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## Issue no. 106

December 2023

### Special Issue

#### How can we construct an economics consistent with the biophysical limits to economic growth?

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## An Invitation

For over a century **economics** has loosely guided the global economy's national economies. Natural science tells us that the climate crisis has been both caused by the global economy and ultimately threatens its continuing existence. Because that crisis is now in an accelerating phase of visible destruction, the economics profession may be ready to address the question:

### **How can we construct an economics consistent with the biophysical limits to economic growth?**

This is a far bigger question than economists have ever addressed. Like astronomy after Galileo's peek through his telescope, it requires recreating our discipline's foundations. In terms of Economics 101, it is a Chapter 1 problem, rather than Chapter 21. As such, it requires open reconsideration of economics' basic concepts and their relations.

To help get such a discussion seriously started, we on very short notice are putting together a special issue of *Real-World Economics Review* to be published in the second week of December, and then in March as an affordable and well-promoted paperback and Kindle.

It will consist of fifteen or more very short essays (between 2-3000 words) addressing in some way the big question. We are inviting economists of note and a few non-economists to contribute, and based on your work, we think an essay from you could be especially helpful.

The submission deadline is 30 November 2023.

**Please** let us know ASAP if you are or are not accepting our invitation. And thank you for taking the time to consider it.

Edward Fullbrook and Jamie Morgan  
editors

## **Part One:**

## **Partial answers to the question**

# Economics as if ecology mattered

Peter Newell

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Economics is dead/long live eco-nomics!

That neo-classical and conventional economics are not fit for purpose for either understanding the current world nor building a better one, is no longer a controversial statement amid growing calls for real world and post-growth economics (D’Alisa et al 2014). The inability of conventional economics to account for actually existing social and economic life and reification of a structurally dysfunctional organisation of the capitalist system which produces crisis after intersecting crisis, increasingly understood as either the poly crisis or permacrisis, is there for all to see (Lawrence et al 2022).

But is there something to be salvaged from the ruins? Can we have an economics which reflects both fundamental realities about what it is that sustains life on earth (spoiler alert: it’s not economic growth), understands how value is really generated and how wealth is really accumulated and, instead, help to reimagine what an economy would look like if the ecology (and people as Schumacher (1974) said) mattered?

If we can, it would have to acknowledge the following as fundamental points of departure:

## **1. There is no economy which exists apart from the ecologies which sustain it**

All wealth in the end is ecological. Economists contend that growth can continue indefinitely because they measure growth in terms of economic value rather than material throughput (Jackson and Victor 2019). Yet we diminish natural wealth and undervalue its exhaustion at our peril. Even in a highly financialised and service oriented economy, where direct connections to patterns of resource extraction and consumption are sometimes less observable, circulations of finance and the constant manufacture of ‘needs’ through advertising and exchange require resource inputs and lock in unsustainable behaviours. Assuming (often more by implication and neglect than explicitly), as many economists often do, that the environment is an infinite sink for waste and byproducts in pursuit of ever greater levels of production and consumption through market means is both naïve and dangerous (Daly 1996). Assessments of how economies perform, and wealth is generated, now need to start from a basic recognition of our dependence on the natural world and metrics adapted accordingly so that we can measure progress (or the lack of it) in building an economy compatible with life on earth and conserving the stocks and resources that sustain it.

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at the expense of other people's land, labour and well-being and at a high cost to the earth. Poverty and wealth have to be seen relationally as two sides of the same coin. When we are overshooting planetary boundaries that afford a safe and just operating space for humanity, we know we have confused ends and means (Rockström et al 2009). In other words, economic growth's claim to have a monopoly on the means of providing human welfare looks increasingly hollow when it depletes the very sources of that wealth by extracting more than is necessary to meet human needs and directs those resources to the consumption of the rich rather than addressing the poverty of the poor. The preservation of life on earth and the wellbeing of all species on this planet cannot be further imperilled by the project of growth as an end in itself when it is so untethered from its ability to reduce inequalities, improve health and preserve the resources we depend upon for our existence (Hickel 2020).

### **3. Understanding the sources of true wealth**

The wealth of richer nations and dominant classes in the current economy does not result from the neutral expression of consumer preferences, unleashed entrepreneurial spirit (the 'animal spirits' Keynes referred to (1936)), or the laws of supply and demand that are said to underpin today's economics. Rather, the contemporary global capitalist economy concentrates wealth by exploiting some for the benefit of others while passing social and environmental costs onto poorer members of society and future generations. Laws, incentive structures and institutions enable this transfer of public to private wealth and intergenerational discounting to occur without regard for the consequences and force invoked where contestation of this maldistribution and dispossession occurs (Dunlap and Brock 2022), as we can see from the atlas of environmental conflicts around the world.<sup>5</sup>

Whereas economists refer to social and environmental costs either as externalities (Pigou 1932) or the necessary price to pay for adjusting to the 'realities' of the market, they are in fact intrinsic to the process of wealth creation in an unsustainable economy which rewards such anti-social and anti-ecological behaviour. Ecological economics has gone some way to making these processes of uneven exchange and extractivism more transparent and visible (Hornberg 1998). But an economics fit for the crisis we now face, must help us to build economies not premised on these principles and where common wealth is the goal and the wealth of the commons is what has to be measured, not the accumulation of wealth by states and individuals in isolation from the societies and ecological systems in which they exist and which sustain them.

### **4. Economists 'invisibilise' the way in which most wealth is created**

Beyond misreading the mechanisms by which wealth is actually generated in the real economy, we also need to recognise the gendered and ecological labour and care economies which underpin and make possible what conventional economists think of as the economy. As we know from feminist scholars and activists (Bauhardt & Harcourt 2018), most of the care and work that underpins the formal economy does not even appear in conventional models of accounting for work, wealth and the real social protection which hugely subsidises the process of private wealth creation. In the UK alone, the economic value of unpaid care in England and Wales in 2021 was estimated to be £162 billion or £445 million per day,<sup>6</sup> while a report for the Argentina government found that unpaid care and domestic work

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<sup>5</sup> <http://www.ejolt.org/>

<sup>6</sup> <https://www.carersuk.org/press-releases/unpaid-care-in-england-and-wales-valued-at-445-million-per-day/#:~:text=The%20economic%20value%20of%20unpaid,they%20were%2010%20years%20ago.>

amounted to 15.9% of the country's GDP, representing the largest sector in the entire economy, followed by industry (13.2%) and commerce (13%) (Ministry of Economy 2021).

This is not news. As Marx wrote in *Capital* 'the original sources of all wealth' are ultimately 'the soil and the labourer' (1974: 475). In a globalised economy, the exploitation of both is less visible and organised across time and space along complex supply chains and hidden behind constructed public/private divides. But it constitutes nevertheless the actually existing way in which wealth is accumulated and growth made possible. Because it distances and renders invisible both the modes of labour and resource extraction and the social and environmental costs associated with it, conventional metrics, models and modes of accounting mis-apportion credit, wealth and profit and so reproduce and legitimate extractive modes of exchange. As Patel and Moore (2018) show, what appears to be cheap, whether nature or labour, is anything but. It is just that the costs are hidden and ignored or paid for by people that conventional models ignore. The fact they are kept out of sight and mind in conventional economics greatly impoverishes our understanding of the world and how it can be changed.

## **5. Inequalities between countries are not a function of superior competitive strategies**

They are not, as often assumed, a function of the laws of comparative advantage (Ricardo 2015 [1817]) and successful progression through the stages of development (Rostow 1960). They have rather been created, built, ossified and locked-in through centuries of colonial exploitation and looting (Bhambra 2021; Rodney 2018) followed by a seemingly more benign approach to controlling and extracting resources from the periphery to the core of the economy enabled by uneven trade rules in a globalising economy, overseen by multilateral economic institutions (such as the IMF and World Bank), and enforced through international economic law (Newell 2012). Extractivist models of development today are further fuelled by the crushing levels of debt many poorer countries have to pay off which lock them into unsustainable resource pathways and who are further punished by credit rating agencies that will downgrade economies diverting from economic orthodoxy (Barta and Johnstone 2018). According to UNCTAD, more than half of the LDC population live in countries that devote more resources to debt servicing than to finance health or education.<sup>7</sup> It is clear then that, contrary to the aspiration of economists that a rising tide lifts all boats and the assumptions of trickle-down economics, development and underdevelopment are relational.

Overall, what this means in practice is that models, metrics, theories, values and practice have to change.

Competitive zero-sum models of understanding who gains and who loses from economic exchange are irrelevant if they do not account for whether they are depleting or restoring natural systems upon which we depend for our collective survival. As Ekins (1986: 7) suggests: 'A large proportion of the outcome of the production process expressed each year in GNP does not represent any benefit to the quality of life and of the environment'. As the 'new economics' tradition has long emphasised, measures of GDP need to be abandoned in favour of some combination of the many alternatives now available (including the Happy Planet Index and Gross National Happiness) that centre planetary health and well-being as the thing to assess and expand as an overarching social goal (NEF 2016), 'rooted in the recognition that human life and economic activity are an interdependent part of the wider ecological process that sustain life on earth and will either operate sustainably within those parameters or bring about their own demise' (Ekins 1986: 132). Though not going far enough for some (Spash 2020, 2021), the 'doughnut economics' of Kate Raworth (2017) provides a promising, near-term and

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<sup>7</sup> UNCTAD, A World of debt: Africa, <https://unctad.org/publication/world-of-debt/regional-stories>



concrete way to build an economics fit for the twenty-first century by focussing on reconciling the meeting of human needs within planetary boundaries that is being put into practice by cities such as Amsterdam as part of a doughnut economics action lab.<sup>8</sup>

A new approach to eco-nomics implies abandoning fictional abstract modelling and rather takes a close look at life, an approach more akin to the ecologist in the field than a scientist in the lab. What is really happening? How do different life support systems (human and more than human) work together to sustain one another through cooperation and mutual aid? How can we strengthen and reinforce the bonds of reciprocity which make life possible? How can circuits of production, trade and exchange be less wasteful, more efficient and more benign in their impacts and the wealth they generate better distributed in ways which improve well-being and reduce inequalities? These should be among the guiding questions of a rejuvenated economics fit for the world we now live in, far removed from that which informed the theories of Smith, Keynes, Ricardo or even Marx.

Removing blinkers and taking sides at a key moment in history will be uncomfortable for many. I also realise this sounds utopian – and it is. But the Cambridge economist Joan Robinson's famous comment that 'The misery of being exploited by capitalists is nothing compared to the misery of not being exploited at all' no longer applies (if it ever did) (Robinson 1964: 46). Everyone on the planet deserves dignity and the right to an existence which is not systematically denied by the ideology, institutions and practice of a destructive economy which extracts and reallocates wealth in such unequal ways. Recognising this can be the starting point for a very different way of doing economics.

## **Final words**

As a species we are not yet done. It is my firm belief that we are better than this, and the current socially depleting, ecologically suicidal economic system is not the ultimate in human ingenuity and nor have we reached the 'end of history' in terms of models of organising economies and politics. In fact, history provides many examples of rapid and progressive change that occurs faster than we thought possible (Newell and Simms 2021) and alternatives grounded in these principles already exist around the world aimed at building new pathways to prosperity (Simms 2013; Jackson 2021). It is time to fire up our collective imaginations and bring these into being.

Solidarity and repair economies, cooperatives and sustainable economies abound if we take the time to see them and learn from them. Indeed, it is the ideology of growth and enclosure that has stripped many communities of their means of subsistence from land and forests and it is privatization of key public services that has denied them access to water and energy, for example (Balanyá et al 2005). Challenging growth and its life-destroying approach to value by defending rights will help pave the way for re-commoning: bringing back into the public realm the resources and services needed to sustain life. This is happening. Between 2000 and 2015, there were 235 cases of water 'remunicipalisation' – the process by which a city, region or national government terminates or refuses to renew water concessions, leases or management contracts with private companies, in order to bring water back under public control. As a result of this rapidly spreading trend of re-municipalisation, 100 million people across 37 countries now benefit from water as a public good rather than as a private commodity (RTA 2019). Indigenous and non-western cosmologies suggest very different ways of reconceptualising and valuing our relationship with the more than human world and innovations to afford legal status to rivers and other ecosystems suggest one way of seeking to defend them from the ravages of the market. For

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<sup>8</sup> <https://doughnuteconomics.org/stories/1>

example, in February 2019 voters in Toledo, Ohio in the US approved a ballot to give Lake Erie rights normally associated with a person to protect it from further high levels of pollution, while in 2017 the New Zealand government passed legislation recognizing the Whanganui River as holding rights and responsibilities equivalent to a person. Those acting on behalf of the river will now be able to sue for its own protection under the law.<sup>9</sup> These approaches are not without their own challenges but they point to the possibility of change and that ground can be reclaimed from powerful actors driving ecological collapse. As ecologists frequently remind us, no condition is permanent.

This is a critical moment for economics as a discipline, worldview and ideology to reflect on what is at stake, consider the role of the discipline (alongside many others) in bringing us to the critical condition we are in today by providing students, publics and policymakers with models and justifications of policies that have wrought havoc on the planet. But, having done so, to then repurpose the latent skills and talents of the discipline for methodological and theoretical innovation and harness them to the goal of building an economics as if ecology and people mattered. Though as Keynes said, 'In the long run we are all dead', before that happens there is time to help nurture an economics for the common good that can sustain a liveable planet for those we leave behind. We have nothing to lose, but a world to gain.

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<sup>9</sup> <https://rapidtransition.org/stories/the-rise-of-the-rights-of-nature/>

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# An economic theory compatible with life processes and physical laws<sup>1</sup>

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An economic theory that is consistent with life processes and physical laws is necessary for a simple reason: the economic theory that underlies modern “mainstream” economics and practically all textbook teaching in economics is *not* consistent with life processes and physical laws. And this is a problem.

Human beings are living organisms. All human activities, including mental activities, are consistent with physical laws. It is natural to build an economic theory on the foundation of biology and physics. In my forthcoming book with Jing Chen, *Entropy Economics*, we undertake this task, for two foundational elements of economics: the theories of value and production.

Modern mainstream economics is a theory of balance, or equilibrium. The basic terms of reference are the concepts of supply and demand, which interact in a market and come to rest at certain prices and quantities. There are a thousand different ways in which this process may be disturbed, by “imperfections” and “shocks.” But at the heart of the matter lie the concepts of balance and equilibrium – the immanent order toward which a market system is supposed to tend. This immanent order is sometimes called a “steady state.” This is a very comforting idea, compatible with such notions as the “end of history” and the triumph of market capitalism over competing social systems.

In real life, there is no such thing. In real life, time moves from the past, through the present, to the future, in an unceasing process of change. The changes take many forms, including birth, growth, decline, death, and the rise and fall of societies and civilizations. All of them occur under the influence of physical and biological laws, including especially the second law of thermodynamics and the laws of biological evolution. In our view, economics should adhere to the same broad principles. It should not rest on the illusion of an underlying steady state.

In modern mainstream economics, there are two separate and distinct institutions or arenas for action. One is the market; the other is the government. These two arenas have separate functions: the market allocates resources according to the preferences of households and business firms; the government enforces contracts and property rights and provides security and protection. Apart from that, government economic activity is described as “intervention” in the market, which is sometimes justified, but often not.

In real life, there are no markets (of any consequence) without governments to regulate them. Regulation creates the conditions under which complex economic activities can occur, and it sets the

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<sup>1</sup> Adapted from the preface to *Entropy Economics* by James Galbraith and Jing Chen, forthcoming from Chicago University Press. The book will contain a full exposition of the theories and supporting mathematics.

terms and limits of economic competition. Regulation has the same function in economics that it does in every mechanical and biological system: it keeps (or tries to keep) the flow of resources within the capacity of the system to handle it safely and sustainably. When regulation fails, markets crumble – or to use the apt metaphor, they “melt down.”

The theories of value and production are the foundations of economic theory. Both should be consistent with life processes and physical laws.

From physics, entropy flow is the fundamental driving force of the universe. It is natural to imagine that entropy somehow forms the basis of economic value. (Georgescu-Roegen, 1971). And indeed, an entropy theory of value is a scarcity theory, very familiar in the history of economic thought. Value is a function of scarcity, which is, in part, a matter of product availability relative to market size. It is also, in part, a function of number of producers or service providers. This too is very familiar in the history of economic thought. In practice, the most important method to enhance valuation is to reduce the number of providers, creating monopoly or oligopoly.

Governments enjoy many forms of monopoly, including over legalized violence, judicial punishments, and taxation. Governments grant monopolies, through patents, intellectual property rights, regulation, and industry standards. Businesses seek monopoly, through technological innovation and market dominance, sometime legal and sometimes not. Unions seek monopolies in bargaining – also called countervailing power – to help workers enjoy some of the fruits of their employers’ monopoly power<sup>2</sup>. The phenomenon extends beyond economics: monotheistic religions hold monopolies to reach heaven, giving them power to prescribe codes of conduct.

Once acquired, monopoly power is naturally guarded. The ruling class generally adopts the policy of “divide and rule”. From its point of view, monopoly power is something *not* to be shared. The ruling class therefore often divides the ruled by race, ethnicity, religion, culture, and other criteria, and encourages small groups to define themselves as distinctive and separate from their fellow-citizens. Similarly, businesses often prefer to stratify their employees by credentials and occupational categories and to negotiate with them (if at all) one-on-one rather than face an organized union. This division lowers the value of voters in a democracy and the power of workers in a contract dispute -- making them easier to rule. Monopoly is for the powerful; competition is for the weak.

If a sub-group grows too large or too strong, so that it threatens the monopoly position of the ruling class, one solution is to split it up into smaller entities, at war with each other. Another solution is to suppress the upstart group altogether. This pattern plays out often on the world stage, and at every scale in the organization of human affairs, from the family to the nation-state. A realistic theory of value should take account of how value is created and maintained through the exercise of monopoly power.

For most goods, therefore, economic valuation depends both on the abundance or rarity of the product (in relation to the market) *and* on the number of suppliers with the ability to produce and access to the market. However, the role of monopoly is modified, in most societies, by social decisions – regulations – that govern economic conduct, including the prices of most types of human labor and the rate of interest. Monopoly power at the level of the business or oligarch is rarely absolute; it would not be tolerable if it were. Or to put the matter in evolutionary terms, societies that do not limit monopoly power are generally unstable and do not last for very long.

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<sup>2</sup> These phenomena were analyzed in Galbraith (1952), Galbraith *files* (1998), and by Ahmari (2023).



A key regulatory function is control of inequality: inequality is necessary, but it is dangerous if becomes too great. Economic inequality motivates activity: economic agents compare themselves to others and strive to improve their position – to make more money, to grow their wealth. Without this incentive, human societies would be much harder to organize and sustain. But too much inequality is like an overheated engine or a person with rising blood pressure. It is a sign of discontent, of trouble ahead, and a warning of potential breakdown.

Mathematically, the entropy theory of value is very simple. It is given by a logarithm function, in which the argument is a measure of market scarcity, and the base is given by the number of suppliers. Some may call this superficial. But such a simple theory can describe the value of monopoly and oligopoly, among the most important phenomena in the economic and social world. It can also help us understand the integration of markets and regulation that is an indispensable feature of all organized economic life. These are qualities the prevailing mainstream theory does not have.

Value applies to goods and services that are produced. Economic activities are mostly about the production of goods and services. Consumption may be the ultimate goal of economic activity, but without production there is nothing to consume. For production to occur, economic decision-makers, such as business firms and governments, must make the decisions to produce. A production theory should explain those decisions.

Conventional economics, such as you find in textbooks, usually doesn't start with production. It usually starts with exchange, with trade. The goods to be exchanged already exist. Where did they come from? Who created them? Why and how? This is usually left to a later chapter. And when production makes an appearance, the theory describing it usually looks a lot like the exchange theory. The difference is that instead of a consumer choosing between eggs and butter, the theory now describes a firm choosing various combinations of labor and capital.

Currently, in theoretical economics, production theory is mainly built around the concept of a production function. In the theory represented by these functions, there is no *decision* to produce. The decision is assumed; production always occurs to the maximum feasible extent; resources (including labor) are not left unemployed. At both the micro- and the macroeconomic levels, the production function is a parable of cooperation between capital and labor in the production of goods and services. It also provides the basis of a theory of wages and profits, relating each to the contribution they make to total output. Production functions thus work to rationalize and therefore to justify market processes and market distributions. They associate the high incomes of some people with their productivity, which is very comforting to those people.

In real life, production comes before exchange. Production is the concentration of resources into finished products. Exchange is the diffusion of those products to those who use them up. For production, regulation is generally essential, though it is often unpopular with those experiencing it. For exchange, regulation is somewhat less essential – though it is often desired to ensure that the process of exchange is fair to all parties. Production therefore happens in organizations; exchange generally happens in markets. A production theory is a theory of the role of organization in economic life.

A production theory based on biophysical principles bears a close resemblance to the production issues faced by actual businesses (and other economic decisionmakers, including households and government planners) in the real world. It should cover the major factors affecting such decisions, including fixed cost, variable cost, duration of production, discount rate, expected return, uncertainty, and, of course, the final output of goods or services. It should spell out with precision the relationships

between these factors. If so, it can provide a realistic understanding of economic (as well as social and biological) phenomena, when compared with the mainstream or neoclassical theory of production.

A biophysical theory of economic production has (as the name suggests) many parallels with life processes. Indeed, economic systems can be understood as extensions of our understanding of life processes, and the physical realities that underpin them. Here, a key fact is that all activity – physical, biological, economic – requires access to and the use of resources. But despite the obvious importance of physical resources, mainstream social theories, including economic theories, often pay little attention to them. Indeed, our standard measures of economic activity, the national income accounting which underpins our concept of Gross Domestic Product, treats all market-based activities as equivalent in dollar terms. And according to that accounting, industries like mining, energy production and agriculture are just a small part of our economic activities -- practically negligible, in value terms.

Why is that? Perhaps it has something to do with the way people who design theories like to look at the world – and at their own place in the world.

Long ago, George Orwell asked a similar question about coal and physical work. In his 1937 book, *The Road to Wigan Pier*, he concluded,

Practically everything we do, from eating an ice to crossing the Atlantic, and from baking a loaf to writing a novel, involves the use of coal, directly or indirectly. ... But most of the time, of course, we should prefer to forget that they were doing it. It is so with all types of manual work; it keeps us alive, and we are oblivious of its existence.

It is only because miners sweat their guts out that superior persons can remain superior. ... all of us really owe the comparative decency of our lives to poor drudges underground, blackened to the eyes, with their throats full of coal dust, driving their shovels forward with arms and belly muscles of steel. (Orwell 1937, 31)

If we acknowledge the essential role of (let's say) coal (or oil, or gas, or water power) in our life, we can no longer ignore the harsh life of essential workers, the coal miners and farmers and other frontline workers, who bring basic resources and food to our homes. But if we recognize them for the essential role that they play and improve their working conditions and pay, many of the rest of us will no more afford as many of the luxuries of modern life that we now enjoy. It was convenient for superior persons to ignore the essential role of coal in the past, and it remains convenient to ignore that of many other essential workers today.

A biophysical theory of value explains the very small weight of natural resources in our measures of economic activity – they are ubiquitous and essential, but they are abundant and cheap. More accurately, they have been abundant and cheap until now. But this has not always been the case, and several centuries of resource abundance may be coming to an end soon. What then? Conventional mainstream theories are not worried; they assume that new resources can be substituted for the old ones, that technologies will adjust, and life will continue as it has. At the very worst, in mainstream theory, the producers of key resources will become wealthier, and others will be less wealthy, as part of the ordinary process of market adjustment.

A biophysical theory undermines this optimistic view. It draws a critical distinction between fixed and variable costs. Fixed costs, set by past investment, determine and limit the options for current, viable production. Variable costs are governed, to a large extent, by the cost and quality of resources. If



those costs rise, or resource quality declines, then a given production technology can become unprofitable, and production using that technology will decline or cease. Indeed, fixed cost is a kind of leverage in the production process. The more reliant production is on large prior fixed investments, the less flexibility there is, and the more vulnerable are production decisions to increases in the cost of resources.

A socially-approved theory provides much needed illusion. Truth, or dis-illusion, will get people disillusioned. That is why most mainstream social theories are built on illusion. Formerly, approved social theories were mostly based on the favor of gods. These are religions. With the increasing power and prestige of science, many social theories began to call themselves scientific, such as scientific socialism. Later, social theories became “social sciences”. But this does not mean the purpose of social sciences is to seek truth or to dispel illusions.

In an age of social conformity and the dominance of mainstream economic ideas, ideas that are politically and socially correct will tend to dominate a society. This is convenient for those who profit from the prevailing climate. But – as a biophysical principle -- maintaining a state of untruth is costly. If the lies, illusions, and misconceptions become too obvious, people will resist them. In that case, it will take a greater and greater effort to brainwash, harass, and even persecute the resisting public. Anyone who has ever taught introductory mainstream economics – or ever taken such a class – has seen this phenomenon in miniature.

If the burden of enforcing a false vision on a society grows too great, the public will tend, at best, to tune out – even to rebel. This is a potent danger to the survival of society itself. To take an easy example from the “other side” of the world, the decline and fall of the Soviet Union can be attributed, in part, to the fact that no-one could any longer believe in the promises of the Soviet Communist Party. This is a lesson that should be applied generally – including to our own social system.

For this reason, seemingly esoteric matters of economic theory can take on a larger importance. We must choose between accepting a viewpoint that is socially convenient but unreal and useless, or attempting to rethink premises and to draw realistic – if sometimes harsh -- conclusions. The first course is much easier, but in the long run, much more dangerous. And there is always the risk, since societies do compete in the world, that if our own does not embrace reality, some other society, with more courage and determination and clearer minds, may beat us to it.

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# Supporting well-being over time: Six kinds of capital required in a healthy economy

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It is recognized by many that, for humanity to emerge from the current mess of crises with a possibility of good lives in the future, the existing global economic system will need to change substantially. Many people are working to lay out visions for what such change might look like. In addition to a vision of the whole – a “new narrative” – we need new words and concepts to help us understand what is wrong with the current system, and to guide us in seeking change for the better. The purpose of this paper is to explore some concepts that may help to frame a vision of a healthy economy.

I will start with a brief definition of what economics is, as a discipline, and what it is supposed to be doing. I will then go onto the more complex questions of what an economy is, as a system, and what it is supposed to be doing. This necessarily includes a focus on goals. Section 3 will describe six kinds of capital resources that must be mobilized to keep an economy moving toward the well-being goals I have defined. Finally, I will discuss how economists can use the concepts of systems capital and meta-externalities to argue for reforming the economy to address the critical issues of the 21<sup>st</sup> century.

