE 2021 NOBEL PRIZES ARE NOT ANNOUNCED UNTIL THE AUTUMN OF THE YEAR IN WHICH THEY ARE AWARDED

https://www.nobelprize.org/prizes/economic-sciences/

1972	John Hicks (1904-1989) & Kenneth Arrow (1921-2017)	Prize lecture by Hicks. The mainspring of economic growth. https://www.nobelprize.org/prizes/economic-sciences/1972/hicks/lecture/ Prize lecture by Arrow. General economic equilibrium: purpose, analytic techniques, collective choice. https://www.nobelprize.org/uploads/2018/06/arrow-lecture.pdf The lecture also considers that adjusting initial distribution in a competitive market, rather that altering allocation methods is a better way of reaching a just distribution.
1971	Simon Kuznets (1901-1985)	Developed ways to calculate changes in national income and of assessing uncertainty in qualitative changes from consumption and production.
1970	Paul A Samuelson (1915-2009)	Prize lecture by Samuelson. Maximum principles in analytical economics. https://www.nobelprize.org/uploads/2018/06/samuelson-lecture.pdf Samuelson recalls that Joseph Schumpeter argued that the human brain had evolved to meet the economic problems of the species.
1969	Ragnar Frisch (1895-1973) & Jan Tinbergen (1903-1994)	Econometrics. Prize lecture of Frisch. From Utopian Theory to Practical Applications: The Case of Econometrics It seems Frisch, too, was unconvinced that John Stuart Mill was correct to think the last word had been written in economics about value and price. https://www.nobelprize.org/uploads/2018/06/frisch-lecture-1.pdf Prize lecture of Tinbergen. The use of models: experience and prospects. https://www.nobelprize.org/prizes/economic-sciences/1969/tinbergen/lecture/ It is pleasant to see that Tinbergen cites at the bottom of his lecture “The General Theory of Employment Interest and Money” by J.M.Keynes.

THIS TABLE AND THUMBNAILS OF THE LAUREATES WORK WILL BE COMPLETED IN ISSUE THREE OF *SCIENCE, PEOPLE & POLITIC* S 2021

The double helix by land and water:
A transcendent philosophy for the economics of our time.

H.G. ©