## 1. What is economics? What is the economy?

Economics is the study of the economy. Its purpose is to help people to understand what the economy is and how it works, in order that human efforts to steer or alter the economy in which they live will produce the desired results. (Note that “desired results” doesn’t say anything about desired by whom – the absence of such a clarification is one of the great flaws of neoclassical economics. Here that question will be addressed in the definition of the goal of the economy.)

An economy is a system of social organization. It may operate at a variety of scales, from local to global. An anthropologist looking at any grouping of people (whether a small forest-dwelling tribe, a family, a city, or a nation) can identify the economy – the system – within which that group carries out the four principal types of economic activity. These are the **production**, **distribution**, and **consumption** of goods and services, as well as systems for **maintaining resources** used for these activities.

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<sup>1</sup> <https://www.bu.edu/eci/>

In the 20<sup>th</sup> century, in capitalist economies, the first three of these activities were described as what markets do, and therefore assumed to cover the whole economy<sup>2</sup>. Such analyses gave insufficient attention to the importance of resource maintenance and even less attention to non-market activity. In fact, much of what is essential to human life and flourishing inevitably occurs with little or no monetary exchange. Thus it is important to understand that the market, or **business sphere** is only one part of any economy. The other major parts are the **core sphere**, where people in households and communities care for one another, especially for children and the infirm; and the **public purpose sphere**, where governments and not-for-profit organizations pursue, or are supposed to pursue, the common good.

Although an economy may come into being without anyone having full understanding of what is being created, it is a human construct. Rarely can a single person within an economic system have full control over how that economy functions, but neither are there immutable, abstract laws embedded within an economy, regardless of the social and the ecological contexts in which it occurs. Human psychology, along with the customs and mores of the society provides some parameters that make some economic behaviors more or less likely, but this is only part of the outline of what is possible, as well as what is desirable. Other critically important parameters are provided by the natural world, which puts limits on economic possibilities: water cannot be made to flow naturally uphill; given too much accumulation of greenhouse gasses in the atmosphere, over time every human economy will need to adjust to an increasingly unstable climate. Within these parameters, of **ecology, human nature, and social history and culture**, the economy emerges out of decisions made by the people within it. This emergence may be purely unconscious. It may also respond to what the human participants believe the goals of the economy should be.

## 2. What is (or should be) the purpose of an economy?

If we were to observe any economic system from a distance – imagining, for example, that we are anthropologists from another planet – we could probably describe what appear to be its goals, or desired results. Such anthropologists, looking at the impacts of the US economy, might conclude that its goal has been to deplete the fertility of the country's soil, the availability of its groundwater, and the diversity of plant and animal species within its borders and in the rest of the world.

No one has proposed these as the goals of our economic system; nor have they proposed a goal of increasing economic inequality, or of feelings of antagonism among various factions within the nation. It may in fact be difficult to find generally accepted goal statements that are closely related to the actual results. Standard economics textbooks in the US may say that the goal of the economy is to maximize utility, but they quickly go on to say that since utility can't be measured, consumption will be used as the proxy for utility; therefor the goal of the economy is to maximize consumption. Implicitly, since the quality of consumption also is difficult to measure, what is being maximized is the quantity of consumption. Given one more translation, this means maximizing the quantity of goods and services produced – with quantity defined in terms of the money value of that output. Indeed, our extraterrestrial anthropologist might agree that the results suggest that another goal of the US economy is to maximize the money value of goods and services produced.

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<sup>2</sup> This fourth activity was introduced to the series of "In Context" texts (E.g. *Principles of Economics in Context*. See <https://www.bu.edu/eci/education-materials/textbooks/>) by one of my co-authors, noted feminist economist, Julie Nelson.

Is this a desirable goal for an economy?

If we recognize that the ecological and social crises overtaking humanity in the 21<sup>st</sup> century are closely related to economic systems that overtly focus on human beings in their role as consumers of goods and services produced through markets, how can we define the goals of a better economy? One reasonable proposal is that the goal of the economy should be to satisfy the basic needs of present and future generations of people, within the ecological planetary boundaries, and aligned with essential human ethics and values. It remains to be seen whether the global human productive capacity can do better than provide for basic human needs, when we are finally forced by nature – or, more optimistically, when good sense and a survival instinct prevail on modern societies – to restrict ourselves to ecological limits.

As a writer of economics textbooks I have gone out on an optimistic limb and used the term *well-being* to summarize reasonable economic goals that include but go beyond simple survival needs. I have stressed the dimension of time: we are not only interested in well-being for ourselves, at this instant in time, but also for our future selves, and for our descendants and other people in the future. Here is where it is necessary to emphasize the fourth critical economic activity, of maintaining the resources that are needed to carry out the other economic activities of production, distribution and consumption. In fact, Part 3 of this paper will delve more deeply into the question: what are the resources we need to maintain in order to preserve a healthy economy?

In addition to basic needs, people almost universally also seek things that they feel make life worth living. Within the ways to make human life possible and worth living there are some general goals that are widely accepted as desirable. Table 1.1, based on recent editions of the “In Context” texts (see footnote 1), offers one possible list of the final goals<sup>3</sup> of economic activity, summarizing the reflection of a number of thinkers, but not attempting to represent a full consensus. I believe it is worthwhile to spell out these components rather than simply falling back on a catchall term such as “well-being,” so that discussions of the purpose of the economy, and of economics, can rise above abstractions.

How does this discussion of goals answer the question raised in the first paragraph of section 1, above: Who are the people whose desires should be reflected in the efforts of economics, as a science, to steer the economy? It is not hard to make a case that the present result, of maximizing the money value of goods and services produced, reflects quite well the desire (for profit) that motivates the holders of financial and produced capital. The money that is earned through such maximizing enables the holders of capital to achieve some of the goals listed in the table below, but many of the goals imply a harmonious, well-working society, and some (e.g., goals 6 and 10) are in direct opposition to the kind of society that results from economic pursuit of profit as an overriding goal. The answer to the question – whose desires should be reflected in the organization of an economy – is, evidently: everyone.

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<sup>3</sup> Final goals are here distinguished from intermediate goals. For example, the possession of wealth is a common goal, but it is often understood to be a means toward almost any of the final goals listed in Table 1.

**Table 1. A Potential List of Final Goals**

1.	Satisfaction of basic physical needs, including nutrition and care adequate for survival, growth and health, as well as a comfortable living environment.
2.	Security: assurance that one's basic needs will continue to be met throughout all stages of life, as well as security against aggression or unjust persecution.
3.	Happiness: adequate opportunity to experience, reasonably often, feelings of contentment, pleasure, enjoyment and peace of mind.
4.	Opportunity to realize one's potential, including one's physical, intellectual, social, and spiritual potential.
5.	A sense of meaning: a purpose to one's life – a reason or purpose for one's activities.
6.	Fairness in the distribution of life possibilities, and fair and equal treatment by others and within social institutions.
7.	Freedom: the ability to make personal decisions while not infringing on the freedom of others.
8.	Participation: opportunity to participate in the processes in which decisions are made that affect oneself and the members of ones society.
9.	Good social relations: having satisfying, mutually respectful relations with friends, family, fellow citizens, and business associates, as well as peaceful relations among larger groups (such as nations).
10.	Ecological balance: protecting natural resources, and, where necessary, restoring them to a healthy state.

### **3. What does it take to move towards the goals of a healthy economy?**

A healthy economy is one that operates so as to achieve its goals, with relatively little of the overall economic activity working against them. There are obviously a great many things that can be said about what it takes to achieve this; here I will only address one set of requirements. This refers to the fourth essential economic activity mentioned above: maintaining the resources required for the other activities of production, distribution, and consumption of goods and services.

This context brings into focus the capital stocks that produce productive flows. For something to be named, within the discipline of economics, a capital stock, it must have the potential to produce something that is economically desirable. Some people reasonably object to the use of terms that describe nature, human beings, or social groups in terms of their potential to produce something economically desirable. The fear is that when we speak of natural capital or human capital, we might

imply that nature, and human beings, are important *only* as productive resources. It is important to emphasize that these terms refer to much more limited subsets of the broader concepts with which they are linked.

With these cautions in mind, I will describe here the five kinds of capital that have become familiar, along with a sixth (systems capital) that is becoming increasingly essential in a world where the dominant economic system is destroying so much of its capital stocks.

- *Financial capital* is what people often think of first when we speak of “capital”; this is money, of various kinds. It facilitates economic production, but it is not itself productive until it is converted, via social systems of law and/or power, to the ownership or control of physical capital, both natural and produced.
- *Produced capital* consists of physical assets generated by applying human productive activities to natural capital. Produced capital may be understood as including embedded technologies; it is convenient to divide these into two types, *ii* or *mm* – *information-intensive* or *mostly material* technologies.<sup>4</sup> Given the deterioration in the global stock of natural capital (atmosphere, water, soil, species of plants and animals, etc.), information intensive technologies offer the hope of carrying on economic and other activities with less damaging effects on natural capital. Such technologies can be embodied in physical capital, as with a computer driven electrical system that uses only the amount of energy needed; or they can be disembodied, consisting of shared understandings and procedures for how to accomplish a task with minimum resource use.
- *Natural capital* is made up of the resources and ecosystem services of the natural world. Along with the expanding disasters of climate chaos, humanity faces critical challenges in the loss or severe damage of much natural capital.

The remaining three items on this list all have to do with how people, as individuals and in groups, accomplish valuable work. “Valuable work” may have obvious economic significance, such as building a business, or educating children, or organizing a system of voting; or it may be actions that people value, regardless of their economic significance, such as learning how to paint with watercolors, or organizing an amateur basketball competition, or winning a war.

- *Human capital* refers to the productive capacities of individuals, both inherited and acquired through education and training. They might include particular knowledge, learned skills, or in-born qualities, such as empathy, or the ability to do mathematics in your head. How could you become better at doing what you want to do – would this require taking lessons, or watching someone who is especially adept, or undertaking a course of therapy that would free you from some inhibition that was due to early life trauma? Any of these things might build your human capital. This is not intended to imply that human beings, and their capabilities, are of value only when they are used for economically valuable production. Rather the intention is to emphasize that things we value for other reasons may also be essential for the economic goals of surviving and thriving.
- *Social capital* consists of the stock of trust, mutual understanding, shared values and socially (as distinct from individually) held knowledge in a society or a social group. Our ability to

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<sup>4</sup> I first introduced these terms in Goodwin, Neva R., “Lessons for the World from US Agriculture: Unbundling Technology” in *World Development*, January, 1991 Vol. 19 no. 1.



purchase something in a deli depends on mutually held trust that both the money and the sandwich will change hands, regardless of which is handed over first. An especially nice piece of social capital is seen when two lanes of traffic converge and the drivers take turns joining the merged line. (I have never known why this pattern endures in some places, and not in others.) Recognition of the idea and the importance of social capital by economists is fairly recent, becoming prominent through Robert Putnam's work,<sup>5</sup> and has been strengthened by the observation that variations in social capital across societies, such as tolerance for corruption, can help to explain some of the differences in their economic development.

- *Systems capital* refers to the qualities and relationships of economic actors within structured groups that allow these groups to work together for shared goals. It builds on the same stocks as social capital – trust, mutual understanding, shared values and socially held knowledge; however these stocks must not only be shared among individuals but also must be embedded and nurtured in organizations or political systems. If social capital supplies the notion that cooperation is worthwhile, systems capital is the ability of groups to cooperate and coordinate with other groups for the common good. The example I gave in a paper in which I introduced the concept of systems capital<sup>6</sup> was industrial ecology, which attempts to put producers (and to some extent consumers) into relationships (e.g., through physical proximity) that will allow economic systems to imitate ecological systems. Another example of systems capital would be the willingness of all, or most, sectors to work together to stave off the worst of climate change – and the ability of governments to ensure such cooperation.

*Individual human capital, social capital, and systems capital* – these three together refer to bundles of characteristics of people, individually, in communities, and in social or economic systems, that make it possible to provide for essential human needs and foster human well-being. Systems capital emphasizes goals not only for individuals, but for the common good. It is noteworthy that the core economy, of homes and communities, and the public purpose economy, of governments and not-for-profit organizations, are heavily involved in the creation and maintenance of these three types of capital. The business economy is much less involved in their creation – indeed, the only kinds of capital that it normally creates are financial and produced capital. But all three economies suffer when these capital stocks are degraded.

The relationship between systems capital, the newest member of this group, and social and human capital, deserves a little more teasing out. As one example, the ballooning of the financial sector, increasingly divorced from actual production of actual goods and services, is closely related to the increase of inequality that has been so well described by Thomas Piketty<sup>7</sup>. When inequality creates circumstances of extreme deprivation for some members of a society it degrades human capital; to the extent that it is viewed as unfair, it makes it harder to mobilize or defend systems capital, which requires a belief in a common purpose for all together in an economy.

I will elaborate more on another example, from agriculture. Some farming communities possess traditions that tell all farmers, in general terms, what to do to prevent soil exhaustion. One such tradition, found in both ancient and modern farming communities, is the idea of crop rotation. If a farmer continually plants the same kind of crop in the same field, over time the fertility of that soil is likely to

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<sup>5</sup> Starting in 1993 with Putnam, Robert D., et al. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, N.J.: Princeton University Press.

<sup>6</sup> See "[Consumerism and the denial of values in economics](#)". 2021, World Economics Association.

<sup>7</sup> Thomas Piketty, 2014, *Capital in the Twenty-First Century*, Harvard University Press



diminish. Rotating complementary crops – for example, alternating legumes with nitrogen-depleting crops – can significantly increase output. This can be achieved with no additional input except the immaterial input of knowledge. Why, then, was the practice widely ignored during the early period of modern industrial agriculture, and why is it being rediscovered today? An understanding of the ecology behind the efficacy of crop rotation could be thought of as a part of the *human capital* of the farmers who employ such practices. When the practice rests less on individual knowledge, and more on a set of community beliefs, these might be thought of as *social capital*. But in the United States the belief system in question went beyond mental constructs – it emerged as a part of a political/economic system, entwined with the *systems capital* of how business operates.

In 1914 Congress created the agricultural extension system which “helped make possible the American agricultural revolution.”<sup>8</sup> As the businesses that produce and distribute food, seeds, and agricultural machinery and chemicals, morphed into huge monopolistic corporations, the prevailing understanding of “good farming practices” was distorted toward the benefit of major commercial interests, through networks of relationships and flows of money (e.g., research and other grants to the colleges responsible for training the extension agents). The education provided to farmers increasingly ignored older traditions of preserving healthy soil and water, as it worked to maximize sales and profits for these corporations, regardless of the impacts on farm workers or consumers.<sup>9</sup>

The *systems capital* in the original US agricultural extension system included such *human capital* elements as educated intelligence and knowledge. It built on the *social capital* of trust and shared understanding that allows people to accept educational leadership. It also began with a vision of a *social goal* – all the immediate and future benefits of “good farming practices” – that is larger than individual or firm success. That social vision is what was degraded and corrupted as the profit motive of the business sphere of the economy overtook the common good goals of the public purpose sphere, both in Congress and in the land grant colleges where “good farming practices” were codified and taught.

#### 4. What do we learn from thinking about systems capital?

A focus on systems capital helps to crystalize a slowly growing public awareness: that *maximizing the money value of goods and services produced is not an appropriate goal for a society*. This radical idea is supported by looking, once more, at the relationship between goals and productive resources, pulling in the now familiar idea of externalities, but amplifying this to cover whole systems.

It is not generally the goal of economic activity to degrade the varieties of natural capital on which it depends, but this has been an outstanding side effect of the dominant economic systems of the world. Some of the side-effects with which humans are now contending may best be called **meta-externalities**: they are the unwanted side effects of a significant portion of the economic system as a whole on its physical and social contexts.

- The largest, most obvious meta-externality from the global human economy is climate change: no single country, business, or system of transportation is responsible for this disaster, but it is an unintended side-effect of, in this case, the whole system.

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<sup>8</sup> <https://www.nifa.usda.gov/about-nifa/how-we-work/extension/cooperative-extension-history>

<sup>9</sup> For the 20<sup>th</sup>-century twist on this distortion see Fairbairn, M., 2020, *Fields of gold: Financing the global land rush*. Cornell University Press

- Another meta-externality is the decrease in respect for the idea of truth that apparently results when the algorithms of social media are designed to increase profits by arousing hatred and mistrust between groups and individuals.
- The emphasis given by the business sector at large, through advertising and media, to a lifestyle consumed by consumerism – to “having it all”, or “I deserve the best” – has destructive impacts not only on the natural environment but also on the health and happiness of society<sup>10</sup>.

Another way of understanding these meta-externalities is to see them as results of the loss of systems capital, where the system in question is capitalism, and its “capital” – the potential to produce well-being by increasing productivity to respond to human needs and wants – has been degraded by insufficiently restrained or regulated pursuit of profit. We can see the results in violent social disruptions, including armed conflict and mass migrations, along with spreading diseases, and disruptions in systems of education and governance – all this in the context of a severely degraded ecosystem – making it ever harder to mobilize and preserve resources to make a good life for the majority of the planet’s eight million people.

In the core sector of an economy, and in much of the public purpose sector, resources are mobilized without needing to maximize the money value of what is produced. That reality should give some hints for how to implement this radical idea in the business sector – while perhaps also shrinking that sector to give more opportunities, and more support to the other two. What I hope to have done, in emphasizing the goals of an economy and the concepts of systems capital and meta-externalities, is to bring to economic studies some useful tools for perceiving and analyzing the largest view of the crises we are in, and for seeking constructive change.

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<sup>10</sup> See, e.g., Tim Kasser and Allen D. Kramer, eds. 2004, *Psychology and Consumer Culture; the struggle for a good life in a materialistic world*. The American Psychological Association, Washington, D.C.. Also Robert H. Frank, 2000, *Luxury Fever: Money and Happiness in an Era of Excess*. Princeton University Press

# Oikonomics and the limits to growth

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## 1. Introduction

Imagine some interstellar anthropologists trying to understand our tribe, the earthlings. On the one hand, they would see a part of the tribe devoted to understanding the functioning of all our Earth systems. Called 'scientists', these tribe members command great respect and funds. This function was once held by the shamans and sorcerers who claimed to speak to the spirits who inhabited it; then, it was taken by the priests and theologians claiming to know the will of God who created it. Now, the earthlings have decided to look to the scientists as their guide, believing that they are the best suited to unveil the laws governing their world and, thus, guide their actions.

One common trait these anthropologists would detect in all scientific narratives is that everything in the universe follows clear laws of scale, existing within definable boundaries. Everything is seen and believed to live in a dynamic balance, neither too small to exist, neither growing indefinitely without eventually collapsing under its weight or exploding from its inner growing pressure. This perception of the importance of scale balance and limits was already present in the previous mythological and religious narratives by the shamans, sorcerers, priests and theologians. Indeed, although expressing it differently, earthlings always knew there was hubris, sin or chaos and system malfunctions beyond these boundaries. From Pachamama, Gaia and the Gods asking humans to respect the limits they set under penalty of Godly punishment, to Daedalus warning his son Icarus to fly neither too low to be caught nor too high to get too close to the sun, up to Jehovah punishing the earthlings for not following the commandments he had given them: everywhere, humans were told to behave respecting the laws and limits seen to govern the universe.

Similarly, scientists worried that climate was changing because of greenhouse gases surpassing certain limits or ecosystems were on the brink of collapse once critical limits for their stability and resilience were reached. Others warned about peak oil scenarios and the economic challenges they represented. Even looking at atoms, seen as the building blocks of matter, these scientists saw an unavoidable law of scale: no atom lighter than hydrogen was seen to exist, and no heavier element than uranium occurred naturally on Earth. Some scientists devoted sophisticated resources and much time to creating artificially heavier elements. They even succeeded in doing so, although all proved unstable and doomed to disintegrate as soon as they were made. In medicine, scientists discovered that subtle balances govern body health and how the unchecked reproduction of cancer cells eventually leads to the organism's death. Even historians and later environmental historians realized that human history results from social power balances and balanced relations of humans with their environment. Empires and civilizations grow to a certain point before becoming unstable and eventually collapsing (Pointing 1993, Diamond 2005).

Notwithstanding, and this may have puzzled these interstellar anthropologists, the economists were a notable exception: they claimed to have discovered the only known system in the universe not

subjected to the laws of scale and doomed to grow on forever, namely the economic system. Unless all the others, they devoted their thoughts and energy not to understanding and defining the lower and upper limits in which stability, balance and health could be observed but to devising ways to promote ongoing growth. What may have puzzled our interstellar scientists even more, is that the voices of this small group calling for infinite growth found friendlier ears from all other earthlings, becoming the dominant narrative instead of all others. Thus, the earthlings devoted their efforts to promoting further economic growth, despite all warnings and even their millenary cultural tradition and wisdom, all built on the need to respect balance and harmony. More strikingly, these modern growth-obsessed earthlings did not realize how odd this idea of unhinged and infinite growth is. Thereby, these interstellar anthropologists may have discovered that Earthlings suffered from cognitive dissonance, holding conflicting beliefs, values, and attitudes without being aware of it.

Of course, a few voices still pointed to the need to respect limits to growth in the social and economic realm, too. But their warnings, as Daedalus call to his son, were ignored.

“A hundred years before the French Revolution, proportion as a guiding or orienting idea, as the condition for finding one’s basic stance, began to be lost. Up to now, this disappearance has hardly been recognized in cultural history. (...) Kohr’s ‘a certain appropriateness’ strikes one as a powerful intuition only when it is understood in the context of a historical fracture. In this rupture, the world we inhabit finds its origin. Kohr insists on the correlation between a certain size and the harmony that shines forth in appropriate proportions. Outside this configuration lies Nemesis.” (Illich and Rieger 1997, 18-19, referring to Kohr 1957).

As a result of this loss, the same earthlings who were becoming increasingly aware of growing imbalances and how their climate, ecosystems, societies and overweight bodies were becoming unhealthy and unstable still believed that more economic growth was the only way forward. Politicians showed concern and solemnly committed themselves to stopping climate change, deforestation, desertification, biodiversity loss, social crisis and violence. Still, they committed more vigorously to recover or increase economic growth, promoting more production and consumption. While concerned with the signs of impending disaster, the earthlings still devote some of their brightest and most creative members to promote human needs and wants, devising clever ways to convince all to consume more and more, while planners, development experts and economists look for ways to remove obstacles and accelerate economic growth.

Earthlings, these interstellar anthropologists may conclude, had a terrible growth-addiction problem while unaware of it. Like all addicted people, they were heading to the abyss while believing this was okay. Thrilled by the magic powers unleashed by the growing number of gadgets, machines and instruments allowing them to accelerate beyond their biological limits with a gentle push of their feeds or communicate with the other side of the world without having to raise their voices, earthlings seemed to be enjoying the ride despite their increasing problems, crisis and pitiful appearance.

Why couldn’t they see the problem? How come and how was it believed that, somehow, the economic process was not subjected to the laws of scale governing the whole universe? What brought this cognitive dissonance and allowed it to become hegemonic?

## 2. It's the economy, stupid

In his *Politics*, Aristotle (1999) made a crucial distinction between *oikonomy* (which he regarded as 'the art of living and living well') and *chrematistics* ('the art of acquisition'). The former included all human activity aimed at producing, distributing, owning and consuming use-values to live and live well. The latter dealt with commerce and trade, thereby exchange-values and prices.

Moreover, Aristotle saw that the 'art of living and living well' starts with Nature providing the substance, the material of wealth. As he argued:

"as political science does not make men, but takes them from nature and uses them, so too nature provides them with earth or sea or the like as a source of food. At this stage begins the duty of the manager of a household, who has to order the things which nature supplies; he may be compared to the weaver who has not to make but to use wool (...). The means of life must be provided beforehand by nature." (Ibid., 17)

Fully aware of the importance of Nature and that chrematistic had to be seen as a means and not an end, Aristotle warned about the need to keep the proper balances and the qualitative rather than the quantitative aspect of trade and commerce at the heart of our economic practice. He even managed to foresee what eventually became widespread with the rise of our modern capitalist society:

"Indeed, riches is assumed by many to be only a quantity of coin, because the arts of getting wealth and retail trade are concerned with coin. (...) But how can that be wealth of which a man may have a great abundance and yet perish with hunger, like Midas in the fable, whose insatiable prayer turned everything that was set before him into gold?" (Ibid., p. 15).

Differentiating between wealth and prices, use-values and exchange-values, Aristotle warned about the misconception and risks of taking the latter for the former:

"Hence men seek after a better notion of riches and of the art of getting wealth than the mere acquisition of coin, and they are right. (...) For natural riches and the natural art of wealth-getting are a different thing; in their true form they are part of the management of a household; whereas retail trade is the art of producing wealth, not in every way, but by exchange. And it is thought to be concerned with coin; for coin is the unit of exchange and the measure or limit of it. And there is no bound to the riches which spring from this art of wealth-getting. (...) But the art of wealth-getting which consists in household management, on the other hand, has a limit; the unlimited acquisition of wealth is not its business. (...) The source of the confusion is the near connection between the two kinds of wealth-getting (...). Hence some persons are led to believe that getting wealth is the object of household management, and the whole idea of their lives is that they ought either to increase their money without limit, or at any rate not lose it. (...) Some men turn every quality or art into a means of getting wealth; this they conceive to be the end, and to the promotion of the end they think all things must contribute." (Ibid., 15-16).

More than two millennia later, Adam Smith (1776/1937) used his intellect to *inquire scientifically into the nature and cause of the wealth of nations*, thus fathering modern economics. Following Aristotle, Smith defined use-value as "the utility of a particular object" and assumed that "every man is rich or poor according to the degree in which he can afford to enjoy the necessaries, conveniences, and

amusements of human life” (Smith 1937, 30). Despite this definition, Smith focused on the quantitative and measurable dimension of wealth, namely exchange-values, as did those economists who followed him (Stahel 2020a).

Therefore, although aiming to inquire into the nature and cause of wealth, on how to produce best, distribute and consume use-values, modern economics focused on how markets, prices and trade worked, on how to generate and accumulate exchange-values. This reversal is even more striking if we consider that Smith saw no direct correlation between use- and exchange-values and that the former cannot be subsumed into the latter. After all, it was he who put forward what is known as the ‘water and diamond paradox’, arguing that

“the things which have the greatest value in use have frequently little or no value in exchange; and on the contrary, those which have the greatest value in exchange have frequently little or no value in use. Nothing is more useful than water: but it will purchase scarce any thing; scarce any thing can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it” (Ibid., 28).

He could undoubtedly have extended these examples to a myriad of other use-values, like the fresh air he breathed continuously to stay alive, the stable climate he lived in, the social and familial networks that sustained him and the academic relations and friendships that nurtured both his emotional and intellectual needs, and his professional career. Moreover, had he looked at these satisfiers, he – and those economists who followed him – would have seen that their capacity to satisfy human needs is subjected to clear laws of scale: too much or too little represents less rather than more use-value. Indeed, depending on their scale and context, some become life-threatening and impairing beyond or below certain limits, thus being negative rather than positive.

By ignoring the centrality of use-values to the economic process and how exchange, from the perspective of ‘enjoying the necessities, conveniences, and amusements of human life’ is but a means to an end, Smith ignored Aristotle’s warnings about what constitutes proper economy and household management. By doing so, economists fell to the illusion that wealth-getting, as Aristotle had already warned, can and should go on forever. It ignored what humans had known till then: life and a good life are found and grounded in balance, not ongoing growth. The Greeks called it eudemonia.<sup>1</sup> The economy, as an art subordinated to life and the good life, is thus neither alien to eudemonia nor dissociated from ethics and aesthetics, from combining different qualitative elements in the proper balances and keeping them within the correct limits.

Notwithstanding, no one seemed to notice that economists mistook exchange-value for wealth and then created a science focused on chrematistics and called it economics. Progress, the guiding principle of Western human aspirations, was hegemonic in the 20th century. It led Europeans to pursue techno-scientific and industrial growth, expanding, colonizing and exploiting the whole world. Later, in the 20th Century, the ideal of progress was reduced to development and then, development was reduced to and quantified in chrematistic, monetary terms and became simply GDP growth (Sachs 1992 and 1999). Nowadays, financial capital has taken the upper hand, putting the accumulation and growth of money out of money at the centre of our economic process, allowing a growing number of

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<sup>1</sup> εὐδαιμονία/eudaimonia is a Greek word commonly translated as happiness or welfare, derived from *eu* (good) and *daimōn* (spirit). It can be understood too as meaning ‘human flourishing’ and was a central concern of Greek philosophy, where many varieties of eudaimonism can be found.



billionaires to multiply their digital chrematistic wealth without physical limits, mistakenly presented as rich when, as Midas, they have mostly been blinded by their unhinged growth appetite (Stahel, 2020b).

### 3. Going beyond economics

Restricting their inquiry to wealth's quantitative exchange-value dimension, and approaching it in purely mathematical terms, modern economics altogether lost touch with the true meaning of wealth and reality. It ceased to be a science by misapplying the method devised by mechanical physics to inquire into the behaviour of simple, passive objects to look at a complex, ever-changing, multidimensional historical reality like the economic process instead (Stahel 2020c). Like medieval theologians before them who tried to read into the physical nature of our universe and our solar system by reading the scriptures, modern economists decided to look into a social and historical reality not by observing the living phenomenon as all other social scientists do but by assuming an idealized, abstract alternate world in which the economic reality is supposed to happen in purely mathematical and definable terms (Stahel 2021a).

In this abstract world of idealized economic models, nothing prevented modern economists from imagining a system in which unrestrained growth is possible and desirable. Not having to deal with the real world in its physical, ecological, social and psychological dimensions in which limits and balances are of the essence, economists resorted to mathematical formulas where functions and equations can be manipulated at will. After all, no number is big enough that we cannot make it bigger by adding one. To do so, as theologians had done before them, economists start their argument from some initial dogma – in the case of economists, the initial hypothesis of the model – and then, through clear mathematical, deductive reasoning, arrive at the conclusions, ignoring that these derive from the chosen starting point, not from the observed reality as such (Stahel 2021a). By conveniently choosing their initial hypothesis and models, economists proved that free-market competition leads to growth-efficiency and that more production and consumption is better than less. What few people have noticed is that, by doing so, economists have become the sole advocates of infinite growth by sacrificing the real world as a reference, looking at an imagined, abstract theoretical world instead. Indeed, economics became a perfect rationalization for capitalism and its continuous need to grow and accumulate.

As Marx, following Aristotle's view, showed,

“The circulation of commodities is the starting-point of capital. (...) The modern history of capital dates from the creation in the 16<sup>th</sup> century of a world-embracing commerce and a world-embracing market. (...) The circuit C-M-C starts with one commodity, and finishes with another, which falls out of circulation and into consumption. Consumption, the satisfaction of wants, in one word, use-values, is its end and aim. The circuit M-C-M, on the contrary, commences with money and ends with money. Its leading motive, and the goal that attracts it, is therefore mere exchange-value. (...) The simple circulation of commodities – selling in order to buy – is a means of carrying out a purpose unconnected with circulation, namely the appropriation of use-values, the satisfaction of wants. The circulation of money as capital is, on the contrary, an end in itself, for the expansion of value takes place only within this constantly renewed movement. The circulation of capital has therefore no limits” (Marx 2015, 145, 146 and 150).

Paradoxically, perhaps, economics became the new theologians disguised as scientists by misplacing Newton's mechanics to study a complex historical phenomenon. From mechanical physics, they took

the scientific aura, and from theology, the method and practice. From both, they took the claim to pursue a universal truth, valid at all times and places. Like theology and theoretical science, its conclusions are based not on observing reality but on abstract reasoning. Notwithstanding, unless in the natural sciences, its findings are and cannot be empirically verified.

Unless all other social sciences, economics became the only one trying to explain a social phenomenon in purely mathematical terms, ignoring Dilthey's (1889) hermeneutic and phenomenological approach, firmly rejecting the application of a methodology formed exclusively from the natural sciences (*Naturwissenschaften*) to the human sciences (*Geisteswissenschaften*). While the former was centred on explaining natural phenomena subjected to unvarying natural laws, the latter had to deal with life's creative manifestation and historical change. While within the natural sciences we seek to **explain** phenomena in terms of observable cause and effect, which repeats itself universally in space and time, in the human sciences we seek to **understand** them in terms of the relations of the part and the whole, as a living, unrepeatable, context-dependent, changing reality (Stahel 2021b). Notwithstanding, no one seemed to care, and indeed, we even forgot that at the end of the XIX Century, within the field of political economy, the Prussian historical school was the favoured and hegemonic approach before being completely replaced and side-lined by the Austrian and later termed neoclassic approach (Stahel 2020a, 118-128).

Moreover, economics, as such, represents an exception not only within the social sciences but, as we saw, all sciences and past human understanding of reality by adhering to the belief and defence of infinite growth. Forgetting that the economic process happens in the real world and, as Aristotle showed, Nature provides its substance, economists ignored the ecological limits to growth. Moreover, by assuming Nature to be external to the economic process, depicted in purely monetary and abstract form, economists aim to manage our household (*oiko-nomos*) without bothering about the laws and order governing this house (*oiko-logos*) in the first place, ignoring how childish such an attempt actually is.<sup>2</sup>

Moreover, economists soon realized that applying the mathematical method is only possible by assuming the *ceteris paribus* condition, greatly simplifying reality to represent it through equations in the first place. Thereby, economists managed to get rid of all other social, historical, cultural, technological and psychological factors by considering them to be unchanging and, thus, external to their models. Notwithstanding, by doing so, economics, like theology, became a rhetorical dispute between models and abstract representations to prove a supposed truth — a place where infinite growth or the virgin birth of Jesus can be imagined and defended (Stahel 2021b and 2021a).

Only by looking at the real world and the economic process as a multidimensional physical, ecological, political, social and cultural historical process will economists realize that there are limits to growth at all levels. Even more, we may remember, as humans always knew, that stopping growing after a certain point is the prerequisite for preserving and promoting a good life (Stahel 2020a).

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<sup>2</sup> The etymology of the word is now clearly established, reaching back to the Greek word οἰκονόμος/oikonomos (i.e. 'household management', a composite word derived from οἶκος/oikos ('house') and νέμω/nemein ('to manage; distribute') by way of οἰκονομία/oikonomia. As for the Chinese *Dao* and the Buddhist and Hindu *Dharma*, *Logos* has the meaning of rightful or cosmic law and order. It should be self-evident that the *oiko-nomos* has to be grounded on the *oiko-logos* and that the economy is as well political, once it has to do with choices, and ecological, once it happens and is sustained by our world. To believe that we can have an economy which is neither political, nor ecological, is to ignore reality and escape into a mathematical 'as if' phantasy world where, as playing children do, you can imagine your own rules and reality at will.



The signs that we are flying closer and closer to the sun, the wax on our wings already starting to melt, are there for all of us to see. But will we wake up from our illusion before we perish amid the abundance created by the capital's insatiable prayer, turning everything set before him into gold? Or will we, like Midas, continue to mistake exchange-values for wealth, gold for life?

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# Reorienting economics to social ecological provisioning

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## Introduction

Modern economics is obsessed with two goals meant to increase choice: capital accumulating growth and efficiency. These define what economists generally regard as constituting a well-functioning modern economy, which is by definition a productivist one, whether State, corporate or some other form of capital accumulating system. Both goals supply rhetorical support for ideological positions on environmental policy. For example, the belief that controlling human induced climate change should improve, not hinder, growth and that all public policy needs to be efficient, namely produce more benefits than costs, has been promoted for over thirty years by economists (e.g., Nordhaus 1994, Stern 2007, GCEC 2014). The conclusion is that only policies that promote growth and net monetary gains are deemed legitimate; that is, investing in catastrophe avoidance should give a good rate of return!

We will not rehearse here the longstanding arguments against economic growth (Spash 2021). Nor will we revisit the hidden values of efficiency and its ethically loaded conversion by economists into a weakly concealed elitist (Pareto) criteria, that allows the rich to be made better off as long as no one else is made worse off, or the further adjustment by Kaldor and Hicks into a mere potential for compensating those harmed. These issues are symptomatic of a more profound problem, that of economics supplying the wrong answers to what is of value and the basis on which we should set our priorities. The result is evident in ignoring value beyond individual preferences, the non-monetary (including unpaid care and reproductive activities) and a whole range of relationships to others—humans, non-humans and Nature. Even more fundamentally much of the economics profession fail to consistently apply their own insights to reform economics itself. Thus, addressing the environmental crisis requires that economists become far more honest about the limitations of what they can achieve, which is certainly not calculating optimally efficient prices for biodiversity or greenhouse gas emissions contra the likes of Nordhaus, Stern and Dasgupta (Spash 2002, Spash 2007, Spash and Hache 2022).

The other and related major failure of economics is its limited perspective on what constitutes an economic system and, based on promoting modern consumerist capitalism, its failure to critically investigate and realistically understand actualised structures. Expansion and accumulation under a capitalist organisation of society is premised on securing ever more low entropy resource extraction in competition with the interests of others (Georgescu-Roegen 1971), and in the process shifting costs onto others (Kapp 1978 [1963]). Accumulation through increased output of goods and services and the build-up in productive capacity requires “the colonisation of ecosystems by human activity” (Pineault 2023: 13). International trade has been a key mechanism for achieving ‘unequal exchange’, whereby labour, energy and materials asymmetrically flow from poorer to richer countries (Hornborg 1998, Dorninger, Hornborg et al. 2021). Such surplus extraction is premised on the exploitation of ‘others’—human and non-human—enabling an ‘imperial mode of living’ amongst colonising industrialised nations of both global North and South (Brand and Wissen 2017, Brand and Wissen 2021). The industrial-capitalist market economy has led to the exploitation of ecosystems as productive

forces while undermining their natural ability to sustain themselves. Similarly, it has commodified human labour while externalising the necessity of unpaid reproductive and care work (typically undertaken by women). This separation of productive from reproductive activities has led feminist scholars to define the social ecological crisis in terms of (re)productivities, which highlight the interdependence of both human and natural productive and reproductive activity (Biesecker and Hofmeister 2010).

Building from such insights, we argue that economics must be reformulated to become the science of sustainable social ecological provisioning systems that meet human needs while allowing for non-human flourishing. The argument for social ecological reform of economics is made as follows. First, we outline the current state of economic thought and its inadequacies when addressing social and ecological crises. Second, we highlight the necessity of radical social ecological transformation of actually existing capital accumulating systems. Third, emphasis is placed on reforming economics to study not just capitalism but the full variety of social ecological provisioning systems and the potential for alternative economic structures. Rethinking and reorienting economics along these lines is argued to be necessary in order to meaningfully move away from impending social ecological economic crises and recognise that addressing such crises requires a lot more than incentivising individuals to conform to limits on the scale of economic growth.

### **Economists' Failure to Reform Economics**

Economics has become obsessed with productivity and growth, which are normally placed within a set of market institutions that determine exchange prices assumed to reflect resource scarcity. These price-making markets were highlighted by Polanyi (1957) as one specific form of market institution and far from being the most desirable for running human society. The assumption that such markets reflect resource scarcity has been deconstructed by the very economists who claim this to be the case.

Advocates of the resource efficiency of price-making market allocation have put forward the concept of 'externalities', which need to be priced outside of market institutions using social cost-benefit analysis in order to correct the failure of price-making markets to take them into account. They attempt to reduce the relevance of such failures to anomalies, but this is no longer tenable given the ecological crisis, which has made evident the pervasiveness of pollution, environmental destruction and associated social harm. Kapp (1978 [1963]) explained how this involves a deliberate shifting of costs/harm in order to make money profits and that cost-shifting is internal to competitive systems, such as market capitalism, not some externality or failure. The implications of pervasive pollution was also later recognised by neoclassical environmental economists (Kneese, Ayres et al. 1970, Bohm and Kneese 1971), but its consequences for price theory have been consistently ignored. Instead an unrealistic theory has purposefully been maintained (Spash 2021).

The simple conclusion to draw is that all the prices are wrong in terms of reflecting resource scarcity and would need to be 'corrected' to reflect 'true costs'. The task is in fact one that requires total planning of the economy. Although, given the interdependence of prices, and path dependence of any adjustments on other price adjustments, what truth means here is far from clear. We could go on to discuss the flawed claims of appealing to 'true preferences', and using methods based on preference utilitarianism, and so on, but this is really just a distraction from the basic flaw of conducting economics as an analysis of optimal efficiency. In practice, pricing all the impacts of material and energy flows cannot be achieved. This means the prices actualised in any market economy are the result of arbitrary processes determining what is, and what is not, included in prices, and how prices are, or are not, adjusted. That in turn depends on the power of different vested interests and economic actors. So,

economics is no longer about anything but instituting a planned economic system, which brings into question why prices are even employed to do so.

More than this it requires rethinking economics and dropping the long standing neo-Austrian definition drawn from Lionel Robbins that restricts economic analysis to an assumed conflict between ends and scarce means. Those ends are typically regarded as derived from unlimited wants for the achievement of hedonistic pleasure from consumption of goods and services, which in the face of limited means is used to focus economics on allocating resources efficiently. The idea of leaving resources untapped or stopping consumption at a level of sufficiency is an abhorrence to the modern productivist way of thinking that expresses itself in an obsession with economic growth, maximising output, maintaining full employment as paid work, and accumulating capital. Such productivism is far from limited to economists of the orthodoxy and is common amongst Post Keynesians, Marxists and socialists, and various environmental apologists for growth (Spash 2021), all of whom equate human progress with materialist and technological development, and thus development with economic growth.

A strong productivist State may then be preferred with the proviso that it redistribute resources more equitably than under market capitalism. For example, Fine and Saad-Filho (2018: 28) argue that through increasing labour productivity the development of technology can potentially facilitate relatively comfortable lifestyles for even poor members of society despite on-going high rates of exploitation. However, such positions typically ignore supply chains and the international structure of modern economies, global care chains and the polarising tendency of capitalist development that creates a persisting hierarchy between core and periphery (Kvangraven 2021). As Hornborg (2023: 24) explains: "To celebrate this development of the productive forces under capitalism is to ignore its demands on the human time and natural space of other sectors of the world-system."

The aim of an economy should not be to grow so that a welfare State can be funded to ameliorate the social, health and ecological impacts of growth, but rather to engage directly in social provisioning that avoids exploitation and deliberate harm. Long ago, Kapp (1970) emphasised the social ecological imperative for reorienting economics towards policies addressing needs, the requirements of human life and social minima. This remains largely off economists' agenda, along with the topic of transforming economies away from divisive, destructive, exploitative, unjust and unethical provisioning systems.

### **Realism and the Necessity of Social Ecological Transformation**

Transformation can be understood as relating to a substantive change in structure. Social ecological transformation should identify and address the structure and causal mechanisms of the social ecological crisis and is radical exactly because it looks for those root causes (Spash 2017: 14). However, there are diverse opinions about what might constitute social ecological transformation, which includes on-going advocacy of green growth that co-opts and converts transformation into incremental change or transition.

Indeed, Brand (2022: 40-41) has identified a 'new critical orthodoxy' that undertakes a radical diagnosis of the ecological crisis, but then combines this with transformation as a process that is to be implemented within current institutions and without systemic change. This fails to address questions of power and domination within social institutions and relies upon a (neo)liberal political theory that leaves State bureaucracy and capitalist markets unquestioned. A promised transition from unsustainable to sustainable dynamics is based upon a low carbon or carbon-free post-fossil fuel economy that otherwise remains unreformed. It features State centred, technocratic and green growth orientated projects, and makes use of a strategic conceptualisation of transformation (Brand 2016: 24).

The popularised notion of boundaries being planetary can also justify business-as-usual with some side constraints. This aligns with the new critical orthodoxy by justifying policies such as carbon trading and biodiversity offsetting as efficient because they allocate restrictions to the least cost (financially cheapest) actors, which is code for the money income poor and disenfranchised. Social ecological economics has developed nuanced critiques of such approaches that highlight their operation in practice. Economic analysis requires attending to real social ecological structures and actual organising principles of modern economies (e.g., Spash 2024). What then becomes self-evident is how existing policies and institutions support social-economic structures based on expansion, growth and capital accumulation, which violate biophysical limits from local to regional to international spatial scales (not just planetary boundaries).

A more foundational economic analysis is required that links to the physical basis of the system. Thus, the concept of social metabolism has been developed as an analogy with biological metabolism, which emphasises the material and energy inputs (resource extraction) and outputs (waste sinks) of any society (Krausmann 2017). Societies structured to reproduce on the basis of growth and accumulation continually seek to increase the use of material, energy and labour and so inevitably violate limits (Spash 2017: 12). The basic laws of physics (conservation of mass and energy) mean the exponential growth in extraction of primary resource stocks, and filling of primary sinks in the biosphere, are fundamentally unsustainable. Increased scale of production means the size and pace of the economy continually challenges ecosystems' structure and functioning. It also means innovative new materials are continually introduced that have qualitative impacts and replace naturally sustained functions with artificial processes that require ongoing human management and intervention and so more material and energy inputs (Giampietro 2019).

### **Social Ecological Provisioning**

Lee (2012) placed social provisioning at the centre of heterodox economics and it has been appealed to by various schools of thought. The core idea is far from new. Over a century ago, Veblen understood the market as wasteful and the real economy as a social provisioning process that includes women's domestic activities (Jennings 1993). Reorienting economics to provisioning appeared in the original ideas of feminist economists (Nelson 1993), or more substantively and preferably social provisioning (Jennings 1993), because the latter emphasises community and unpaid caring activities in the (re) production of society (Dengler and Lang 2022). Spash (2024) argues that reorienting economics requires debunking economic growth and efficiency and replacing them with a goal of social provisioning set within biophysical structure, and that this could provide a unifying common denominator concept for heterodox economists.

Social provisioning is a way of understanding an economy as constituted of interdependent social processes, whereby people organise themselves collectively to "get a living" (Power 2004: 6), whether by paid or unpaid means. The goal is not individual utility maximisation but social production and reproduction aimed at improving living conditions and wellbeing. The focus of economics would then be on the institutional organisation of social activities as opposed to individual choices. The organisational structure of process for social provisioning are diverse and may involve commoning, market institutions and planning and a variety of actors such as government, unions, enterprises, households, and other configurations of group provisioning and care. Contra Polanyian claims of a divorce between formal and substantive economies, and so forms of economic analysis, all economies involve social relations of production and reproduction (Spash 2019).

Provisioning systems, whether capitalist or not, are also embedded within ecological, or more generally biophysical, systems, and subject to their capacities and limits. This means economics must relate explicitly to both ecological and social structures if it is to have any claim to conduct a realist descriptive analysis of how actual economies operate. Dengler and Plank (2023) use the term social ecological provisioning to emphasise the connections. This is regarded as an amalgamation of social processes within broader culture-nature life processes for provisioning of needs via satisfiers. They distinguish their approach from the literature on provisioning systems that has focused solely on the monetised economy while overlooking unpaid work, power and social structures of inequality and oppression. Social ecological provisioning aims to combine concerns for provisioning systems, social provisioning and the material ecological basis of how human needs are satisfied.

The theory of fundamental human needs and related satisfiers provides a conceptual framework that distinguishes between what are objective requirements and how these can be met in different ways (Rauschmayer and Omann 2017). Max-Neef (2009 [1992]) proposed thinking in terms of a matrix of existential and axiological needs, with existential ones including the needs of subsistence, protection, affection, understanding, participation, creation, leisure, identity, and freedom. Axiological needs are being, having, doing, and interaction. Human needs are considered to be finite, satiable and universal across space and time. Fundamental human needs are neither hierarchically ordered nor able to be traded against one another (Max-Neef, Elizade et al. 1991: 17). Institutional design of social systems, with their economic and political structures and specific organisations, determine how needs are satisfied. A social environment can repress, tolerate, or stimulate opportunities and the potential to meet our needs in different ways. Under market capitalism the commodification of satisfiers makes them ends in themselves and so subordinates life to the service of artefacts. An important point is that the social metabolism of an economic system follows from the satisfiers created to meet needs. For example, modern satisfiers tend to be material and energy (especially fossil fuel) intensive.

Economies structure the social arrangements for providing meaningful and caring lives through daily practices of reproduction and interaction with Nature. Modern price-making market economies misdirect meaning and care via objectifying social and Nature relations as commodities and reducing value to monetary exchange. The needs of humans for friendship and love become things to be satisfied through quantifiable commercial arrangements that allow somebody to accumulate money and profit (typically at others expense, i.e., cost-shifting). Economics then fails to achieve its aspirational goals of maximising human wellbeing let alone providing for all with equity and justice.

There is in addition to human needs the necessity of meeting the requirements of non-humans. Social ecological provisioning should certainly avoid instrumental reductionism of the non-human world to a mere resource input or set of functional structures maintained to ensure human survival. The importance of human relationships with Nature have been central to environmentalism, and have included moral, psychological and spiritual dimensions. However, as Vetlesen (2015) has explained, human to non-human relationships have tended to be converted into human interests, while those of non-human to non-human have been ignored. A humane society requires an ethics that takes into account the moral standing of non-humans and non-human collectives (e.g. species, ecosystems) on their own terms. That non-human entities have their own good is captured by the Aristotelian concept of an ability to flourish. What is encouraged to flourish, and prevented from flourishing, requires explicit ethical consideration, rather than the common disregard currently facilitating processes of on-going mass species extinction.



## Concluding Remarks

Economics fails not merely to account for biophysical limits to growth but to account for actual and potential alternative provisioning systems. Instead, talk of 'the economy' makes an implicit ontological claim that there is only a singular form of modern economy: the capital accumulating, price-making market economy. Economics has then become limited to a discussion of market capitalism and how it can be maintained in light of its evident failings. Hence, a new critical orthodoxy has arisen that seeks to maintain 'business as usual'. Recognising that there is considerable potential for alternatives to current economic systems is a first step beyond this orthodoxy. Economics must go much further to become a science of social ecological provisioning that recognises and provides for diverse alternatives to be actualised.

The bottom line is how alternative economies as ethical social provisioning systems can be made to work, how current economic and political structures operate to prevent change to such systems and how we get from here to there. Social ecological economics emphasises that there is a material, energy and so ecological dimension to economics. Reorienting economics to become a science concerned with the analysis of how to meet different fundamental human needs would mean paying attention to the ecological and social structures that enable provisioning. The social dimension of social ecological transformation also necessitates that attention be paid to the specific social context in which provisioning occurs, and this includes power structures and institutions—understood as conventions, norms, and formally sanctioned rules and regulations—that coordinate social interactions. What is required now is an economics discipline that studies the implementation of social ecological provisioning to meet human needs within an ethical framework of care and justice for others, both human and non-human. Economics in the 21<sup>st</sup> Century must address the radical transformation of existing economic structures if it is to stop the mechanisms creating social ecological crises.

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# An economics of deep transformations

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## 1. Introduction

A wide range of literatures have identified the capitalist organisation of societies, and the capitalist growth imperative central to this organisation, as the root cause of the catastrophic climate and biodiversity crises. Highlighting the need to break with this imperative, a growing community of scholars conduct research revolving around the notion of 'degrowth'. While the degrowth perspective is generally viewed as anti- and postcapitalist, there is no consensus on how precisely to conceptualise degrowth. In recent works we have proposed a conceptualisation according to which it is a process involving *deep transformations* on four interconnected planes of social being (e.g., Buch-Hansen & Nesterova 2023). Here we draw on Bhaskar (2016) who proposes that social being exists and unfolds on four planes at once. These are (a) material transactions with nature, (b) social interactions between people, (c) social structure, and (d) the inner being of individuals. Degrowth transformations for example involve (a) that transactions with nature are improved via a selective and equitable reduction in matter and energy throughput, (b) that social interactions between people come to be characterised more by caring, empathy, solidarity and embracing diversity, (c) that social structures undergo significant changes, for instance involving redistribution of resources to massively reduce economic inequality and, finally, (d) that substantial growth takes place on the plane of peoples' inner being.

In our forthcoming book (Buch-Hansen et al. 2024), we theorise what such transformations entail in – and how they can emanate from – the sites of civil society, the state and business. In the present contribution we add to this perspective by briefly contemplating what sort of economics could play a positive role for deep transformations to unfold. We start out from the currently dominant perspective in economics, neoclassical economics, arguing that it constitutes an economics of *deep degradation* inasmuch as it produces harm on each plane of being. We then outline a vision of an economics of deep transformations (EDT) – a philosophically informed and genuinely interdisciplinary and holistic economics that could support change on all four planes.

## 2. The (neoclassical) economics of deep degradation

Much policymaking, including policies concerning the natural environment, broader society and business, is based on the ideas and recommendations of neoclassical economics. This form of economics has long been subject to invalidating critique (e.g., Keen & Morgan 2021; Lawson 1997). For good reasons. Seen from the vantage point of our perspective, neoclassical economics contributes

to produce degradation – as opposed to the needed transformations – on all four planes of social being.<sup>1</sup>

The first plane, *material transactions with nature*, is disregarded in this perspective. Envisioning the economy in terms of circular flows of goods, factors of production and wages between firms and households, the complex interactions between economy and nature altogether fall under the neoclassical radar. The negative effects of capitalist growth on nature thus constitutes a nonissue.

As regards the second plane, neoclassical economics advocates a highly reductionist perspective on *social interactions*. These are viewed solely in terms of market-based, monetary exchanges operating under the forces of supply and demand. Societies are reduced to individuals; individuals to consumers, wage earners and investors; and firms to profit maximisers. As such, particular forms of social interactions and practices – such as wage labour – are normalised whilst others fall out of sight. This normalisation contributes to create popular opposition to measures that may be instrumental for deep transformations to materialise – a case in point being any sort of limitations of excessive production and consumption patterns.

Turning to the third plane, *social structures* are reduced to capitalist market structures in neoclassical economics. Whilst neoclassical economists generally present their research as politically neutral and objective, policies based on their perspective serve to reproduce neoliberal capitalism, thus moving societies in the opposite direction of the needed transformations. Such policies address the climate and biodiversity crises via market-oriented instruments such as carbon taxes, emissions trading and monetary valuation of ecosystem ‘services’, instead of seeking to reduce the overall size of economies to bring them within planetary boundaries.

Also in relation to the last plane, that of the *inner being* of individuals, neoclassical economics is advocating a reductionist perspective. Picturing the individual as a ‘homo economicus’, human beings are represented as greedy and selfish, incapable of acting based on other values and ideas. And incapable of self-transformation. Moreover, no differentiation is made between the wants and the actual needs of human beings.

Overall, the currently prevailing form of economics offers a grossly reductionist and harmful perspective. This perspective serves to lend ‘scientific’ legitimacy to practices and policies reproducing business as usual. Instead of providing valid answers as to how humankind can leave the path to ecosocial collapse, it stands in the way of the urgently needed transformations toward ecologically and socially sustainable societies. As such it constitutes an economics of deep degradation.

### **3. Envisioning an economics of deep transformations**

An economics of deep transformations would differ radically on all four planes from the economics of deep degradation. While it would be able to draw on various existing strands of heterodox economics, it would also need to transcend these strands so as to take a genuinely holistic and interdisciplinary perspective on economic activities. It would, then, be an economics that engages seriously with a rich variety of other fields. At the same time, it would be conscious of its own situatedness in relation to, and its entanglement with, ethics, politics and philosophy of science.

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<sup>1</sup> In neoclassical economics we include ‘environmental economics’ as the latter extends the neoclassical framework to address matters related to environmental sustainability.

As regards the first plane, various heterodox schools of thought in economics consider *material transactions with nature*. Different strands within the field of ecological economics are a case in point, examples including steady-state and degrowth economics. Despite considering material transactions with nature, this field is not without downsides. Recognising that economies and societies are embedded in nature should be regarded as no more than a starting point for developing an EDT. One important avenue could be to expand what is understood by the concept of 'nature'. Nature is not simply an abstract space within which societies are embedded and which imposes limits on human economic activities. And nature consists not only of ecosystems that serve as resource pools and waste sinks; it consists also of non-human beings (e.g., trees) and individuals (animals) and their communities. An EDT would need to take such beings and individuals as well as their rights and needs into account. It is also crucial to recognise that material transactions with nature are always transactions somewhere, i.e., they always occur in specific *places* with their unique constellation of natural and social structures. To begin to consider how the conception of nature can become more nuanced and place sensitive, dialogues can be initiated with fields or perspectives such as deep ecology, new materialism and human geography.

As regards the plane of *social interactions*, an EDT would break with the neoclassical aspiration to turn everything into tradeable commodities and to put prices on even the most sacred aspects of being. These aspects for example include life, health, education, care and nature. In breaking with this aspiration, an EDT can draw on a vast body of degrowth scholarship which puts commercialisation into question while pointing to the limits of markets. Such scholarship brings non-monetary forms of interactions into the economics discourse. These forms for instance comprise sharing, giving, tool libraries, time banks, repair shops and swap stations. An EDT problematises how human beings interact with one another in capitalist settings. It envisions instead different modes of interaction in economic spaces such as companies and markets, interactions premised on flat hierarchies and humane relationships. Such interactions already take place in communities and movements organising for change. Yet they have traditionally been a focal point of sociology, suggesting that this could be a relevant dialogue partner for an EDT. Moreover, to move beyond the mechanistic, utilitarian and exploitative perspective on human interactions found in neoclassical economics, an EDT can engage with the humanist tradition which outlines healthier modes in which humans can interact with one another.

As regards the third plane, an EDT would need to recognise that economic structures interconnect with other *social structures*, including institutional, political and cultural ones. Because such structures differ from one space to another, economies take different forms. That is, a variety of market economies and growth models currently exist – and degrowth economies, if they were to materialise, can thus also be expected to take a plurality of forms. A related aspect of great importance to an EDT is that, as pointed out in diverse economies scholarship (e.g., Gibson-Graham & Dombroski 2020), a great variety of non-capitalist social structures and options already exist on the margins of contemporary societies and economies. Some of these structures and options could play a positive part in transformations towards sustainable societies. With profound changes of economic structures, existing economic activities – including production, exchange and consumption – would be different in degrowth settings. A broader range of organisations of production beyond businesses would thus be studied by an EDT, cases in point being worker cooperatives, community supported agriculture, foraging and community gardening. Such an economics would take into account structures that neoclassical economics overlooks or only accounts for when monetised. Social structures would need to be guided by – and kept within a framework of – an ethics of fairness, solidarity and needs satisfaction. A dialogue with the sustainable welfare scholarship may be a useful step forward in the development of an EDT. This may especially be so in relation to the design of eco-social policies (e.g., Laruffa et al. 2022), i.e., policies capable of initiating change on the plane of social structures to

improve social equity while at the same time improving human transactions with nature. Caps or taxes on income and wealth, Universal Basic Income or participation incomes, the introduction or expansion of Universal Basic Services in areas such as public transport (e.g. subsidies for train travel) and (organically and locally produced) food provision are examples. Scholars in the field stress the importance of a deliberative moment in co-creating such policies, e.g., via citizen forums (e.g., Koch et al. 2023).

Turning to the plane of *inner being*, an EDT would be based on a view of human beings fundamentally different from that of neoclassical economics. In this context it is worth noting that the degrowth literature, and ecological economics scholarship more generally, rejects the homo economicus as an adequate conception of human beings. However, these fields have done little to discuss human nature, i.e., who we are as human beings. This is a problematic omission: if interactions and social structures are deemed necessary to be transformed by agents, it is important to have an alternative vision of what human beings are like. In considering this matter, an EDT can engage with various traditions in science and philosophy to which this contemplation has from the outset been central. Examples include various forms of psychology, for example eco-psychology and humanistic psychology, existentialist psychoanalysis and the philosophy of meta-Reality. In an EDT, the focus of economics would shift from growth in production and consumption, to inner growth and self-transformation of human beings. A key matter of concern in this respect is the question of how human beings can self-transform. That is, the formative mechanisms behind self-transformation need to be understood. These mechanisms may for instance include life experiences, access to nature, school education and lifelong learning. With an EDT being profoundly different from the currently prevailing form of economics, it follows that economics education would also need to be deeply transformed and start much earlier than at the level of higher education.

#### **4. Concluding thoughts**

Above we have outlined the contours of an economics of deep transformations, emphasising the need for it to be holistic and interdisciplinary. Existing forms of heterodox economics have taken very gentle steps towards other fields but have yet to engage with other fields deeply and seriously. Interdisciplinarity has been shallow and cautious, whereas an EDT requires an adventurous and bold approach. However, while within the heterodox economics space – maybe academia more generally – there is a felt need for increasingly interdisciplinary research to be conducted, there may also be fear of genuinely stepping into it. There can be various reasons for this. One may be that, in contemporary academia, researchers simply do not have enough time for engaging with works and humans in other fields. This presents an obstacle to an EDT given that it entails fusing economics with the range of fields mentioned above (and likely other fields as well). Simply put, slow science is a precondition for an EDT.

Moreover, it is widely considered a risky undertaking to embrace interdisciplinarity due to the specialisation of journals and university departments. This already puts ecological economics in its current form at a disadvantage. Pursuing EDT theorising may amplify this disadvantage even further, thus threatening a scholar's career and even employment prospects. Little in the existing academic system facilitates the EDT type of economics. Certainly, a scholar wishing to publish in the main journals of the field, is well advised to take the mainstream, neoclassical path, adopting its methods such as ever more sophisticated mathematical models. This is problematic as sophistication in economics need to emanate not from the use of advanced mathematical models but from deep interdisciplinary thinking.

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## Will Economics Ever Become More...Ecological?

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“If economists could manage to get themselves thought of as humble, competent people on a level with dentists, that would be splendid”.

---[John Maynard Keynes](#)

I cite The Master because I don't think economists, working within “economics” in its present form can really address the crisis of limits we're facing—but I do think men and women who work as economists can. But only if they behave like dentists. Let me explain.

To review the last few years' weather reports, read public polls about fears of “global warming”, or listen to scientists yet again explain the effects of carbon-loading on the Earth's atmosphere—and ultimately the ability to sustain life—is, to say the least, quite unironically, chilling.

The UN lists five major consequences that are flowing from global warming: hotter temperatures; more severe storms; increased drought; warming, rising oceans; massive loss of species; major food shortages, especially for the poor; more pandemic health risks; poverty and forced displacement (and hence migration). And global warming is only one aspect of the crisis of biophysical limits we are apparently facing.

So when asked to suggest how “economics” might be reconfigured to reflect, operate and theorize within the limits of the biophysical world, to be honest, I paused and almost said “no”—because too many conflicted ideas and feelings enveloped me.

The question, as I see it, presumes—without saying so—what is widely (though not universally) held as true these days: that the earth environmentally is rushing toward human uninhabitability, and that the millions of co-resident species of all kinds with whom we share the earth, will suffer enormously as well, perhaps extinguished themselves.

There are certainly scientific analyses that don't embrace this sort of full apocalypticism—but nonetheless affirm varying degrees of it: some regions of the earth will become uninhabitable, they forecast; others will be left habitable only under radically-altered-and-insulated conditions; human life will thus likely survive but in radically reduced forms, in variety, condition and numbers. How many homo sapiens—and which homo sapiens, from which nations, races, genders, and classes—will be those survivors is at best gingerly addressed.



The cause for this bleak assault on “life”—a biological form of existence that to date has been discovered nowhere else in the universe—is, we now understand, us. We human beings seem to be literally manufacturing our own demise.

But that’s not quite right: it’s human beings through their organized use and misuse of the planet in just the last 200-300 years that bear the accusation. And, lest we forget, in those last 200-300 years it in truth has only really been some human beings in some societies who’ve been leading, organizing, and enforcing this use and misuse—and hence what’s likely to happen next. Before the 18<sup>th</sup> century, evidence for devastating human impact—at least on the planetary scale—was limited (though that’s hotly debated.)<sup>1</sup>

Those last 200-300 years are coincident of course with the rapid development of “capitalism”, a quite particular form and stage of human social development that appeared first in northwestern Europe, then metastasized globally as Europeans expanded their control over ever-greater regions quite distant from Europe.

But with “capitalism” as the term for this period came something else, something I want to reflect on. With capitalism came an ever-proliferating literature, one that sought to identify and explain the “capitalist” system’s key processes, and with it a class of thinkers/writers who by the early 20<sup>th</sup> c. were increasingly employed by the modern university, itself another noteworthy aspect of the capitalist era.

This architectural-conceptual apparatus—in the 18<sup>th</sup> and early 19<sup>th</sup> c. it was called “political economy”, then in the late 19<sup>th</sup> and early 20<sup>th</sup> c. “scientific economics”, and finally in our own era simply “economics”—grew like the amoebic creature called “capitalism” it sought to theorize. “Economics” as an ideational system and its progenitors, like capitalism, grew up in stages and particular locales—and in each stage, arguing about the great crises of the era, it sought to generate a “master narrative” of ideational solutions that, however original in form, always ended up largely defending the underlying property system, wealth and income distribution and the class relations attached.<sup>2</sup> Of course, these would-be master narratives—like the socio-political-economic world they struggled to describe—met with counter-narratives and quite often vivid, and often violent conflict and resistance. That history is too well-known to merit recapitulation here.

Fast forward.

Thirty years ago, an “end of history” narrative rather suddenly appeared, with “capitalism” (in its late 20<sup>th</sup>-c. Anglo-American form) and its master-economists’ narrative logic cast as not just ubiquitous (albeit unevenly and unsteadily) but successful worldwide. The claim rested on three giant steps the world clearly had taken after World War II.

The first was Europe’s “decolonization” of the South, which resulted in standardization of the nation-state: tribe, clan, kingdom and empire were no more. The second was (a frequently-coerced) “globalization” process—built on a wholly-new level of international trade, international

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<sup>1</sup> Robock and Graf, “Effects of Pre-industrial Human Activities on Climate”, *Chemosphere* Sept, 1994 <https://pubmed.ncbi.nlm.nih.gov/7953464/>

<sup>2</sup> For succinct treatment of this process of economic theory as crisis-response, see Heilbroner and Milberg, *The Crisis of Vision in Modern Economic Thought*.

investment and lending, and international bureaucratization. From this, a surprisingly-standardized globally-distributed “administrative/consultative class” emerged, closely transposed from extant G-7 state and corporate models onto the new states as well as the new corporations that followed. Third, late in the century had come “de-socialization”, first in the South, courtesy of the Washington Consensus, then in the West thanks to neoliberalism’s electoral and academic triumphs, then with the (unexpected) collapse of capitalism’s chief antagonist in Moscow and the eerie shape-shifting of Chinese socialism into some sort of mercuric state-capitalist hybrid.)

The triumphalism of course didn’t last—new wars, the Great Recession, COVID, and Donald Trump and his imitators in quick succession made sure of that. And as the planet has visibly heated up and the limits to the planet’s carrying-capacity become clearer, the term “end of history” now points not to the demise of colonialism or communism, but of capitalism and human civilization itself.

Back in the late 1960s, a tiny band of unconventional economists encountered an environmentalism in the midst of radical rethinking. Prompted by Carson’s *Silent Spring*, capitalism and its science were being accused of major crimes—against nature, our fellow species and humankind itself. Hiroshima had shattered confidence in the benignity of Progress, especially Progress through Markets and Corporate Science. Now that skepticism looked around through a wider lens and would soon birth “ecology” with its excoriating indictment of our fundamental relations with Earth.<sup>3</sup> Herman Daly and John Cobb’s pioneering works, Ken Boulding’s “spaceship earth” argument, and The Club of Rome’s Limits to Growth warnings led the way. Much has since transpired—nowhere more apparent than in “economics” and the crises today it seeks to address.

Sixty years on, let me name three principal strategies for theorizing a “new economics of ecological limits” that have evolved from that 1960s moment:

- 1) Neoclassical Environmentalism: The Neoclassical assumptions about rationality, markets, price-based efficiency, and growth as desiderata are retained but reweighed and recalibrated, with “externalities” made a catch-all for costs related to addressing environmental limits and administered price adjustments, mainly through taxes the key. Of the many in this tradition, Nobel Laureate William Nordhaus<sup>4</sup> idea to use a Global Carbon Tax to manipulate the discount rate applied to carbon’s “externalities” may be the best known.<sup>5</sup>
- 2) Ecological Keynesianism: government’s micromanagement role here adds science-defined goals for “harm reduction” to nature and humankind--and typically also

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<sup>3</sup> For pre-1960s attempts to construct an “environmental economics”—from Condorcet to Musgrave—see Agnar Sandmo, “The Early History of Environmental Economics”, *Review of Environmental Economics and Policy*, Winter 2015.

<sup>4</sup> See Jason Hickel, “The Nobel Prize for Climate Catastrophe”, *Foreign Policy*, 12/6/18 at <https://foreignpolicy.com/2018/12/06/the-nobel-prize-for-climate-catastrophe/>

<sup>5</sup> Although Nordhaus, like others in this camp, defend Neoclassical assumptions about Market Efficiency, prominent conservatives zealously attack him: see the Hoover Institution’s David Henderson’s “The Problem with Nordhaus”, *Defining Ideas*, 8/27/21 <https://www.hoover.org/research/problem-nordhaus>

stresses “public-private partnerships” to this end. Nicholas Stern’s famous review<sup>6</sup> illustrates the model in its mainstream form, emphasizing public subsidies and constraints (taxes and regulation) --plus extensive intergovernmental cooperation as well as public-private partnerships-- to move toward a “global green economy” in which, most importantly, fossil fuel use is radically curtailed. The much-discussed “Green New Deal” as taken up by the Biden administration, though in some ways more “progressive”, also fits in here.

- 3) Post-Marginalist “Biophysical Economics”: A form of “deep ecology” that’s fairly easy to envision intuitively, challenging to explain systemically, so far very hard to theorize, let alone operationalize. Seeks, but has not yet found exactly how to reframe neoclassical (and Keynesian) “economics” by adopting some analog to Newton’s laws (especially the Second Law and entropy). Often cited as forefathers are Georgescu-Roegen, Herman Daly, and Kenneth Boulding. Robert Constanza, a prominent professor of ecological economics at Univ. of Vermont, a) describes the field as trans-disciplinary (he includes “psychology, anthropology, archeology, and history” ; b) says its goals are “sustainable scale, fair distribution, and efficient allocation”.<sup>7</sup>

Among the three, I find myself torn, because I think each has points to recommend it. I say that though because of something fundamental here: I don’t think any economic paradigm has a leading role to play. Why do I say that? First because to me the looming planetary disaster is a “political disaster”, not a “natural disaster” --albeit on a scale without precedent. Second, I find I can’t imagine a “science-based solution” --let alone a new “economic theory” (if we mean an orderly macro-systemic set of interrelated axioms or principles that can be operationalized mathematically)-- that can forestall this disaster. Once again, to be clear, that’s because I see “political decisions”—actions taken by governments, particularly the large governments, that measurably alter patterns of behavior by individuals and firms, and in a democratic society are actions fairly consistently affirmed (or at least reasonably accepted) by the electorate.

That said, I do think that assembling a reconfigured narrative for what “economics” might be and do could be of help, albeit in a secondary and supportive way in this Mother-of-All-Political-Crises we’re facing.

In the story we often tell ourselves about “economics” and its impact on the world, we describe a direct (albeit complicated) link between economic theory (the work done almost exclusively by “theorists” who are usually workers in the economics departments of major universities) and the far vaster and varied activities of the billions who, as just one part of their lives, daily produce and consume objects and relationships, most of which can be monetized and exchanged.

That story seems almost entirely wrong, as I reflect on world history over the past three centuries.

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<sup>6</sup> See Nicholas Stern, *Blueprint for a Safer Planet*; for critique of Stern, see Bumpus and Liverman, “Accumulation by decarbonization and the governance of carbon offsets”, *Economic Geography*, Spring 2008.

<sup>7</sup> Robert Constanza, “What Is Ecological Economics?”, *Yale Insights*, 5/11/10 <https://insights.som.yale.edu/insights/what-is-ecological-economics>

First, the problem of consciousness: only a relative handful of human beings have ever studied academic economics over these past three centuries—a problem economists don't address because they analogize their work to natural scientists' study of the world. Geologists, biologists, and the like don't need rocks or trees or most living species to be conscious they are being studied.

But for an “economics” attentive to biophysical limits, crucial is a research agenda centered on consciousness, variously individual and variously collective, that takes account of our relations to the family, to neighbors and neighborhood, to the workplace, to media (as information and entertainment), and to the nation and beyond. Recognizing that individuals and groups they inhabit (and shape and are shaped by) are not only isolatable economic actors opens avenues for multi-disciplinary approaches that academic departmentalization and neoclassical reductionist axioms have imposed.<sup>8</sup> In this, I largely (but not entirely) agree, as a starting point, with the “Biophysical Ecology” camp I outlined above.

Second, a new “biophysical economics” needs to reclaim and reconstruct the neglected field of “political economy” as what I've elsewhere called the “political economy of nature”, and focus its work not for a meta-structure equivalent of the neoclassical kind but on the carefully-evidenced interplay between actual (versus theorized) national economies, their specific institutions and classes, the environment (from local to global), and human well-being. (Here I'd define “well-being” minimally by Amartya Sen's concept of “capabilities”, with its explicit invocation of moral precepts and advocacy for metrics of well-being, which are ideationally embedded in the Millennium Development Goals and their successor Sustainable Development Goals and the SDG's Agenda 30).<sup>9</sup>

As James Bryce describes it, such a “political economy of nature”

pays attention not only to the net magnitude of costs and benefits but also to their distribution. In the realm of positive analysis – descriptions of how the world works – this means exploring the multiple ways in which the distribution of wealth and power affects environmental outcomes. In the realm of normative analysis – prescriptions for how the world should work – political economists advocate a range of criteria including not only cost effectiveness but also safety, sustainability, and environmental justice.<sup>10</sup>

Note here Boyce's overt (and unembarrassed) specification of multiple goals and metrics for the political economy of nature. Rather than a single telos, frame or criterion such as “Pareto optimality” or “general equilibrium”, the political economy of nature's conceptual frame is (as Constanza advocates) multi-disciplinary—and, let me add explicitly, with an egalitarian and democratic bias (or presumption, if you prefer).

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<sup>8</sup> On economists' resistance to multi-disciplinary work, contempt for other social sciences and excessive reliance on mathematical formalism, see Fourcade et al., “The Superiority of Economists,” MaxPo discussion paper, 12/14 at [https://pure.mpg.de/rest/items/item\\_2071743\\_2/component/file\\_2071741/content](https://pure.mpg.de/rest/items/item_2071743_2/component/file_2071741/content)

<sup>9</sup> <https://www.un.org/sustainabledevelopment/development-agenda/> I'm keenly aware that the MDG's and SDG's advocacy of “growth” make them suspect to some in the “Biophysical Ecology” community—but welcome the debate because it clarifies the degree to which “political” anchors my idea of a new “political economy” work.

<sup>10</sup> James Boyce, “Political Economy of the Environment”, PERI working paper, U. Mass Amherst, 6/29/20

The presumption of neoclassical economics to be “scientific”, and thus somehow neutrally “objective” in deploying its “market” model (for which it assumes universal relevance), its rational actors, and its ability to reach an optimal equilibrium have suffered too many wounds to bear reconsidering. Mimicking that misconception of “science” by searching for a closed-system, axiom-driven, and math-powered foundation for the political economy of nature will bear only bitter fruit.

Better for those willing to take up work in a multi-disciplinary political economy of nature would be to take Keynes’ (in)famous injunction seriously—and think of the work ahead as akin to dentistry.

And what do I think those dentists should do?

- If determined to work in university, start petitioning for a “political economy” department separate from the extant “economics” department; tenure operates on the minds of “free market” advocates in predictable ways.
- Design courses and degree requirements after consulting already-existing political economy departments, many of which are still areas or fields in political science and government departments or public policy schools. (A Google search is the easy starting place.)
- Encourage in-depth study of economic inequality in all its manifestations—by race, gender, region, occupation, class, etc. (The Stone Foundation, for example, is now funding inequality research at Harvard, Stanford, Chicago, Brown, INSEAD and University College London, with plans to expand. <https://www.stonedn.org/>)
- Track the work of the research centers that are pioneering study of biophysical limits and the relationship between inequality and, for example, climate for models for your own research. <https://wid.world/news-article/climate-inequality-report-2023-fair-taxes-for-a-sustainable-future-in-the-global-south/>
- Pay close attention to the new generation of young lawyers--and law school courses---that have shed the Chicago School’s libertarian “Law and Economics” frame when it comes to environmental regulation, monopoly and anti-trust, unions, corporate crime, etc. (Go for a start to the Law and Political Economy Project, at <https://lpeproject.org/>. See as well Yale’s Center for Environmental Justice, <https://environment.yale.edu/research/centers/environmental-justice>)
- Monitor think tanks that focus on government regulatory, spending, tax and trade policy, as a starting point for your incorporation of the governmental—one aspect of the “political”—in your work. Here the list of worthwhile groups blessedly is too long to enumerate, but the organizations are easily found online.
- Center in your work the idea of the individual not as the Neoclassical economic agent but as a richly-complex being—and as a citizen ideally in a democratic world that does not yet fully exist and as a much less destructive inhabitant on the one planet where the very idea of “life” seems to have found form. I personally find the legacy of John Dewey helpful here—in his idea of democracy as learned habits of mind and personal behaviors, not just

institutions, and in his theorizing about “education for democracy”.<sup>11</sup> There are a plenitude of others to name, and perhaps a project to be taken up would be to catalog and annotate those names .

A quick summation: I’ve not tried to conceptualize an “economics of biophysical limits” for a pragmatic reason. That such an ideational structure, somehow anchored in a “objective scientific discourse”, might be possible is true but uninteresting because I frame the challenge ahead in political terms with multiple interlocking yet sometimes competing aims such as “greater equality”, “justice”, “community”, “humility”. Those values—differently understood at different times by different peoples nonetheless recur stubbornly despite their ambiguities. They have the advantage of being better understood and embraced by more people than any imaginable “economics of biophysical limits”.

It may be that time is running out on us as a species—and certainly there is gathering evidence for that intuition. But I’m disinclined to the apocalyptic, and stubbornly appreciative of a rhetoric grounded in the aims I’ve just listed.

To the degree that would-be economists are willing to embrace the role Keynes suggested we should—that of the dentist, and not the physicist (or metaphysician), I think we can make a real contribution to slowing the currents of the river we’re now on.

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<sup>11</sup> <https://plato.stanford.edu/entries/dewey-political/>

# Towards a relational economics

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## 1. Introduction

The question posed is: *How can we construct an economics consistent with the biophysical limits to economic growth?* By this I assume is meant an economics that concerns itself with how human economic activities can be carried through in a manner such that we all can live well without doing irreparable harm to the biophysical environment in which we live. As the organisers of this collection suggest, being able to address this issue in a relevant manner will likely require a significant change in the fundamental tenets of the economics discipline itself.

My (necessarily limited) proposal here is that, as part of that required significant change in fundamentals, economists concern themselves in an essential manner, certainly more than is currently the case, with *social relations*. It is vital to recognise that most social phenomena are relational in nature, so that an economics that can have any relevance, including one that seeks to make proposals consistent with avoiding severe damage to the biophysical environment, will be attuned to the relational nature of all that goes on.

Of course, social phenomena possess other significant properties too, not least those of being contingent, generated in systems that are open not only in the present but to the future, and so appear typically not in regular sequence but as parts of (cumulative) causal processes that can stretch or endure over time in non-predetermined ways (see e.g., Lawson, 1997, 2003, Lawson and Morgan, 2021a). But it is the relational aspect of all this (and so relations that are necessarily in process, being reproduced and transformed through our activities) on which I focus here.

I set out my argument in a number of short sections where I cover 1) how social relations and relational phenomena emerge through processes of *social positioning*, rendering social relations all-pervasive, 2) how (academic) economics as traditionally practiced needs to change to accommodate the analysis of social relations, 3) the bearing that the sorts of social relations in question have on social life, not least on the possibilities for human flourishing, 4) the need there is for a critically oriented (relational) economics, and also 5) the implications the current relational situation has for the content of an economics concerned both with relevance and with moving the economy forward in an environmentally sustainable or responsible fashion coherent with facilitating human well-being.



## 2. Social positioning

Most social phenomena are in fact constituted as *components* of human *communities*. The process of component construction is as follows. Community *positions* comprising *packages of rights and obligations* are created and persons and objects are allocated to them, the result being community components. In the case of *person positions*, the person occupants of each one can themselves access the rights and obligations that constitute the position, where these bear upon allowed, required or disallowed *ways of acting* of the components so formed. In the case of *non-person or object positions*, the rights and obligations that constitute each position are accessed not by the position occupants of course, but by various person components in the same community. Indeed, an object position consists of a *subset* of those rights and obligations that constitute person positions in the same community, namely those that determine the allowed, required and disallowed *uses* of the object component associated with the object position in question in the relevant community. It is through such positioning processes, then, that community components such as teachers, students, nurses, tickets, passports and pedestrian crossings are constituted.

Each right (obligation) that is part of a package that comprises a person position is matched to an obligation (right) also part of a package comprising a (typically different) person position. These matched right/obligation pairs are social (power-over) relations. The (component) wielder of a right has *power over* the one with the matched obligation. Rights and obligations are positive and negative *deontic* powers. So, all community components are formed by positioning persons and other entities, that is by placing them in social relations so that components formed are seen to be relational in nature.

It is a mistake, then, to view the essential properties of social entities, at least those that are community components, as intrinsic to the items that come to occupy positions. Rather the essential properties of community components are the positional relations that determine their legitimate actions and uses (for an extensive elaboration of all this see especially Lawson, 2022, but also 2023a, 2023b, and Lawson and Morgan, 2021b).

Thus, a chairperson at a seminar usually possesses and exercises the right (a positive deontic power) to determine who asks the next question, and more generally the order of speaking at the meeting. However, the person X occupying the position of chairperson would likely be in a lot of trouble if he or she, etc., seeks to act in a similar fashion away from the seminar. The rights in question belong only to the relational component that is the chairperson of the (community that is the) seminar, not to the person X who contingently occupies the position. In similar fashion, the community uses of a (relational) community entity like money are determined by associated social relations (matched right/obligation pairs) that constitute the money position and are not intrinsic to the kind of thing (a form of bank debt, or a kind of commodity, a type of precious metal, or whatever) that contingently occupies the money position (see Lawson, 2022).

So whatever other properties social phenomena may possess (and amongst other things, to repeat, they are in continuous transformative process) community components, which comprise most social phenomena, are relational through and through. Even *non-social* phenomena and (social) human *artefacts*, both of which are determined in kind (that is, as the sorts of things they are instances of) independently of processes of community positioning, have to be socially positioned to be made use of in the community, and so are thereby formed into social relational components. Thus, books are (positioned in a manner as to be) formed into commodities, or into library, or privately held, books, buildings are positioned as, say, hotels or churches, and metals

like gold may even be positioned to form money. Relationality is ultimately the mark of everything that figures in community life, that is in human social life.

In fact, all geo-historical forms of societies or communities can be characterised precisely by the sorts of (historically specific) social relations that prevailed and were constitutive of the types of (community) components that have manifested<sup>1</sup>.

### 3. Immediate implications

But so what? Well, for starters, if the foregoing is correct, it follows that most of contemporary economics ought really to be ditched. For the vast majority of contributions rely on methods of a sort that, to have any relevance, actually *necessitate an absence of operative relations*.

I refer, of course, to the widespread and seemingly unceasing reliance on methods of mathematical modelling in economics. These are everywhere adopted in an *a priori* fashion despite their failure so far to generate new insight. Such methods, to recall briefly, are appropriate only where the objects of analysis act in the manner of isolated atoms. For, in order that the methods can be successfully wielded in some domain there must be patterns or correlations of the generic form 'whenever event X then event Y' occurring in that domain. But this in turn requires that in the relevant domain there are factors that (are atomistic in the sense that) in repeated given conditions X they always act in the same way Y, and that there is nothing else going on to prevent Y from being realised. The latter requirement means that the causal factor(s) producing Y is(are) isolated from other causal phenomena. Clearly a causal factor cannot be isolated where it is constituted in relation to other phenomena. So, the relationality of real-world social phenomena is itself sufficient to explain why it is that the project of economic modelling has supplied no insight after so many decades of trying. (In addition, of course, the processual nature of social phenomena undermines the presumption of fixity of causal responses, of causal factors acting like atoms).

If social phenomena are found to be relational in nature, meaning there is (ontological) depth to social reality, then the goal of seeking correlations with the hope of making predictions is reasonably replaced by that of causal explanation (an approach that figures centrally in most other disciplines, [as in moving from, say, symptoms of an illness or a puzzle to the virus or agent or whatever responsible]). That is, instead of endlessly pursuing correlations amongst surface phenomena like events and states of affairs – where the failure of this enterprise so far is a clear sign that social reality is open (that situations in which social event regularities occur are rare at best) -- the relevant concern is with identifying the (ontologically) deeper phenomena of social relations that underpin and are causally responsible for the phenomena of experience, and through which we organise our lives.

Given that most things that happen in the social realm involve human activities, social explanatory endeavour of relevance will be especially oriented to *accounting for human activities of interest* (say those bound up with crises, oppression, discrimination, environmental damage, caring,

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<sup>1</sup> Thus, community relations (consisting in matched rights obligations pairs) have constituted human persons as feudal lords and vassals, landlords and serfs, kings and queens, cooks and cleaners, and members of castes, etc. And they also constitute us as owners of the means of production, bankers, all other forms of wage laborers, military commanders, etc. And they constitute physical items as not just money, but as cheque cards, cash, tickets, passports, pedestrian crossings, forms of capital, types of military weaponry, etc.

reducing economic harms, emancipatory successes) in terms of the (underlying deeper) relations that render them feasible (and in that sense are causally responsible).

#### **4. Biophysical limits and wellbeing**

Of course, the question to be addressed here is about more than how to achieve an economics that is once more capable of providing real-world insight. It is also, and especially, about how we intervene in the world, and in particular is about finding, or facilitating, ways for human activities to proceed without our doing irreparable damage to the biophysical environment. But it is additionally, or ought to be, about even (and much) more. For the point of any interventions of this sort is to improve or safeguard the well-being of humans and other species. Certainly there is no point, or at least far less point, to considering how to avoid damaging the biophysical environment if we do not actually care how human beings and other species fare anyway.

So, in order to go further in addressing the question posed, more ontology -- that is more enquiring into the *natures* of the kinds of things with which we are concerned -- is unavoidable. In particular, if we are to make interventions, we need to be knowledgeable of the nature of the materials involved (social and non-social) so that we may act on them in appropriate ways (regarding social phenomena there is no point in treating complex relational social structures as if they have the properties of isolated atoms), and we need especially to understand the natures of all those species including human beings that any interventions are intended to benefit.

Economists traditionally claim that such matters are not their concern. But just as it is the case that when they adopt methods of modelling, these economists are implicitly (doing ontology by way of) making commitments to a particular conception of the nature of social reality (that it consists of systems of isolated atoms), so when they advance policies supposedly designed to achieve growth, low inflation, lower unemployment, and the like, they are (once more doing ontology in) supposing in effect that the *natures* of human and other species are such that economic growth etc., are always good for them. And, just as the implicit presuppositions involved with method choice are easily shown to be inappropriate when examined (explaining continuing modelling failures) so those that underpin these economic objectives (such as the presumption that growth is always good for us) are generally seen to be misguided when examined.

#### **5. Human responsible flourishing**

So, what is human nature? *If* we suppose there is no such thing, that there are no natures to anything including human persons, and some do, then there is no point to the exercise anyway. For, if there is no way in which an entity of any sort can be true to, or fulfil, itself, that is, be authentic, then there are no conditions that allow it to thrive according to the sort of thing it is. Then any conditions for it are as good as any other.

Human beings I have elsewhere argued, do clearly have capacities and needs that make up their nature, and so are capable of flourishing (see especially Lawson 2015, but also 2023a). But it is also evident that human persons have both some needs in common (for example to enter capably into social being, to acquire language, etc), as well as some that are not (those related to different ages, sexual orientations, biological features, cultural upbringings, etc.). So, the goal must ultimately be to bring about a world in which we all (and other species too) can flourish *in our*

*differences*. This includes, of course, seeking a conception of a world of this sort that is shaped to fit with what is possible given (not only the nature of facilitating and delimiting social relations but also) the limits set by the planet's biophysical nature. So, to put it more succinctly the goal is a world in which we all can flourish *responsibly* in our differences.

Clearly any specific proposals for economic or political interventions require more to be said about (the obviously contested matter of) specific human needs or aspects of flourishing than I can possibly address in a short note such as this. But one feature that I have argued for repeatedly elsewhere (as part of an account systematised as *critical ethical naturalism*) and emphasise here is the assessment that the flourishing of each of us depends on the flourishing of all others (and other species), and at some level we all know this to be the case (see e.g., Lawson, 2015, 2017, 2023a, Martins, 2017, Ragkousis, 2023). So, at some level we all, or most of us, will the flourishing of all others. This feature takes the form of an ever-present disposition, a tendency in all or most of us, to care for others (albeit one that is continuously counteracted to a degree by other factors); and it explains why in a world dominated by ideologies of greed, selfishness and othering, along with processes of dumbing down, misrepresentation, manipulation, and deceiving, we somehow still act as caringly to each other as much as we do, which for most of us most of the time is significantly.

If I am half correct about this, it means that in order to flourish fully and responsibly we need to work towards a world of generalised caring, giving and cooperating, supporting a world of harmony, love, peace, kindness and such like (away from one that is oriented to discrimination, oppression or feeding greed and other misguided ambitions). And, of course, any actions taken towards achieving these ends must themselves be caring and generally consistent with these same ends.

## **6. A critically reflexive economics**

But what does 'working towards' such a world involve for a reoriented economics specifically? I have emphasised that we are human persons in relations. As human persons we, most of us most of the time, I have also suggested, reveal a disposition, a continual tendency to act in ways that are caring, that move us in the direction of a world of generalised human flourishing in our differences. But it is the social relations through which we exist and act as social beings that make the difference; these can be facilitating of such tendencies, or they can act as obstacles.

If this is right, then an economics that has any relevance will be *critical in nature*, being, amongst other things, concerned with identifying the causes of social harms and oriented to determining whether relations revealed in causal explanatory endeavour are consistent with generalised and responsible human flourishing, *critiquing* (including suggesting ways of transforming or replacing) *those that are not*. Just as in medicine the uncovering of the causes of symptoms leads automatically to the question of whether the causes are harmful to the patients and/or others and should be removed, so the same can and should apply to social relations uncovered in an economics of relevance. So, for an economics to contribute to achieving a world of harmony, etc., of generalised human flourishing, is for it to be oriented fundamentally to *explanatory critique*, with social relations the primary focus.

## 7. Growth, accumulation and money, etc

And under the current system it is clear that the relations that prevail are very often by their nature harmful to persons, the environment, or both. It is evidently the case, for example, that harm has long been, and continues to be, done through forms of gender relations -- which usually ensure that one gender sub-group (typically that of men) is able to discriminate against, oppress, or in some way benefit at the expense of other subgroups -- through (oppressive) race relations, and through (discriminatory) immigrant and citizen relations and so on. Here, though, the major disparity to pull out (given the initial question posed) is between human needs and the conditions of responsible flourishing on one side, and, on the other, the nature of social relations of specifically *processes of production* (including distribution).

In particular, relations of the sort that prevail (or the more fundamental ones) ensure that the means of production are owned by the few, and that these owners are consequently served by the many in the task of generating a surplus for the former. Competition compels the owners (whatever their preferences and concerns) to keep accumulating in order to survive as capitalist producers, which for many at least means endlessly seeking growth, ways to increase productivity, of acquiring additional, cheaper inputs, especially of forms of energy, perhaps ways, too, of masking, or avoiding responsibility for, harmful side effects of the production processes, or of exploiting any discriminatory gender or other relations as exist in relevant localities, ways of making consumers want both more and different sorts of things whether they are needed or not, and so endless waste, and so on. At the same time, most of the rest of the community have to serve as wage labourers in order to survive at all, and to do so in ways whereby most necessarily receive but a fraction of what they contribute, certainly of the value of the final product, and, like the environment, are regularly irreparably damaged in the process.

Meanwhile developments in technology that have the potential very often to benefit humanity (if significant resources were to be devoted to their development), even to do away with the need for human persons to work (certainly to work for others, or in order to survive, and in ways that are harmful), are instead, or first and foremost, shaped (along with wants) in ways that serve (not to meet generalised human needs, but) to produce a larger (or to maintain a) surplus, or, given the existing *relational* world order, to create ever more harmful instruments of warfare, spying, people control, and such like (often financed by the State). Within production itself, innovations are in large part devoted to intensifying the various processes as producers endlessly pursue ever more novel ways to ensure they remain competitive in the face of pressures on all to so innovate, with each producer knowing or expecting that others will do so. And so on. In short, it is the social relations under which production occurs and technological 'advances' are shaped and used that (though they are never fully determining of what happens, are themselves always potentially subject to some modification in the light of technological innovations, especially in their less fundamental features, and always require mediation to impact at all) make the difference.

Much of all this turns ultimately on the fact and uses of (the social relational entity that is) money. Just to eat, or to consume in general, means acquiring (items in the relational form of) commodities, where these can be obtained only by paying for them with money. So, most participants are absorbed in the pursuit of money just to carry on existing, that is surviving, as they are. The system thus keeps churning on, with the majority of people caught up in it.

At some level most participants know that carrying on 'as normal' is in many, if not most, situations both harmful to others and leading to planetary disaster, and many offer resistance where they

can. But most, most of the time, are consumed with their own survival and feel impotent anyway in the face of the relational forces that everywhere confront them. So, processes oriented to accumulation and derivatively achieving growth continue endlessly onwards with limited opposition. Meanwhile dominant media outlets are themselves caught up in these same processes with their owners and their agents mostly supposing their own survival (as owners and their agents) are best served through encouraging the view that the pursuit of greed, power and wealth, output and productivity growth, and generally the maintenance of the status *quo*, is somehow good for us all.

## 8. Moving forward

All this is to say that if generalised and responsible human flourishing in our differences is the goal, social relations of the sort that prevail under contemporary conditions must be recognised as significantly incompatible with it. They, many at least, are in large part obstacles to emancipatory advances and warrant being transformed or replaced. This is a simple inference, though obviously achieving the sorts of transformations that are needed will not be easy. But prioritising anything else is short-term amelioration at best, and likely to serve as a distraction. This is the pattern of the past. But for an economics that seeks relevance, to repeat, such issues, and specifically identifying the relational obstacles to generalised responsible flourishing and formulating strategies for transforming or absenting them, ought increasingly to be a focus of study. No doubt, the sorts of questions and issues that come to the fore to be addressed thereby will often be difficult to handle, requiring thinking outside the box. But this is the situation that obtains in all sciences. And as in all other sciences, anticipated difficulties and challenges is not a good reason to give up or to look elsewhere.

Perhaps some concrete suggestions for questions to address are required. One such question is how wants can be shaped and satisfied in ways that are consistent both with meeting real needs and with respecting the biophysical limits of the planet. This question, of course, is being addressed all the time to an extent, but within relations of the noted sort, and with limited success. Another such question I suggest is do we really need money. Personally, I cannot imagine how *either* the conditions of generalised flourishing, *or* simply staying within biophysical limits of the planet, can be achieved in world where money and its pursuit remain the central organising factors. Another is, do we really need the relational entities that are corporations. These are community entities constituted (relationally positioned) as legal persons, that is, are treated in law as having many of the rights and obligations that were intended only for (they stand in the same social relations as) human persons. These allow corporations to get away with creating untold planetary damage, not least through (parent) corporations creating subsidiary corporations, of which they own all their shares, but for which, like human shareholders, they have 'limited liability' when harm is done. (This creates the incentive for parent companies to direct their subsidiaries to act however they wish, knowing that these subsidiaries can be simply wound up when they are in trouble, without the parent company being held to account or even the feasibility of being punished in the manner that human persons can be. [See Lawson, 2019, chapters 3 and 4]). Another is whether the creation of *care* (or '*eudemonic*') *bubbles* or *communities of care* that allow flourishing along one limited set of axes at least (as with some families, refuges, even some study groups, many other support networks, the UK NHS systems as they were when formed etc.), are widely viable, and where they are whether they constitute a step towards (or even sometimes an obstacle to) conditions of generalised responsible flourishing (see e. g., Lawson, 2017, 2019, chapter 8). The most important question of all in my view is how we all can be enabled and encouraged to be ever



more critically aware (not least of the sorts of caring beings we really are, and of the more fundamental relational factors that underpin most harms we produce) and (where feasible and relevant) active. But most controversially of all, perhaps, economists ought to consider the issue of human population growth, and whether it is not the time to conceive of ways of reining it in. I suspect there are already too many people on the planet for all to flourish fully, certainly to do so without simultaneously damaging a multitude of other life forms, and much else. This may not immediately appear to be a relational issue. But it is existing relations that create the conditions (like the need to have a sufficient number of younger workers to generate the means to (re)fund pensioners, or to preserve a system of competition based on a majority serving the few) that lead so many governments of national communities and other commentators endlessly encouraging community participants to further procreate, etc.

## 9. Final comments

As a final comment it warrants stressing that an essential feature of proceeding in a relevant way in an open complexly relational system is that few developments can be planned in much detail in advance. *There can be no blueprint*. The best we can do, normally, is identify, and devise strategies for overcoming, obstacles that lie in the path to a world of generalised responsible flourishing in our differences -- this being a task in part for a relevant economics -- and then to set about continuously removing or appropriately transforming them (including absencing any debilitating absences), thereafter examining the possibilities for greater flourishing that emerge along the way, in a continuous iterative process.

I fear, though, that many economists, even some that present themselves as radical thinkers, are too caught up in their own survival (or promotion ambitions, etc.) in the academy to move in a direction of any relevance. The convenient, often seemingly compulsory, recourse is to stay on the safe and (in truth far too) easy (if seemingly impressive to the non-mathematical) path to nowhere that is economic modelling. Already numerous self-styled heterodox economists of recent years have reverted to it. No doubt new models will be *presented* as different, radical and relevant. But how could they be relevant? If the ontological presuppositions are as wide of the mark as I have suggested, they simply cannot provide novel insight. This of course applies as much to models interpreted as concerned with degrowth, post-growth, steady-state economies, local and regional economies, complexity, general well-being or whatever. The current emphasis on modelling, rather, is one of the obstacles to be transcended if we are to (achieve a discipline capable of contributing to determining ways to) move towards a world of generalised responsible flourishing.

Relatedly, it can also be something of a distraction to devote significant resources to supplementing or even seeking to replace existing economic indicators like GDP by (well-motivated) constructions such as well-being measures, or resource-use measures, *if* all are based on assumptions that are as untenable as those used to fabricate existing aggregate economic measures. For not only is a reliance on them itself a questionable activity (given the manner of their construction), it is likely to further divert attention from factors that really do matter but are very obviously not measurable, including the social relations that govern (render possible and set limits to) all activities.



In any case, do we not all already know simply from everyday observations and experiences that access to the resources of the world is massively unevenly distributed, that most people on the planet are suffering and unnecessarily, that the planet and its climate are being continuously harmed, and the world's resources are continually being wasted? Does producing new 'measures' that allow the creation of novel (sorts of) diagrams and such like really help take us far forward?

What is less well recognised or considered is that the problems we have lie in, or stem from, the very manner, the *kind of way*, in which our economic and other activities are most fundamentally *organised*. In a word, the goal, if we are not to destroy the planet fairly soon, can no longer be (just) an amelioration of events and states of affairs, but deeper-structural, social-relational, that is social-organisational, *transformation*. Fundamentally we ought to be seeking to remove or to appropriately transform those relational structures (largely consisting in harmfully formulated positional rights and obligations) that constitute *obstacles* to a world in which we all (and other species) can flourish in our differences within the limits of the resources available. How we all choose to live as and when, or if, such relational obstacles are removed or appropriately transformed is not something anyone can (or should want) to predict and/or control but can be determined only as we go along.

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## Putting energy back into economics

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Human society is energy blind. Like a fish in water, it takes for granted the existence of that without which it could not survive.

As with so many of humanity's problems, this conceptual failure can be traced back to an economist. However, the guilty party is not one of "the usual suspects"—Neoclassical economists—but the person virtually all economists describe as "the Father of Economics", Adam Smith.

Smith led economics astray on the vital issue of energy in the very first sentence of *The Wealth of Nations*, when he stated that:

THE annual *labour* of every nation is the fund which originally supplies it with all the necessaries and conveniences of life which it annually consumes... (Smith 1776, p. 10. Emphasis added)

I emphasize "labour" in that sentence because, apart from that word, it is virtually identical to the opening sentence of Richard Cantillon's *Essay on Economic Theory*, which was published two decades before *The Wealth of Nations*:

*Land* is the source or matter from which all wealth is drawn; man's labor provides the form for its production, and wealth in itself is nothing but the food, conveniences, and pleasures of life. (Cantillon 1755, p. 21. Emphasis added)

With that one word altered, economics took a terrible lurch away from realism and into fantasy. Cantillon's insight was that what existed before Man and outside human society—let alone outside "the economy"—was the source of the material wealth we generate within the economy. Smith's substitution saw an action within the economy itself—the work of the labourer—as the source of value, and the division of labour over time as the source of its growth.

Cantillon's perspective, that wealth originated outside the economy—though the form wealth took was shaped within it—was correct, according to the incontrovertible Laws of Thermodynamics (Ulgiate and Bianciardi 2004; Eddington 1928, p. 37). Smith's perspective was wrong, because he contemplated that the closed system of the economy could produce more outputs than inputs over time. This wasn't known to be false until a century after *The Wealth of Nations*, when the Laws of Thermodynamics were developed, so Smith cannot be criticised for that mistake. But economists today should not persist with models of production that violate the Laws of Thermodynamics.

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<sup>1</sup> [www.isrs.org.uk](http://www.isrs.org.uk)

From the First Law, that energy is conserved, we know that there cannot be a surplus of outputs over inputs. From the Second Law, that energy degrades when used to do work, we know that order declines over time in a closed system—which the economy, considered in isolation from the environment, is. So, even worse than “no surplus”, there is “more disorder”: the economy, considered in isolation from the environment, must degrade rather than grow.<sup>2</sup> To explain the economy, we must start from a flow of energy from the environment into the economy, and end with waste that must be dumped back into the environment, as a consequence, not merely of growth, but of any economic activity whatsoever, whether the economy is expanding or contracting.

Classical and Neoclassical economics developed in ignorance of these Laws, and therefore developed in ignorance of the role of energy in production. Marshall used the term “energy” 79 times in the foundational text for Neoclassical economics, his *Principles of Economics* (Marshall 1890 [1920]), but always to describe human initiative and action, and not once in the thermodynamic sense. Energy, which should be front and centre in the economic analysis of production, instead disappeared from view.

### **Neoclassical Economics—the Cobb Douglas Production Function**

Cobb and Douglas, when they developed the now dominant Neoclassical model of production, considered only Labour and Capital as inputs—though they did state that “we should ultimately look forward toward including the third factor of natural resources in our equations and of seeing to what degree this modifies our conclusions” (Cobb and Douglas 1928, p. 164). That was never done. Instead, after an initially rocky reception, the Cobb-Douglas Production Function (CDPF), with only Labour and Capital as inputs, became the accepted model of production for Neoclassical economists.<sup>3</sup> The reason for its acceptance was neatly expressed by Robert Solow when he quipped to Franklin Fisher that:

had Douglas found labor's share to be 25 per cent and capital's 75 per cent instead of the other way around, we would not now be discussing aggregate production functions. (Fisher 1971, p. 305)

Cobb and Douglas found that result by fitting the function shown in Equation **Error! Reference source not found.** to index number data, which they had laboriously assembled from Census data and an established index of manufacturing output (see **Error! Reference source not found.** in the Appendix). In Equation **Error! Reference source not found.**, P stands for manufacturing output, L and C for employment and capital respectively in manufacturing, and b is a constant:

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<sup>2</sup> Georgescu-Roegen gives a very accessible definition of both energy conservation and entropy: “In an isolated thermodynamic system the available energy continuously and irrevocably degrades into an equal quantity of unavailable energy, so that the total energy remains constant while the unavailable energy keeps increasing up to a maximum.” (Georgescu-Roegen 1993, p. 187)

<sup>3</sup> Computable General Equilibrium (CGE) models are an obvious exception, with their input-output tables for production, but over time these have become relics in Neoclassical modelling, with the Cobb-Douglas Production Function (in raw or CES—“Constant Elasticity of Substitution”—form) reigning supreme in the era of DSGE models.

$$P = b \cdot L^k \cdot C^{1-k} \tag{1}$$

Their regression returned the result shown in Equation **Error! Reference source not found.**:

$$P' = 1.01 \cdot L^{3/4} \cdot C^{1/4} \tag{2}$$

They reported an extremely high correlation coefficient, not merely for Equation **Error! Reference source not found.**, but for what they described as the data “with trends eliminated”:

The coefficient of correlation between  $P$  and  $P'$  with trends included is .97 and with trends eliminated is .94. (Cobb and Douglas 1928, p. 154)

This implied a high level of robustness for their result, but this is not the case. The results and high correlations for the absolute value data are correct, but as Samuelson later observed, this was largely due to the collinearity of the data (Samuelson 1979, pp. 929). However, their stated results for the “trends eliminated” data are an artefact of their method of de-trending, which was to analyse the three-year moving average. When annual changes are used, the results are disastrous: the coefficient for  $a$  is negative (and, for what it’s worth, the  $R^2$  is much lower)—see **Error! Reference source not found.**

**Table 1: Parameter values and  $R^2$  from the Cobb-Douglas index data, and annual fractional change in the data**

Economists, data & assumptions	Functions	Fitted values	$R^2$
1. Cobb-Douglas original data	$P = b \cdot C^a \cdot L^{1-a}$	$b=1.02, a = 0.25$	0.94
2. Cobb-Douglas change data	$DP/P=a \cdot DC/C+(1- a) \cdot DL/L$	$a=-0.15$	0.66

The results are similarly bad when modern data is fitted—see **Error! Reference source not found.** in the Appendix for the Penn World Tables data for the USA from 1950 till 2019 (Feenstra, Inklaar, and Timmer 2015) and the fractional annual rate of change. The results from fitting the CDPF to this data are shown in **Error! Reference source not found.** and are similarly disastrous for Neoclassical theory. A fit of the CDPF to aggregate data returns an  $\alpha$  of 1.24, which heavily weights Capital’s contribution to output, and gives Labour a negative weight. The annual rates of change data generates a value for  $\alpha$  which is less than 1, but also “wrong”, in terms of the Neoclassical theory of income distribution: it attributes 71% of the change in output to Capital and only 29% to Labour. This may in fact be more realistic, but it conflicts with distribution of income data, and therefore with Neoclassical theory. As Solow said, had Cobb and Douglas returned results like these, Neoclassical economists “would not now be discussing aggregate production functions”.

**Table 2: CDPF fitted to PWT data for the USA from 1950 till 2019**

Data	Functions	Fitted values	R <sup>2</sup>
3. PWT rgdpna, emp & rna	$P = b \cdot C^a \cdot L^{1-a}$	b= 0.013, a = 1.24	0.997
4. Annual change fraction PWT	$DP/P=a \cdot DC/C+(1-a) \cdot DL/L$	a = 0.71	0.29

### Rescued by Solow’s Residual

However, Neoclassical economists were saved the embarrassment of encountering these results by Solow’s introduction of technical change into the CDPF. His intentions were laudable, but to achieve his objective he had to add two assumptions—that the exponents in the CDPF were the marginal products of Labour and Capital, and that these were equivalent to income-share data:

The new wrinkle I want to describe is an elementary way of segregating variations in output per head due to technical change from those due to changes in the availability of capital per head. Naturally, every additional bit of information has its price. In this case the price consists of *one new required time series, the share of labor or property in total income*, and *one new assumption, that factors are paid their marginal products*. Since the former is probably more respectable than the other data I shall use, and since the latter is an assumption often made, the price may not be unreasonably high. (Solow 1957, p. 312. Emphasis added)

Of course, Neoclassical economists were more than willing to pay this “price”, since it was to assume that their theory of production and of income distribution were both correct, and consistent with each other. They could then derive the contribution of change in technology from the difference between change in GDP and change in the two income-distribution-weighted “factors of production”. From this date on, the exponents in the CDPF were not derived from empirical data, but were simply assumed to be correct, and equal to the shares of Labour and Capital in income distribution data—roughly 1/3<sup>rd</sup> for Capital and 2/3<sup>rd</sup>s for Labour (Solow 1957, Table 1, p. 315). Variation between changes in output and the weighted changes in inputs was attributed to “total factor productivity” and measured by “the Solow Residual”. The fact that, in Solow’s initial paper, 87.5% of growth was attributed to technical change, and only 12.5% to changes in the factor proportions of Labour and Capital, was only moderately embarrassing. Subsequently, Neoclassical economists have since simply assumed that their models of production and distribution are correct, and the coefficients of the CDPF have altered from flawed empirical findings to unquestioned theoretical assumptions.

All of this was without considering energy: to this day, the vast majority of Neoclassical models of production consider only Labour and Capital as inputs. But when energy was considered by some Neoclassicals, it was accorded the same treatment: its exponent was set by its share in GDP, and this was assumed to be equal to its marginal productivity.

### The Power(lessness) of Energy?

Two of the very few Neoclassical papers that include energy in a production function and ascribe a numerical value to it<sup>4</sup> are (Engström and Gars 2016) and (Bachmann et al. 2022). The former uses an exponent of 0.03 and the latter of 0.04, in production functions of the form shown in Equation **Error! Reference source not found.**:

$$F(K, L, E) = K^\alpha \cdot L^{1-\alpha-\nu} \cdot E^\nu \quad (3)^5$$

Both made Solow's assumption that the share of energy in GDP is equal to the marginal productivity of Energy. This led Bachmann et al. to comment that:

Therefore, for example, a drop in energy supply of  $D \log E = -10\%$  reduces production by  $D \log Y = 0.04 \times 0.1 = 0.004 = 0.4\%$  ... [which] ... "shows that *production is quite insensitive to energy E as expected*" (Bachmann et al. 2022, Appendix, p. 5. Emphasis added).

The data begs to differ. **Error! Reference source not found.** and **Error! Reference source not found.** to **Error! Reference source not found.** show Gross World Product<sup>6</sup> against Primary Energy Supply<sup>7</sup> for the years 1971 till 2019. Far from production being "quite insensitive to energy",

$$\frac{\Delta Y / Y}{\Delta E / E}$$

as assumed by Neoclassical economists, the empirically derived value of  $\frac{\Delta E}{E}$  is 0.97, rather than the 0.03-0.04 value assumed by Neoclassical economists. Instead of production being "quite insensitive to energy", to a reasonable first approximation, production *is* Energy.

**Error! Reference source not found.** shows the coefficients for regressing GDP and change in GDP |(DY/Y) against linear equations for Energy and change in Energy (DE/E).

**Table 3: Regression of Energy against Gross World Product**

Data	Functions	Fitted values	R <sup>2</sup>
5. OECD Energy & World Bank GWP	P=a+b.E	a=3510, b = 0.14	0.99
6. Annual change fraction	DP/P=a+b. DE/E	a=-0.01, b = 0.97	0.7

<sup>4</sup> (Solow 1974b; Solow 1974a; Stiglitz 1974b; Stiglitz 1974a) include energy or resources, but do not provide numerical values for the exponents.

<sup>5</sup> Equation 4c in (Engström and Gars 2016, p. 546)

<sup>6</sup> <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>.

<sup>7</sup> <https://data.oecd.org/energy/primary-energy-supply.htm>.



Figure 1: Gross World Product and Energy Consumption over time

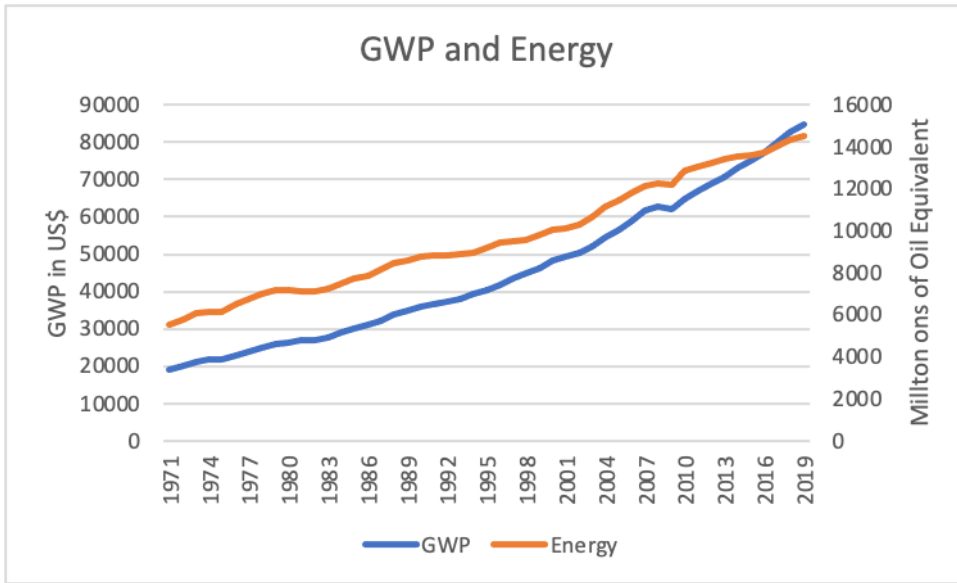


Figure 2: Energy vs GWP



Figure 3: Ratio of GWP in US\$2015 billion to Energy in MTOE from 1971 till 2019

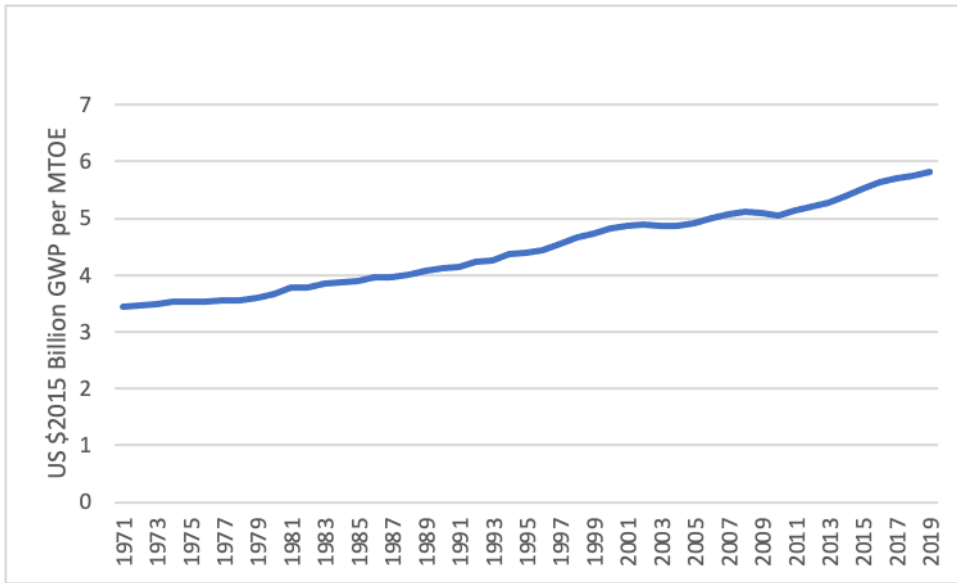


Figure 4: Change in GWP and Change in Energy in Percent p.a.

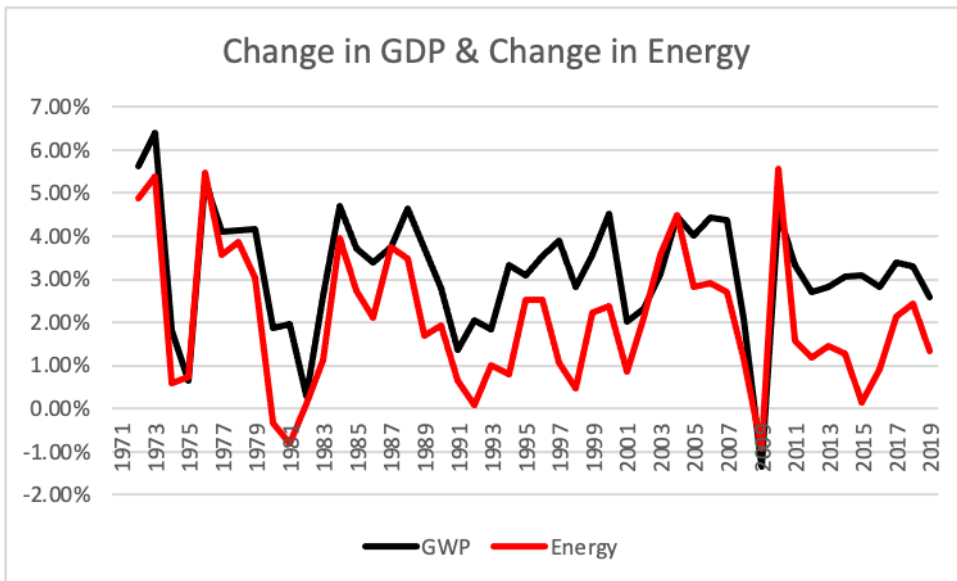
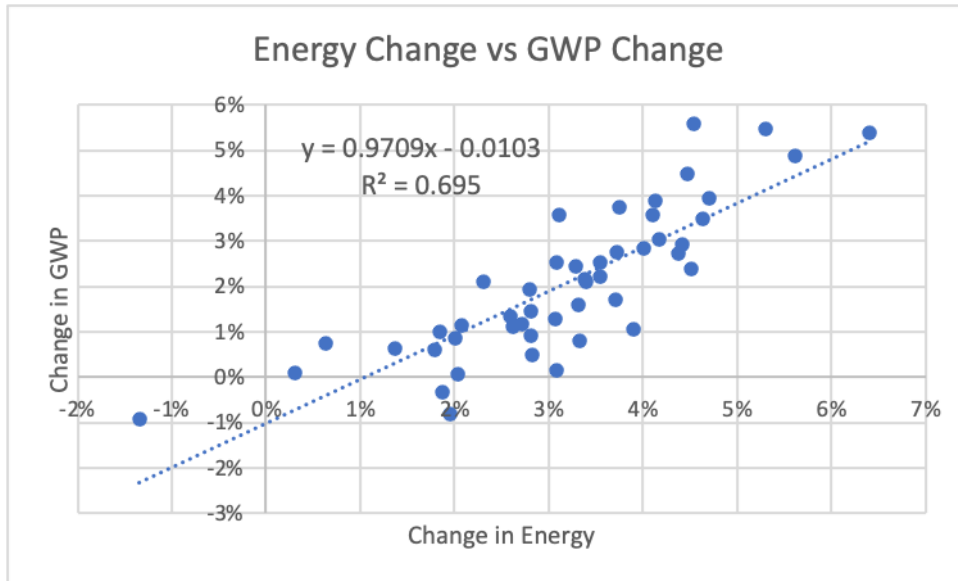


Figure 5: Correlation of change in Energy and change in GWP in Percent p.a.



This empirical data, as Bachmann et al. unintentionally show, is an effective refutation of the Neoclassical theories of production and income distribution, and confirmation of the Post-Keynesian theories.

They compare the polar opposites of the Cobb-Douglas and the Leontief in a CES production function, where the elasticity of substitution between inputs  $s$  for Cobb-Douglas equals 1 and that for Leontief equals 0. They correctly lay out the implications of the Leontief case, that:

Leontief production... implies that ...  $\Delta \log Y = \Delta \log E$  ... Therefore, if the elasticity of substitution is exactly zero, production  $Y$  drops one-for-one with energy supply  $E$  ... *Intuitively, the Leontief assumption means that energy is an extreme bottleneck in production: when energy supply falls by 10%, the same fraction 10% of the other factors of production  $X$  lose all their value (their marginal product drops to zero) and hence production  $Y$  falls by 10%.* (Bachmann et al. 2022, Appendix, pp. 5-6. Emphasis added)

They plotted the *theoretical* relationships between energy input and GDP output for different values of the substitution parameter  $s$  in their Figure 1 (reproduced as **Error! Reference source not found.** here).

Figure 6: Bachmann et al.'s theoretical predictions of change in output for a change in energy

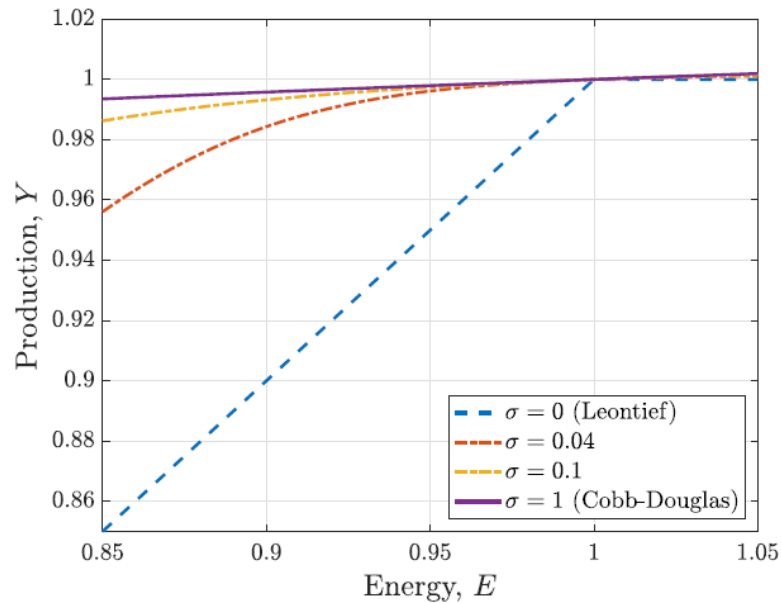


Figure 1: Output losses following a fall in energy supply for different elasticities of substitution

They then rejected the Leontief function, on the grounds that its prediction of a 1:1 fall in production for a fall in energy leads to nonsensical results *in terms of Neoclassical theory*:

**Extreme scenarios with low elasticities of substitution and why Leontief production at the macro level is nonsensical ...** The blue dashed line in Figure 1 showed that output falls one-for-one with energy supply in the Leontief case... *the marginal product of energy jumps to  $1/\alpha$  [their exponent for energy] while the marginal product of other factors ... falls to zero. If ... factor prices equal marginal products*, this then implies that similarly the price of energy jumps to  $1/\alpha$  and the prices of other factors a fall to zero... this then also implies that the expenditure share on energy jumps to 100% whereas the expenditure share on other factors falls to 0%. *We consider these predictions to be economically nonsensical.* (Bachmann et al. 2022, p. 15. Italicised emphasis added)

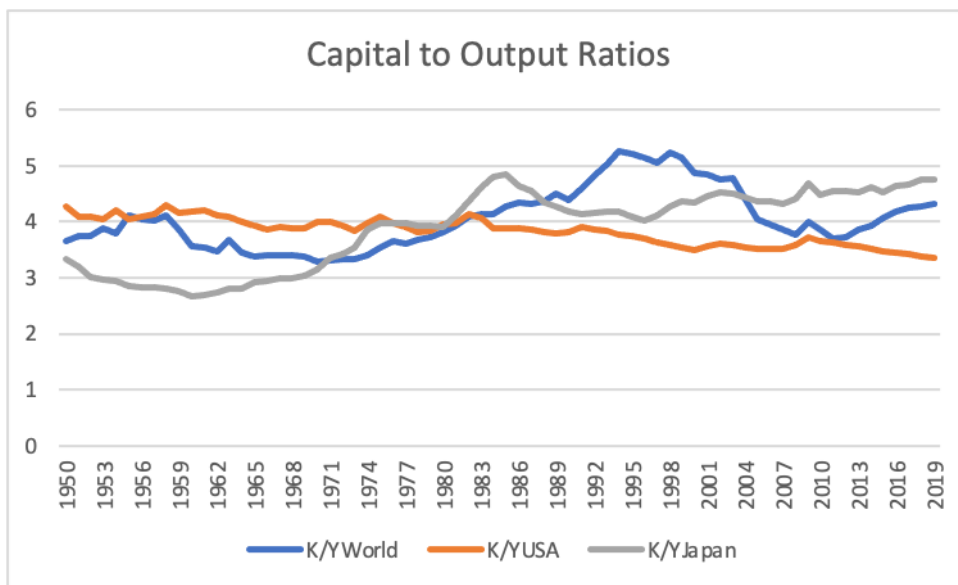
These predictions *are* nonsensical, but at the same time, *the Leontief case fits the empirical data* (which, following Solow's lead, they did not consult). It is not the data which is false, but the assumption they made that "factor prices equal marginal products". Therefore, wages, profits and the price of energy cannot be based upon the "marginal product" of labour, capital and energy respectively. The Neoclassical Cobb-Douglas model of production is false,<sup>8</sup> and the Post-Keynesian Leontief model of production is correct. The question now remains as to why the Leontief model is correct.

<sup>8</sup> This empirical critique adds to the logical critique made by Shaikh (Shaikh 2005, 1987, 1980, 1974) and McCombie and Felipe (Felipe and McCombie 2020; Felipe and McCombie 2014; Felipe and McCombie 2011; Felipe and McCombie 2007; McCombie 2000) that the Cobb-Douglas function is simply a nonlinear mapping from the income identity that Wages plus Profits equals Income, given the empirically realistic assumption of relatively slow changes in the distribution of income.

### From Empirical Regularity to the Role of Energy in Production

The Leontief Production Function began as an empirical regularity between GDP, however measured, and Capital, however measured. The ratio was relatively constant over time and showed no trend—see **Error! Reference source not found.** for Capital to Output ratios derived from the Penn World Tables database.

**Figure 7: Capital to Output Ratios are reasonably constant over time**



This led to the pragmatic Post-Keynesian school adopting the capital to output ratio as its “production function”, with the justification that this relationship was found in the data, but with no real explanation as to *why* it was found. Leaving aside the minimum form in which the LPF is often expressed but seldom used, we have, as in the Goodwin model (Goodwin 1967):

$$Y = \frac{K}{v} \tag{4}$$

Here  $v$  is the capital to output ratio. With  $K$  having the dimension of Widgets, and  $Y$  of Widgets per year, for dimensional accuracy,  $v$  must be a time constant denominated in Years.

The empirical regularity behind the LPF can be explained by the aphorism that Ayres, Standish and I applied in “A Note on the Role of Energy in Production” (Keen, Ayres, and Standish 2019), that:

labour without energy is a corpse, while capital without energy is a sculpture.  
 (Keen, Ayres, and Standish 2019):

This suggested that the inputs of Labour and Capital assumed by both the *CDPF* and the *LPF* should be replaced by the energy inputs to both Labour and Capital, via the substitution shown in Equation **Error! Reference source not found.**:

$$\begin{aligned} L &\rightarrow L \cdot E_L \cdot e_L \\ K &\rightarrow K \cdot E_K \cdot e_K \end{aligned} \tag{5}$$

Here respectively  $L$  and  $K$  stand for units of Labour and Capital,<sup>9</sup>  $E_L$  and  $E_K$  represent the energy consumed by a unit of Labour and a unit of Capital, and  $e_L$  and  $e_K$  are time constants (dimensioned by 1/Year) representing the proportion of these inputs that are turned into useful work over a Year. This then suggests a way to derive the *LPF* from the dimensionality of the substitution proposed in Equation (5). In the standard single commodity *CDPF* and *LPF*,  $Y$  and  $K$  are denominated in “widgets per year” and “widgets” respectively—units of a universal commodity that can be used for either investment or consumption:

$$Y \Rightarrow \frac{\text{Widget}}{\text{Year}} \tag{6}$$

The substitution in (5) on the other hand has the dimensionality of units of Energy per year:

$$K \cdot E_K \cdot e_K \Rightarrow \text{Widget} \cdot \frac{\text{Energy}}{\text{Widget}} \cdot \frac{\text{Scalar}}{\text{Year}} \Rightarrow \frac{\text{Energy}}{\text{Year}} \cdot \text{Scalar} \tag{7}$$

Call this  $Q$ , denominated in units of Energy per year, to distinguish it from  $Y$ , denominated in units of widgets per year:

$$Q = K \cdot E_K \cdot e_K \tag{8}$$

$Y$  is therefore equal to  $Q$  divided by  $E_K$ :

$$\begin{aligned} Y &= \frac{Q}{E_K} \\ &= \frac{K \cdot E_K \cdot e_K}{E_K} \\ &= K \cdot e_K \end{aligned} \tag{9}$$

Equating Equation (9) with Equation (4) shows that the empirically derived capital to output ratio  $v$  is in fact the inverse of the proportion of inputted energy that machinery turns into useful work:

$$\begin{aligned} \frac{K}{v} &= K \cdot e_K \\ e_K &= \frac{1}{v} \end{aligned} \tag{10}$$

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<sup>9</sup> Units of Capital raise all the issues in the Capital Controversies (McCombie 2001; Harcourt 1972), but this formulation also enables an empirically sound way around them.

This provides a physical explanation for the empirical regularity on which the Post-Keynesian model of production is based: it is due to the role of machinery in turning energy—predominantly fossil fuel energy—into useful work. This model therefore ties Post-Keynesian theory to the initial accurate insights of the Physiocrats, that Nature is the source of wealth, and that what human ingenuity does is enable the conversion of “this superfluity that nature accords him as a pure gift” (Turgot 1774, p. 9) into useful work. Given the close relationship between GDP and Energy shown in **Error! Reference source not found.** to **Error! Reference source not found.**, at a first approximation, GDP *is* useful energy. Equation (9) can therefore be used in place of Equation (4) in Post-Keynesian models.

Increased living standards over time can now be explained by the increasing quantity of energy  $E_K$  being consumed by (and turned into useful work by) the “representative machine” of any age. For an extreme comparison, Energy per machine has risen from the roughly 30 tons of coal per day that Watt’s steam engine consumed in 1776, to the 1,000 tonnes of methane consumed by SpaceX’s Starship in a single launch lasting under ten minutes.<sup>10</sup> This increasing energy consumption per head is the true basis of the increase in the Wealth of Nations.

The Post-Keynesian model is also consistent with the Laws of Thermodynamics, including the Second Law (which the Physiocrats did not realise) that doing work generates waste as well as desired output. With the capital to output ratio averaging 4 globally, and ranging between 3 and 5 for developed nations, the magnitude of  $e_K$  is of the order of 0.2-0.33. This then quantifies the waste generated in production as being of the order of 0.67-0.8: humanity generates more waste than output. The constancy of the capital to output ratio, much criticised by Neoclassical economists, is in fact due to the impossibility of substituting any other input for energy, and intrinsic limits to the efficiency of conversion of energy into useful work given by the Second Law of Thermodynamics.<sup>11</sup>

## Conclusion

The Neoclassical Cobb-Douglas Production Function, with its exponents assumed to be equal to the income shares of factor inputs, and also equal to the marginal product of those inputs, cannot be reconciled with energy data, or with the Laws of Thermodynamics, and it is therefore wrong.

The Post-Keynesian Leontief Production Function, on the other hand, is not only empirically accurate, but is also consistent with the Laws of Thermodynamics. Though the construction of a universal commodity in aggregate production functions has always been a convenience, the fact that GDP and Energy are so tightly coupled means that the LPF is a reasonable first approximation to reality. Solow’s observation that “As long as we insist on practicing macroeconomics we shall need aggregate relationships” (Solow 1957, p. 213) is correct, but the only aggregate production function that fits the bill is the Leontief Production Function.

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<sup>10</sup> See <https://www.energy-cg.com/NorthAmericanNatGasSupplyDemandFund/NaturalGasDemandMethaneFuelMuskStarship.html>.

<sup>11</sup> “It would be a mistake to think that the limits imposed by the conversion of heat to mechanical work are of a technical nature (i.e., are due to the unavailability of tools or cylinders and pistons without friction or perfectly sealed)... *it is a constraint imposed by Nature and not by the use of technically poor instruments.*” (Ulgiati and Bianciardi 2004, pp. 112-13. Emphasis added).



## Appendix: Data Tables

Please see here: <http://www.paecon.net/PAEReview/issue106/Keen Appendix106.pdf>

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# Against the clock: Economics 101 and the concept of time

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## 1. Introduction: the shit we're in

The question posed for this collection was 'How can we construct an economics consistent with the biophysical limits to economic growth?'. As any ecological economist is aware, this is a foundational issue not an afterthought chapter tacked on to the end of a textbook or delegated to a sub-disciplinary specialist who can 'deal with that for us'. Doing either of those has been part of the problem. Mainstream economics takes as its primary focus the microeconomics of price signalling in systems of market exchange and assumes efficiencies in dynamic market processes are sufficient to ensure best use of resources and eventual development of alternative ways of achieving what we want and need (through a combination of behavioural change, investment and technology). At the same time, the macroeconomy is conceived through a circular flow of income and targets continual economic growth. This implicitly equates health of an economic system (as a source of both progress and wealth) with continual economic growth (bigger is better rather than different can be good) and this growth is conflated with the possibility of solving problems created within the system, including environmental ones. Economic growth implicitly becomes the basis of solutions rather than merely source of the problems we see around us. This mirrors the basic socio-economic drivers of our dominant ways of living (the apex which others aspire to and which 'development' assumes is the way to go), capital-accumulating industrial-consumption economies presuppose growth and, government stabiliser policies notwithstanding, if growth fails to occur this is deemed a signal of crisis (and this remains the case despite the proliferation of alternative indexes of human development and wellbeing).

What is very obviously not foundational is the basic fact that an economy is a material-energy process on a finite planet involving metabolic flow and waste, that a bigger global economy observably outstrips any 'efficiency savings' to the extent that the biosphere has been profoundly altered and polluted. Environmental economics has taken its cue from mainstream economics. Its main focus has been relative scarcity rather than absolute scarcity, addressing market failures (taxes, subsidies and regulation to get the price right, altering behaviour while also working to induce market processes that promote technological transitions), and if there is no market, creating property rights and securitisable assets to essentially create synthetic markets (trading pollution and valuing nature for its preservation). All of this simply ignores the basic problem of socio-economic drivers, implicitly assumes technology will mainly solve problems and underplays the need to rethink how society and economy are organised – around a concept of 'a good life within planetary boundaries' and a concept of 'enough' (a different concept of 'abundance'). These are just not questions and issues either a mainstream economist or an environmental economist can meaningfully address within their skillset and framework of thinking (and this remains the case despite growing concern among world scientists regarding trends and

despite some limited progress at the annual COP meetings – in which issues like financing, just transition and so on have become legitimate subjects of discussion).

A future threat has become a present reality and ecological breakdown, climate change and erratic and extreme weather events are now all around us. We are only at 1.1-1.2°C of heating. Worse is yet to come and an avalanche of statistics makes it very clear that rhetoric has not yet translated into action with sufficient urgency. We are on the clock and time is against us.<sup>1</sup> This is obvious and there is some danger that a collection of essays focused on economics and biophysical limits to economic growth will provoke considerable duplication insofar as common sense (if not yet political sense or public consensus) dictates you cannot solve a problem unless you reorient theory and method to better explain and understand actual causes as a precursor to realistic (in the sense of what a liveable planet allows) solutions... With that in mind (the danger of duplication) I am going to take the concept of time in economics as my subject matter. This is not a digression or evasion. It is not 'beside the point'. How economists have conceived what happens in time is also a problem of how they have conceived of time. I say 'conceived', in fact there has been relatively little discussion of the adequacy of the concept of time in economics. Given the relatively strict word limit for these essays concision is required and I will be brief, the main point I am going to make is that the dominant concept of time is unrealistic and lacks an adequate focus on causal temporality – put another way, it lacks process and complexity.<sup>2</sup> This has two consequences, unrealistic theory of how things happen and inability to address within economics the big questions of what could happen (what we need to happen). So, for Economics 101, get the concept of time right and arguably everything else follows (or at least can follow)...

## **2. Two concepts of time: logical time and historical time**

Anyone familiar with standard undergraduate economics will be aware that the dominant treatment of time decomposes into statics, comparative statics and dynamics. In statics there is representation of variables and their relations but no explicit time (the archetype is the graphical representation of demand and supply with axes for price and quantity). In comparative statics two or more sets of positions of variables are overlaid (the archetype is a shift in demand and supply). In both statics and comparative statics formulas, functions and decision rules dictate the values variables take (typically built from axioms that determine what an agent does) and also determine how sets of variables interact (the archetype is a convergence on equilibrium). So, in the absence of time there is a presumption of *activity* necessary to determine an outcome (again, typically an equilibrium or jump from one equilibrium to another – a before and after). Statics and comparative statics are timeless yet time dependent. Dynamics in contrast introduces a time variable, a  $T_1$ ,  $T_2$  etc. However, this shares with statics and comparative statics some carefully defined formulation that determines the values (or range of values) taken at each point in time ( $T$ ) – functions, structural equations etc.<sup>3</sup> This is usually subject to the overriding assumption of convergence (again, archetypally an equilibrium which dictates movement and allows a solution) and/or manipulates the infinite future to facilitate a discounting process that dictates some determinable quantity at a particular point in time ( $T$ ) – though this may not

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<sup>1</sup> The idea of apocalypse of one kind or another is, of course, not new and there is a long list of end of the world predictions that have not come to pass, though it would be reckless to place the problem of anthropogenic climate change within his category. Visit: [https://en.wikipedia.org/wiki/List\\_of\\_dates\\_predicted\\_for\\_apocalyptic\\_events](https://en.wikipedia.org/wiki/List_of_dates_predicted_for_apocalyptic_events)

<sup>2</sup> A lot of what follows draws on the book I have been writing on and off (for over a decade) with Heikki Patomäki on time and economics. See also later references (and hopefully at some point the eventual book).

<sup>3</sup> Or at least defines pathways from which data is deemed to deviate – for example, an 'output gap'.

necessarily be deemed dynamics in the strict sense. Those familiar with economics will know numerous strategies are involved in the manipulation of time – assumptions of complete information, regular activity and outcomes, Bayesian learning, ergodic processes etc. All of these (statics, comparative statics, dynamics) and their associated strategies of theory construction, proof, modelling and empirical/data applications fall into the category of ‘logical time’.

As the name suggests, representations of economic phenomena in logical time begin from defined logical relations – how one (or more) defined thing stands to another, how one thing acts in terms of another, responds in terms of another etc. Logical time does not need to take a mathematical form, but in economics it overwhelmingly does. In any case, logical time has several key characteristics. First, the determinations of activity that dictate the values variables take exhibit ‘time reversibility’, which means whether one runs the determinations forwards or backwards the outcomes remain the same (to be clear this can remain the case for a stochastic process). Second, and often as a consequence of the first characteristic, logical time ‘spatialises’ time, treating it as a set of coordinates. Third, irrespective of whether a specific time variable is absent or takes the form of  $T_1$ ,  $T_2$  etc., the present has no unique status for the purpose of the treatment of time. In a real present there is always the possibility of action and outcome which is novel, unexpected or unaccounted for. In logical time determinations and coordinate placement remove the possibility that things can be otherwise in any fundamental sense *from within the theory or model framework* (there can, of course, in some approaches be ‘structural breaks’, but this is not a transition to a different treatment of time). In logical time, in statics and comparative statics (which either presuppose time has taken place or formally assume instantaneous outcomes) the present is either rendered irrelevant or is simply meaningless. In the case of dynamics the present becomes merely  $T_{\text{now}}$  in a well-specified series of coordinates and the past (logically if not empirically) is composed of former  $T_{\text{nows}}$  while the future simply becomes  $T_x$  that is yet to happen.<sup>4</sup> Though a comparison to clock time may not be exact for all treatments of logical time, the basic analogy to time as a standardised, quantified, and universalised point-to-point count does capture the spirit of logical time.<sup>5</sup>

When economists argue that culture, socialisation and history matter for ‘how things turn out’ and that contingency, diversity and multiplicity (causal complexity) are intrinsic to an observably continuously changing and evolving economy (relative stability of institutions in time and place notwithstanding) they are invoking ‘historical time’. Historical time does not just mean ‘pay attention to history’. It is rather a set of claims about the nature of temporality. Historical time is characterised by cumulative causal process, irreversibility, path dependence but only relative stability in time and place, and the perpetual possibility that things can be otherwise, leading to open futures and fundamental uncertainty. It speaks to not only quantitative but also qualitative change (not easily captured in logical time), the specificity of time and place and thus to the need for very different approaches to theorisation and research on determinations (multiple, granular etc.).

The contrast between logical time and historical time ought to be familiar to anyone who has read or engaged in methodological discussion regarding the meta-trends and characteristics of economics over the last two hundred years or so.<sup>6</sup> That said, the focus of debate has mainly been what happens in time as a way to critique different theory, models and schools of thought, rather than on time itself –

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<sup>4</sup> Standard econometrics and error terms etc. in classical probability merely complicate this.

<sup>5</sup> For an excellent account of the sociology of time see the work of the founding editor of *Time & Society*, Barbara Adam (2004).

<sup>6</sup> For background see one of the few books dedicated to time in economics, Currie and Steedman (1990).

debates over the nature of economic man, the role of culture and institutions, universalism, formalism, economics as science, whether economic laws exist and so on. Perhaps the best-known use of the language of logical time and historical time is among post-Keynesians (though one can find it in Schumpeter's work and various others too).<sup>7</sup> Perhaps the best-known essay using the terms (other similar ones have been used) is Joan Robinson's 'Time in economic theory' (Robinson 1980).<sup>8</sup> Perhaps the most interesting treatment of time is found in George Shackle's work (which covers a great deal of similar ground with the philosopher Henri Bergson on the psychology and phenomenology of time – Bergson questions the coordinate spatialisation of time and whether physics is adequate to the task of expressing the full meaning and significance of the experience of temporality – Shackle focuses on decision making and the capacity to think and act differently in the continually moving present).<sup>9</sup> But for our purposes perhaps the most important work on the difference between logical and historical time and of the need for historical time comes from Nicholas Georgescu-Roegen. For Georgescu-Roegen, time is a 'plurichromatic' concept i.e. is many faceted. His work brings together the physics of processes and thus issues I referred to in the previous section that ecological economists draw attention to (the importance of material-energy use or metabolic flow, waste and entropic processes etc.) and an understanding of human consciousness and agency (drawing on Shackle, Schumpeter and Bergson). This leads to a concept of entropic-historical time that is qualitative/ordinal and unidirectional.<sup>10</sup>

Insofar as mainstream economics has been dominated by logical time, the main claim made in the introduction should now be relatively clear: the dominant concept of time is unrealistic and lacks an adequate focus on causal temporality – put another way, process and complexity. The first of the two 'consequences' should also be clear: an unrealistic theory of how things happen. There are numerous examples one might draw attention to in order to illustrate this. Perhaps the most appropriate is the Integrated Assessment Models (IAMs) that populate many of the studies the IPCC draws on for its synthesis reports and which inform Representative Concentration Pathways (RCPs) and Shared Socioeconomic Pathways (SSPs) (unidirectional linear change, curve fitting, calibrated discount rates and damage functions, and representative agents abound – complex cumulative interconnectivity with feedback, transitions, thresholds and exponential consequences and realistic scenarios do not, for this *anthropogenic/capitalogenic* catastrophe in motion). These models are dynamic but the dynamism conceals a host of failings (as almost everyone seems to acknowledge these days). This brings us to the second consequence, an inability to address within economics the big questions of what could happen (and what we need to happen).

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<sup>7</sup> See the survey from the (broadly) post-Keynesian Mark Setterfield (1995).

<sup>8</sup> For a recent 'reconstruction' of Robinson's work focused on her later split from post-Keynesians over modelling and in the context of her approach to time see Martins (2023). For a comparison to Bergson, see Culham (2023).

<sup>9</sup> Most of Shackle's work is built around theory of time. For a concise discussion see his published guest lecture series (Shackle 1958). For comparison to Nicholas Rescher see Latsis (2015).

<sup>10</sup> One of his final ruminations on time is published in a collection dedicated to John Hicks, a pioneer of comparative statics who moved towards historical time in later life (Georgescu-Roegen 1994). See also Bobelescu (2017).



### 3. Logical time and what we need to happen

In the introduction I suggested that the other consequence I was going to pursue was an inability to address within economics the big questions of what could happen (what we need to happen). On this subject one could just say (in addition to what I have suggested from the ecological economics critique): much of economics has difficulty addressing big questions, it often lacks a capacity to deal with its normative implications or make a normative case, and it tends to present itself as a simple data science of the kind 'if we assume  $x$  and you do  $y$  then the likely outcome is  $z$ ' (subject to using data to test concepts and concepts to test data). But this is a short essay on the problem of time in economics. If we return to the implications of logical time then it ought to be clear that there is a basic problem in making sense of transformative action intrinsic to this concept of time – and this is the 'what we need to happen' in an ecological context. In logical time the present is simply  $T_{\text{now}}$  in a well-specified series, which means the past is composed of former  $T_{\text{nows}}$  and the future is merely  $T_x$  that is yet to happen according to a specification. Clearly, reality as we observe it and policy as it is pursued do not reduce to economists using logical time. But logical time is still problematic, given the way it represents reality and restricts the imagination. If we are to have real agency (if we are to do 'otherwise') this cannot be accommodated by logical time. And, of course, we *do* have real agency. In reality what we do resists specification and so the past is not really a simple series of such specifications and the future will never come into being as merely a manifestation of successive  $T_{\text{nows}}$ . There is contingency and uncertainty and at the same time (no pun intended) there are futures we want and futures we don't. But the existence of uncertainty (with its question mark over prediction) means historical time too might seem to be potentially unhelpful. But this is an apparent rather than real problem and to see why this is the case we need to start thinking of historical time in terms of the open future and we need to start thinking about the special status of the present and its significance. The future is not merely predicted, the future is made – albeit there is a popular version of the metaphysics of time that seems to say differently.<sup>11</sup>

### 4. Cumulative causal complexity and the complications of the special status of the present (back to the metaphysic)

There is a set of arguments regarding the 'block universe' which conjecture that the whole of space-time exists together and so the experience of time is a limitation of perception rather than a feature of reality. From this point of view the special status of the present is rejected and things can never be otherwise since all space-time coordinates already exist. However, if this is so then our capacity to make things otherwise has already happened and we have made our choices (in a universe that came into being all together) and the fate of the planet and our species is moot (we have either 'chosen' to do what is necessary or we haven't). Of course, from a spatiotemporally limited perspective of the human mind we can't know if thinking about this context affected how we responded in context and so was part of a block universe in which we fail to flourish or was instead a counterproductive surrender to the illusion of the inevitable, if we in fact fail to flourish. In any case, if we put the block universe aside and opt for what is called dynamic theory of time (not to be confused with dynamics in economics) then reality is tensed.<sup>12</sup> It is in the present that we act, the past consists of former presents and has (Einstein's 'relativity of simultaneity' notwithstanding) happened and cannot be changed, the future is the present that is yet to be and remains contingent until it becomes the present. We do not get to

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<sup>11</sup> For brilliant work on the subject of process and prediction see Rescher (1996, 1998).

<sup>12</sup> I discuss the metaphysics of time in Morgan (2023), as well as in the book with Heikki.



choose if this happens, since it is intrinsic to time's arrow that we progress through time, but we *do* get to choose (if not without condition) *what we do in time*.

Let's consider some features of the metaphysics of time. If we add in the concept of process then temporality is not just a movement between points, and if we accept the implication of this, then process is *cumulative* insofar as what happens affects what then happens. Moreover, if we then add in a concept of causation then the concept of the present within process becomes an even more interesting issue. Action coalesces in an event (just as a cause has a consequence) and an event becomes one in a series. This is the flowing present conceived as an ordering of events and it is only in the particular event – in time and space – that something happens that could have happened otherwise but did not. However, it is observably the case that the causes of events are not reducible merely to the events. Events can have *multiple* causes. Now, if we translate these back into processes and think of causes as part of processes it is no great leap to realise that not only are there many different kinds of causes (which we might think of as the product of the way of acting of particular things and systems that have powers and potentials based on their organization or constitution – physical, chemical, biological, conscious-intentional, social, economic etc.) but the processes in which these are instantiated can be operating over different time scales and spatial extents. What else after all is anthropogenic climate change if not a product of multiply causal spatiotemporal process?

Let's reconsider the concept of the present.<sup>13</sup> In an event sense the present becomes the past and is done (is over) but in a process sense its relational significance can be incomplete. Carbon emissions occurring now, quickly become past events but their significance is for future average global temperatures and consequent climate system changes that someone then gets to experience as part of their present. Incompletion (which is just another way of saying processes continue) is especially interesting if we start to think about the attributes that human consciousness and reflexivity bring to reality. The meaning of the past for the present can itself be under review in ways that affect what happens in the present. Put another way, if we start to think of historical time as cumulative causal process and then start to think of the past as still active in the present (and there are many ways this might be so, not just via being 'under review') then it becomes possible to start to not just describe a geo-historical reality (making a claim that 'this is how things are' – so historical time is more realistic than logical time), it becomes possible to *think* in terms of the significance of a geo-historical reality. Our understanding of the flow of time, of the many 'causal' processes we are entangled in (and of which we are part) and especially of the nature of institutions, can alter and so our attitudes to design can be different and our reasons to act can be different – affecting what we do and how we act. In historical time, agency in the present has the quality of altering determinations. A reflexive agent can learn to think geo-historically and arguably this provides a more productive way of approaching the future that mediates between, on the one hand, contingency and uncertainty and, on the other hand, closing down some futures and opening up others.

With all of this in mind then, the concept of historical time is, potentially, not just a more realistic theory of time. Our reasons for adopting historical time can be more than just 'because it is more realistic'. Thinking in historical time becomes a medium for progress because thinking in terms of it allows us to appreciate the nature of opportunity built into the processes active in time and this itself is part of learning to be different in the world with consequences for the world (reclaiming agency in a world of cynicism, scepticism and fear of 'the inevitable'). This doesn't seem much like economics does it? It

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<sup>13</sup> The basic argument here draws on Heikki's ideas and also Roy Bhaskar's but plays down some parts that might be confusing regarding the idea of the extended relative present (Patomäki 2023). I'd also been reading Sayer (2011) and Lawson (2019) on social theory – not temporality.

might also seem trivial. But stop for a moment to think about the two consequences I suggested in the introduction I would be pursuing: unrealistic theory of how things happen and inability to address within economics the big questions of what could happen (what we need to happen). Logical time has its uses, but it is clearly insufficient to address the problems around us and that includes climate emergency. The switch is perhaps not so trivial...

## 5. Conclusion

I stated in the introduction that you cannot solve a problem unless you reorient theory and method to better explain and understand actual causes as a precursor to realistic (in the sense of what a liveable planet allows) solutions. What I meant by this in terms of a focus on theory of time should now be clearer. However, there's always a danger of overcomplicating any theory of complexity. The simple point I have made is that once we start thinking in terms of causal process the present becomes qualitatively different as a concept and our perspective on time becomes different. Causal process changes temporal dynamics and gives depth and nuance to historical time and historical time seems to be more adequate than logical time. One might, of course, think this too difficult for Economics 101, but the whole becomes less mind-bending and/or ephemeral once we start to think about focusing on the data for material-energy processes on a finite planet involving metabolic flow and waste and marrying this to exploration (and decomposition for particular discussion) of the many causal processes that are operating and our role within them. This leads to focus on social redesign and institution building – exploring the legitimization of ways of doing things in terms of say, wants and needs.

There are many issues that need to be addressed. For example, not only is there an approach that presupposes continually expanding economies, but there is also a general argument that we need bigger economies to afford the changes we want to see. This is often misdirection. The UK, for example, is currently the sixth biggest economy in the world by annual GDP. In current \$US terms, according to the World Bank, the UK's annual GDP was \$73 billion in 1960 and over \$3 trillion in 2022 (so larger by over \$2.9 trillion, since \$100 billion would be a tenth of a trillion).<sup>14</sup> Yet the UK has a cost of living crisis, a public and private debt crisis, a housing availability and affordability crisis, low levels of investment, failing infrastructure, degenerating public services and welfare system, rising poverty and massive wealth inequality and entrenched income inequality (exacerbated by chronically low social mobility). Exactly how big does an economy have to be before it can 'afford' to treat its people and the planet better?<sup>15</sup>

Pessimism is everywhere at the moment – we have leaders who struggle with object permanence, never mind truth. For our purposes, however, economics has to be able to tell a story of rational hope and for this to be so there has to be the possibility of better and this should be basic to Economics 101. In his book *World Statehood: the future of world politics*, Heikki Patomäki introduces the phrase 'self-transformative capacity of contexts' (Patomäki 2023). I like this phrase. There are numerous other works offering ways forward that one may or may not agree with. The work of Clive Spash (2024), Kate

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<sup>14</sup> Visit: <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=GB>

<sup>15</sup> There is, of course, continual technological change and a great deal of focus now on technology for climate purposes. For example, the *Financial Times* recently reported a possible breakthrough by Toyota in commercial solid state electric batteries for vehicles etc. However, in the same week new research taking into account the aerosol effect reduced the remaining carbon budget for 1.5°C from approximately 500 billion tonnes of CO<sub>2</sub> to about 250. Visit: <https://www.ft.com/content/f4353d2b-f941-475b-bc1d-a64475503ea6> and: <https://www.thetimes.co.uk/article/less-time-to-avoid-breaching-1-5c-limit-n8j9bsj06>

Bayliss and Ben Fine (2020), the Foundational Economy Collective (2022), Jason Hickel (2020), Anitra Nelson (2022), Erik Olin Wright (2019), Hamed Hosseini and Barry Gills (2023) etc.<sup>16</sup> There are many others, including the collection this essay appears in, but the point though is to at least expose students to ideas and for debate to be had. This, I suppose, might render economics what Andrew Sayer refers to as 'post-disciplinary' – in economics' case this can only lead to a progressive oxymoron.

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<sup>16</sup> See also: <https://doi.org/10.1080/14747731.2021.1906006>

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# The adoption of “complexity” in economics as a contribution to resolving dilemmas in the Anthropocene

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## Introduction

Anthropogenic climate change and ecological breakdown are now major threats to human life and other species. It is widely acknowledged that mainstream economic theory and especially neoclassical theory lack adequate concepts to address these problems and arguably have contributed to them through misdirection and delay. “Complexity” sciences, however, are now widely adopted but have as yet made little impact on economics. In this short article I advocate the widespread adoption of “complexity” in the field of economics. Complexity means more than just acknowledgement that “it’s complicated”. Its greatest attraction in our current “climate emergency” is that it is capable of dealing with the interconnection and interdependence between the biosphere and economic systems. I draw attention to several significant aspects of complex systems for economics:

- a) The lack of homogeneity among the elements of the system in terms of the characterization of agents (attributes, rules of behaviour, cognitive rules, strategies, learning capacity) and the environment where patterns of interaction occur;
- b) The adaptive nature of an agent’s behaviour in interaction with their environment;
- c) The concept of emergence as the property of novelty, change, and innovation of complex systems that exhibit a wide range of aggregate patterns.

Theory and policy that fail to consider a) to c) in the context of the impacts of economic systems on the biosphere are deficient and as Winkelmann et al argue, there is a need to “close this loop” (Winkelmann et al., 2017)

## 1. The incorporation of complex economic and biophysical systems in Eco 100

While founding economists such as the physiocrats and John Stuart Mill had some concept of the material impact of economic activity, mainstream economics has since become divorced from the physical world. Its main focus is exchange valuations and at the macroeconomic level, national accounting, circular income flows and trade balances (for discussion of issues see Naredo, 2012; Green 2012). Mainstream economics exemplifies a mechanistic cause-and-effect perspective prevalent in the 19th century. Simple linear cause-effect and recourse to *ceteris paribus* clauses don’t allow for realistic representation of the economic system (Madi, 2020). The mainstream has attempted to adapt itself through “environmental economics”, but as “ecological economists”

argue, this remains incapable of appropriately incorporating material flows and energy use in ways liable to lead to a rational conception of “biophysical limits”. Moreover, Econ 100 courses and textbooks still treat the environment as a specialist issue rather than a basic concern. This state of affairs reflects a deeper problem of unrealistic knowledge, mainly predicated on homo economicus (with a few modifications) and Cartesian reductionism (Fullbrook, 2016). Worse, a mainstream economics education imposes implicit norms that prevent students cultivating a critical mindset. In a time of “climate emergency” this is a major problem (Reardon and Madi, 2020).

Earth systems scientists have developed a “planetary boundaries” framework which seeks to model the interactions between human activity and different systems – of which climate is only one (Steffen et al. 2015a, 2015b). Earth system scientists work with a concept of “safe operating space” and report that multiple systems have now exceeded this (Steffen and Morgan, 2021). It is partly because of such changes that Earth systems scientists have also coined the term “Anthropocene” (though others, such as Jason Moore, prefer the term “capitalocene”) (Donges et al., 2017).

It seems clear that economics needs to adopt an appropriate variation of the kind of complex systems approaches that are now available (though it is also important to distinguish these from the simple models advocated by William Nordhaus and others, which ecological economists argue have resulted in deeply unrealistic work). Appropriate complexity allows for greater realism of relations and impacts in time and space.

Recognition of the need for greater realism in terms of time is, of course, not new. John Maynard Keynes, for example, placed specific emphasis on the uncertainty inherent to a monetary economy of production, wherein money serves as the bridge connecting the present and the future (Madi, 2020). Space, on the other hand, has not been a significant or enduring aspect of mainstream economic thought – though economic geographers have long recognised the need to spatialise theory. In terms of ecological economics, the need for a better theorisation of space and time are basic to the work of Nicholas Georgescu-Roegen. Mainstream economics, however, has resisted taking such work seriously.

## **2. Complexity and Econ 100**

Complexity is characteristic of a system that preserves the differentiation among its constituent elements while also preserving their identity. Complexity also implies dynamic systems, that is to say, open totalities of interrelated parts constantly changing in spacetime. The complexity of a system is related to the coexistence of intertwined parts in spacetime and complexity is intrinsic to real-world natural, economic and social processes (Almeida Filho, 1998). If we are to address contemporary problems of the kind referred to in the introduction both the natural world and human society need to be understood as complex systems, where the latter is nested in the former and interdependencies of different kinds arise.

An economy, similar to other systems, consists of complex networks of agents engaged in ongoing interactions, characterised by competition and cooperation. These agents constitute heterogenous components and are in a constant state of learning, adaptation, coevolution, and potential transformation or elimination, as part of an uninterrupted dynamic process (see Arthur, 1988; Arthur et al., 1997). In an economic system, different agents must work to find solutions to challenges they encounter, act in accordance with what is expected of them by others, and collaborate with one another to construct economic, legal, and social structures.

Clearly, the standard circular flow model found in mainstream economics differs markedly from a complex system. Within this model, the interacting agents in the economy (households and firms) are typically homogenous, solve problems with more or less all relevant information and according to clear and simple decision rules founded on rationality, and activity tends towards equilibrium states (see Mankiw, 2015).

If represented as a complex system the circular flow would be replaced by dynamic interactions among heterogenous agents, subject to endogenous causal effects in time and space. Nonlinear causality is extensively employed in complex systems and emphasises indeterminacy, equifinality, feedback loops, disproportionality, multiple causes, and downward-upward causation as crucial characteristics (Van 't Hof, 2018):

- Indeterminism: events may not invariably be caused by antecedent actions;
- Equifinality argues that a single event might have numerous consequences that alter a given circumstance;
- Disproportionality examines the discrepancies between cause and effect;
- Feedback loops refers to the way in which events produce reinforcing influences;
- Downward-upward causation investigates the reciprocal influence of actions.

Clearly, any such representation must also incorporate interdependencies with the biosphere based on such concepts as metabolic flow and intrinsic interconnections with the biophysical environment (García and Ivarola, 2022). It is also imperative that this representation incorporates fundamental characteristics that set the Anthropocene apart from previous epochs (Donges et al., 2017):

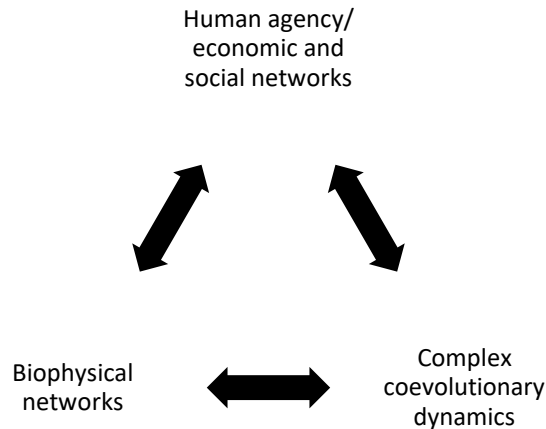
- a) The existence of human agency on a planetary scale;
- b) The interconnectedness of global economic and social systems;
- c) Substantial interactions between human systems and planetary processes.

With a) to c) in mind, the goal of Econ 100 should be to introduce the conceptualization of the economy as a complex evolutive system with individual components that are connected and interdependent. Action of one part may trigger reactions of other parts, and these also have the potential for adaptation, reaction, innovation or collapse. Evolution is an irrevocable and unrepeatable process of unfolding, transformation, self-organisation entailing oscillation in time and space (Miroslav, 2020).

If considered in terms of epistemology, economic complexity deals with the actions, reactions, expectations, and strategies of economic actors with bounded rationality in an always changing picture. Understanding and modelling tightly intertwined economic-social-environmental systems requires addressing human agency, system-level effects of networks and complex coevolutionary dynamics. Figure 1 summarises this:



**Figure 1. The open coevolutionary interactions of complex economic and biophysical systems.**



Ultimately, in complex systems, there is a permanent tension between stability and change. Crucially, coevolution in the form of material impacts on the biosphere gives rise to discontinuities that increase uncertainty at the economic and social levels and these should be a matter of concern.

### **3. An examination of the impact of climate shocks on economic outcomes via the business cycle**

The 21st century will be marked by a crucial debate: can we make economic growth compatible with the preservation of our natural environment? (Reardon and Madi, 2020). An enduring myth of neoclassical economics is that the economy has a growth path from which it may deviate in the short term, possibly requiring macroeconomic stabilization policy, but to which it will return in the long term.

Complex systems in contrast provide a more appropriate way to reconnect biophysical and economic phenomena. This can be briefly illustrated.

It is possible to conceive of business cycles which endogenously link biophysical and economic variables. It is already the case that study of finance requires consideration of climate-related risks at the micro and macroeconomic levels. Although such risks are currently underrepresented in the macroeconomic literature, they can more adequately be connected with biophysical disruptions. Such disruption can propagate through economic interconnections, increasing the likelihood of macroeconomic instability. For example, the expansion of decarbonising green investments can produce multiple systemic outcomes. A micro-macro dynamics can be applied that take account of non-linear causation, and which can examine reciprocal relationships between micro-level process components and larger-scale processes. Here, a macroeconomic approach can facilitate the organisation of the framework in which a network of micro-interactions occurs (see García and Ivarola, 2022).

In simple terms, there are clear possible counterproductive effects. After a period of expansion of green investments, and in the aftermath of a climatic shock, property damage may lead to an

increase of climate physical risks that have a heterogeneous impact on banks' assets and liabilities. Non-performing loans, increasing financing costs, and falling asset values can all have an effect on the interaction between credit, liquidity, and market risks that affect the balance sheet of banks and thus their subsequent lending strategies. It may be that indebted firms cannot fulfil their financial obligations. As a direct result of this, the levels of credit, green investment, production, employment, and income may all reduce. Furthermore, when profits and asset prices begin to decline, a credit constraint may also restrict external financing to firms and households, in turn creating a severe demand for liquidity.

I could go on, but it should be clear that complexity allows for multiple consequences and it is likely these would multiply. Over time, climate-related risks could dampen the level of green investment and delay the transition to a low-carbon economy. This, of course, means emissions would continue at higher levels for longer, with further impacts and feedbacks on climate systems, putting more pressure on planetary boundaries. As this brief illustration indicates it is only via complexity that we achieve a sense of dynamic interdependencies. This can be extended to more specific coupling approaches to structural change and economic stability in a theoretical setting that highlights emergence, non-linear causalities, and irreversibility.

### **Final considerations**

If we are now living in the Anthropocene and the Holocene is behind us then it is incumbent on us to take responsibility for the world we are making. Climate emergency requires we take seriously the problem of "biophysical limits", but in order to adequately assess what these are in relation to economies, the widespread introduction of complexity science would seem to be imperative.

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# Biophysical limit and metabolic growth: New understanding of modern division of labor and sustainable economies

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## 1. Introduction

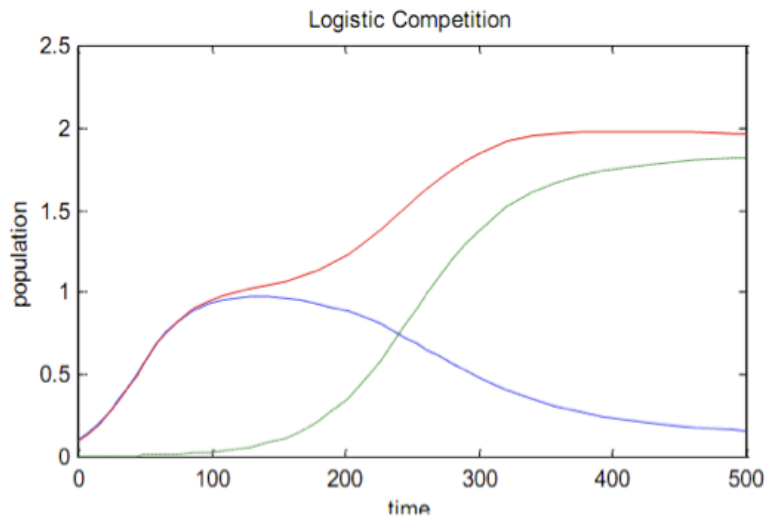
Current ecological crises are driven by excess consumption, which has been justified by neoclassical theories of unlimited growth. The theory of metabolic growth provides a better alternative to understand biophysical limits of economic growth and ecological constraints of the modern division of labor. It should be noted that among the founding tenets of classical economics is the Smith theorem that the division of labor is limited by market extent. Malthus, of course, whatever one thinks about the overall argument he provides, at least realized there could be competition between resources and population, and this issue subsequently influenced the works of Darwin and Marx. Today, economic “color chaos” provides strong support for Schumpeter’s business cycle theory conceived as heartbeats, as well as Hayek’s view of endogenous money. Furthermore, the nonlinear dynamics of the division of labor and the theory of metabolic growth reveal lifecycles (more exactly, wavelets) in the *co-evolution* of ecology-technology-culture. This allows a reconsideration of a “true face” of Smith in the form of a Smith Theorem of complex ecological systems or the trade-off between stability and complexity in which general equilibrium frameworks break down under increasing returns to scale. Clearly, given the predicaments of the modern period, coordination of nations is a more critical issue of the global division of labor than competing for power and wealth of nations. As such, it can be contended that Popper’s theory on science philosophy should be brought to the fore in combination with complexity economics.

## 2. Neoclassical Theories of Unlimited Growth and Metabolic Growth Theory with Ecological Constraints

Two neoclassical growth theories on exogenous and endogenous growth provide theories for unlimited growth (Solow 1970; Romer 1986), and these promote excess consumption without appropriate recognition of biophysical limit. It is widely understood that mainstream economics cannot deal with the current ecological crises, including global heating, population explosion, and energy and food shortages.

In contrast, the theory of metabolic growth introduces a nonlinear network of population dynamics for limited economic growth (Chen 2014). The simplest ecological model of growth was the logistic model with an S-shape, which was verified in studies of the origin of the division of labor of social animals (Chen 1987). See Fig. 1.

**Figure 1. The theory of metabolic growth and the Logistic wavelet.**



The blue line represents obsolete technology or industry that declines into a logistic wavelet under strong competition from emerging technology (represented by the green line by a logistic growth curve with an S-shape). The envelope (red line) describes macro growth cycles as the sum of competing technologies at the meso level.

It can be argued that two classical theories shed new light on complexity economics, and these can be used to better understand the biophysics foundation of limited growth. The Smith Theorem clearly states that the “division of labor is limited by market extent” (Smith 1776, Book I, Chapter III; Stigler 1950). Malthus, meanwhile, draws attention to resource capacity as a constraint on population (Malthus 1798). Subsequent work develops a general Smith theorem or Smith-May-Chen theorem (May 1974; Chen 2014) based on nonlinear ecological networks rooted in population dynamics. Here, competing technologies are limited by three factors. First, resource capacity, (e.g., land or natural resources) which management science refers to as scale economy. Second, biodiversity, which indicates the scope of economy. Third, the magnitude of environmental fluctuations, such as natural disasters and wars. These provide aspects in which there is a trade-off between stability and complexity.

### **3. New Basics of Economic Ideas and Concepts**

It can be argued that the theory of metabolic growth provides new foundations in economics based on five reasons. First, a biophysical foundation to economic growth introduces industrial structure into the economic framework. Technological competition mainly occurs at the meso (i.e. medium structure) level. Accordingly, the Keynesian micro-macro model can be extended into a three-level framework of micro-meso-macro economics. Here, the biological perspective is essential for meso-economics (Chen 2005). It is also the case that Schumpeter’s view of business cycles, conceived as heartbeats, is fully supported by the discovery of economic “color chaos” and logistic wavelets in population dynamics (Schumpeter 1939; Chen 2010).

Second, the AK model of the neoclassical production function can be replaced by a dynamic model of evolving returns to scale. Any technology has a lifecycle with four stages: an infant R&D stage, an early or young stage of increasing returns, an adult stage of constant returns, and an aging stage of decreasing returns and subsequent death. This involves a changing role for governments and society. As Smith recognized “wealth is power” (Smith 1776, Book I. Chapter V). Accordingly, regulatory policy faces a critical choice: dominant economic power may protect obsolete technologies, while innovative sectors will demand institutional reform to advance rising technologies. How these are deal with provides for new understandings of economic justice and fair competition.

Third, as any ecological economist is aware, basic assumptions of neoclassical economics violate the biophysical foundation of economics. For example, the Arrow-Debreu general equilibrium model excludes increasing returns and the non-convex set, which is the typical feature of S-shape logistic growth with ecological constraints. Furthermore, the Lucas theory of rational expectations and micro-foundations is a slave model of population without individual degrees of freedom, and this is in tension with the principle of large numbers (Lucas 1972, Chen 2002). One might also note that the representative agent model in econometrics and finance is based on a random walk or Brownian motion model with a single particle, and this clearly does not accord with the behavior of humans as a social animal. The better alternative model of the financial market is a population model of the birth-death process, rather than variations on the Black-Scholes model of option pricing (Chen 2005). Market fluctuations are driving by gaming between bull and bear camps rather than random shocks of a representative agent. Insofar as this is achieved then it becomes possible to diagnose financial crises and provide an early warning (Tang and Chen 2014, 2015).

Fourth, the linear demand function with infinite wants cannot be justified by human nature of greedy. People’s physical needs are limited by physiology, while psychological needs may be unlimited in some ways but are conditional (Maslow 1948). Moreover, modern diseases like obesity and diabetes are stimulated by the kind of conspicuous consumption long identified by original institutionalists (Veblen 1899) and anthropology can provide an alternative ecological perspective on civilization diversity and learning (Harris 1978; Gowdy 1997; Chen 1987, 2014).

Fifth and finally, the theory of metabolic growth can reveal the core mechanisms of colonialism and geopolitical conflict, which is rooted in market-share competition for energy and natural resources played out through the globalization of the international division of labor. Clearly, market exchange cannot solve persistent conflicts such as war in the Middle East (Coase 1960; Chen 2007). It is also notable that the idea that transaction costs tend to fall, proposed by Coase, is challenged by empirical evidence, since the U.S. economy *increased* its transaction costs from 25% of GDP in 1870 to 50% of GDP in 1970 (Wallis & North 1986). The point being made here, albeit briefly, is that international conflicts are ultimately ecological in nature and crisis prone. Coordination of nations is, therefore, more critical than market forces in dealing with global heating and ecological crises (Chen 2021, 2024).

#### 4. Economic Complexity vs. Neoclassical Simplicity

Complexity science originated from astrophysics when Henri Poincaré discovered the three-body problem had no analytical solution in 1899. The discovery and development of deterministic chaos in the 1960s to 1990s found wide evidence that nonlinear deterministic systems only have limited predictability. Ilya Prigogine further recognized the important role of irreversibility in biological evolution since time's arrow and history inherent to biological evolution works against thermodynamics equilibrium. In reality non-stationarity is dominant in time series economics but absent in controlled experiments in physics and biology. In this sense economic complexity is *more* complex than physics and biology. In any case, the study of economic complexity reveals the fundamental flaws of neoclassical simplicity in three ways (Chen 2019, 2024).

First, the three-body problem is radically different from a one-body, two-body, and infinite-body problem. Three and many-body problems are more complex and often without analytical solutions, while in economics the representative agent model, the two-player model in game theory and international finance, and the mean-field model in statistics are all equivalent and deficient as an equilibrium framework. For example, a two-country exchange model can calculate the exchange rate and interest rate parity, but this is not so for three or more major currencies. This is also why the option-pricing model has a fundamental flaw since it is based on a single-particle model of Brownian motion without collective behavior.

Second, nonlinear stochastic processes may have a *multi-peak* distribution such that high moments cannot be ignored during phase transition, and this is the root of financial crises (a point that will make more sense to readers conversant in finance). The polarized presidential election in the U.S. shows a typical polarization with dual-peak distribution, which is a sign of bifurcation at the cross-point of coming crisis.

Third, nonlinear trends in macro and financial indexes are the main difficulty in macro econometrics. So-called "market expectations" can be measured by macro trends separated by medium business cycles by the HP filter (Chen 1996). Yet macro management is better aimed at frequency rather than amplitude observation, and this is often used in medical diagnosis. Furthermore, the study of economic color chaos revives Schumpeter's view of business cycles as heartbeats.

Finally, the following six tables provide a summary of issues for interested readers and provide a comparison of different levels of complexity (Chen 2024).



**Table 1. Simplicity and Complexity in Math Economics**

<b>Issue</b>	<b>Simplicity</b>	<b>Complexity</b>
Number of players	One-body, two-body, infinite body	Three-body problem
Number of equilibriums	One	Multiple
Set theory	Convex	Non-convex
Returns to scale	Decreasing returns, constant returns	Increasing returns
Utility/Production	Unlimited, log-linear functions	Logistic functions
Deterministic	Linear	Nonlinear
Stochastic	Markovian	Non-Markovian
Time series	Stationary	Non-stationary
System	Close/Convergent	Open/Divergent
Boundary	No cell, no state	Multi-level boundaries
Structure	Homogeneous	Non-homogeneous

**Table 2. Simplicity and Complexity in Economic Concepts**

<b>Concept</b>	<b>Simplicity</b>	<b>Complexity</b>
Order	Optimization, convergence, stability  Unique stable equilibrium	Evolution, diversity, uncertainty  Multiple stable/unstable equilibrium states
Efficiency	Cost-minimization, predictability	Creativity, innovation, opportunity
	Infinite predictability	Finite predictability
Expectations	Rational, fully predictable  Labor choice of recession	Nonlinear changing trends, open competition  Interactions between trends & major players
Equilibrium	General equilibrium, disequilibrium	Non-equilibrium, multi-biological rhythms
Economics	Two-level of micro-macro	Three-level of micro-meso-macro
Money	Volume conservation  Exogenous (independent central bank)	Volume expansion/contraction  Endogenous (constraint central bank)
Policy	Invisible hands without policy	International competition & domestic change

**Table 3. Simplicity and Complexity in Science**

Discipline	Simplicity	Complexity
Math	Linear difference equation	Nonlinear differential & mixed eqn.
Systems	Linear system with single layer	Nonlinear system with trade-off between stability and complexity
Physics	Perfect, imperfect gas, fluid, solid  Hamiltonian system  Equilibrium structure  Equilibrium thermodynamics  Disorder=heat death  Vector & Tensor field  Harmonic waves	Nonlinear, non-equilibrium physics  Dynamical system without optimization  Dissipative structure  Evolutionary thermodynamics  Changing order out of chaos  High-dimensional networks  Non-Eucledian wavelets
Chemistry	Linear chemical reactions,	Nonlinear chemical reactions
Biology	Biostatistics, game theory	Population dynamics, social animal
Psychology	Behavioral psychology	Evolutionary psychology
Neural science	Linearized neural cell	Brain structure and complex networks  Hierarchical structures

**Table 4. Neoclassical Simplicity and Pseudo-physics**

Theory	Concept	Math	Pseudo-physics
Price	General equilibrium	Scalar field	Point state without time & space
	Unique price	Linear pricing	Infinite speed for price adjustment
Rationality	Preference	Isolated man	No social interact. & learning
Friction	Disequilibrium	Shocks	Frictions from struct. & boundaries
Crusoe	Individualism	Representative Agent	Selfish against nature of social animal
Optimal	Convergence	Equilibrium Order	Heat death=disorder= Maxim entropy in thermodynamics
Consumer	Greedy	DD& SS curve	Constraints of physiology & ecology
Firm	Transaction costs	Zero-transaction costs	Inertial motion, no changing speed
	Complete market	Perfect information	Perpetual motion machine I.
	Perfect competition	No monopoly firms	No classification of firms and consumers
Econometrics	Shocks	Random, Brownian	Perpetual motion machine II.
Finance	Arbitrage-free	Option pricing	Single particle without population
Exchange Rate	Bilateral parity	Parity theorem	Uncertainty in international competition
EMH	Efficiency	Random series	FD whitening filter for price signals
Rational	Expectations	Error-free prediction	Infinite computing power
	No financial crises		Perpetual motion machine III

**Table 5. Competing Models of Complexity**

Classification	Theory / Model	Measure	Examples
Computation	Fractal, Levy	Fractal dimension	Coastline, geographic
System	Networks	Dimension, structure	Ecology, WWW, AI, big data
Physics	Sandpile, spin-glass	Scaling	Snowflake, turbulence,
Chemistry	Dissipative structure	Strange attractor	BZ reaction
Biology	Organism	Structure, life cycles	Species, cell, cell membrane
Sociology	Imitation, pandemics	Multi-peak distribution	Ising model
	Traffic, city	Flow structure	Two-fluid mode, city evolution
Economics	Color chaos,	Correlations, trend	HP filter, freeway model
	BD process	High moments	Phase transition of viable mkt
Brain	Epistemology	Mind-structure	Piaget cognitive psychology
	Maslow hierarchy	Multi-layer needs	
Computation	Fractal, Levy	Fractal dimension	Coastline, geographic
System	Networks	Dimension, structure	Ecology, WWW, AI, big data
Physics	Sandpile, spin-glass	Scaling	Snowflake, turbulence,
Chemistry	Dissipative structure	Strange attractor	BZ reaction
Biology	Organism	Structure, life cycles	Species, cell, cell membrane

**Table 6. Open Issues of Complexity Science**

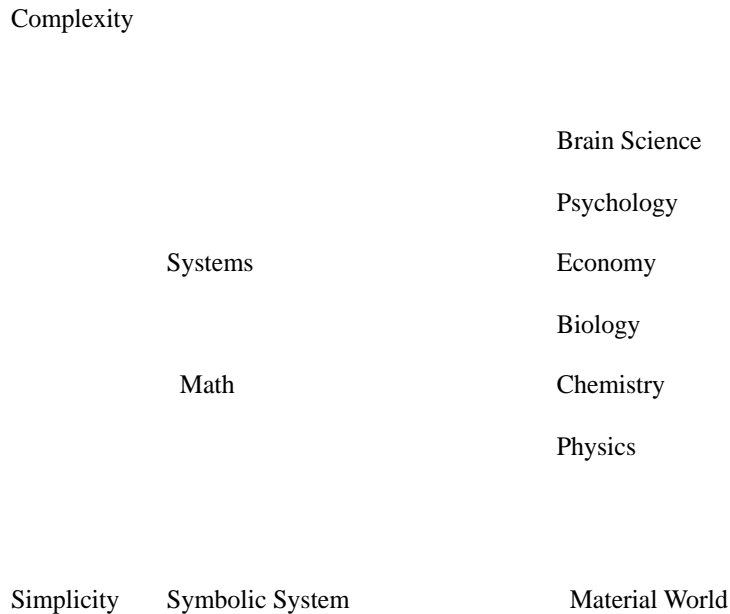
Concept	School	Theory	Examples
Self-organization	BAC	Dissipative structure	Origin of life, Division of labor,
Self-organization	SFI	Edge of chaos	ABM, artificial life, artificial market
Spontaneous order	Austrian	Holistic knowledge	Endogenous money without state
	Keynes	Wartime economy	Endogenous money with state
Biological clock	Schumpeter	Multiple waves	Business cycles like heartbeats
Scaling laws	EPS	Power laws	turbulent flow, high-frequency trade
Social temperature	EPS	Trade balance	Immigration through boundaries?

**Note:** BAC for Brussels-Austin-Chinese school, SFI for Santa Fe Institute, EPS for econophysics (Chen 2019, 2024).

### 5. Conclusion: Developing a General Theory of Physics-Biology-Economics

The development of complexity economics revives the dream of a general theory in economics, first proposed by Einstein in physics, and later suggested by Keynes in economics (Galbraith 1994; Chen 2024). It does so in conformity with the problem of biophysical limits rather than in ignorance or isolation from them. One might note that science has a hierarchical structure, and this is described in figure 2 below.

**Figure 2. Hierarchical Structure for Symbolic System and Material World**



(Left) The inverse pyramid of the symbolic system from simplicity to complexity.

(Right) The pyramid structure of the material world from bottom to top layer.

It can be argued that figure 2 speaks to a new understanding of philosophy of science. Physics is the very foundation of all scientific branches because organic life still obeys the laws of physics but is not explanatorily exhaustive. Clearly, a physics-biology approach ought to be a foundation of real-world economics and any grand unification theory should have a hierarchical knowledge structure. Mathematics meanwhile must be appropriate to its application.

Basic assumptions in the linear-equilibrium formulation of neoclassical economics are essentially utopian theories based on perpetual motion machines (Chen 2024). Ecological dynamics introduces nonlinear and non-equilibrium perspectives into ecological economics. Complexity sciences develop new tools for evolutionary economics and institutional economics with structural changes and diversified development. We need a new (Popperian) philosophy of science to understand the evolutionary tree of human knowledge. For example, the neoclassical model of efficient market is a special case of calm market while financial crisis is the special regime of turbulent market in the phase-transition model based on birth-death process (Tang and Chen 2015). I contend that existing mainstream and heterodox economics can be better understood as special cases in different branches of the general evolutionary tree of human history.



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## Complex economies embedded in the biosphere with the commons restored

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How can we construct an economics consistent with the biophysical limits to economic growth? First, we can consider the kind of economies and economics that can support human societies healthily into the indefinite future. Then we may consider what drives unlimited growth in the present regime and how pathological growth may be not only limited but excluded from healthy economies.

A science of human economies must start from the knowledge that we human beings are part of the natural living world, the biosphere of planet Earth. We and our societies are intimately embedded within the biosphere. An economy in turn is embedded within a society: it is the way a society collectively provides for its material needs.

Living systems are complex self-organising systems<sup>1</sup>. An economy is necessarily also a complex self-organising system because many of its components are living (people, food plants, food animals, and so on). An economy would be complex anyway because of the large energy flow through it and its many nonlinear interactions. A modern economy is a far-from-equilibrium system.

Thus to adequately study an economy we must understand complexity. The behaviour of a complex system is fundamentally determined by the nature of its internal interactions. In a modern economy there are two main kinds of interaction: social and exchange, the latter largely mediated by money. Thus we must understand money and social interactions.

The social behaviour of human beings is neither wholly competitive nor wholly cooperative, but a subtle balancing of the two, from which the richness of human experience arises. This co-existence of cooperation and competition occurs pervasively in the living world.

Understanding money requires clarity on the nature of modern token money and on the roles of central banks and commercial banks. Token money involves debt, which links the future to the present, as Keynes observed (quoted by Keen<sup>2</sup>, p. 293-4). It thus exerts a powerful influence on the dynamics of an economy, the way the economy unfolds into the future. Because the future is unknowable, debt also introduces risk. Token money is powerful but dangerous. Like fire, it must be handled with great care.

The purpose of an economy is to support the society of which it is a part. This support must encompass not only the welfare of the society's members, but the continuation of the society in a

form that its members desire. It must also encompass the continuing health of the biosphere within which the society is embedded.

The management of an economy requires proper balance-sheet accounting, not just a crude tally like Gross Domestic Product. The accounting must encompass the material provisioning of the society, the health of the society, and the state of the biosphere. Triple-bottom-line accounting, covering the economy, society and the environment, attempts to do this, and it can be extended and refined.

A key requirement of economic management is to ensure a fair flow of wealth to all members of society. All wealth is generated collectively. Any enterprise draws on our inherited culture, and the vast accumulation of knowledge that is part of that inheritance. Any enterprise also requires an ordered society and many functioning institutions in order to conduct its business. Thus no-one has exclusive claim on any new wealth generation, and everyone has some claim, by virtue of their common inheritance.

Wealth distribution would be best managed at the source, through appropriate forms of collective ownership, such as cooperatives involving employees, managers and possibly other stakeholders. In this way wealth would flow automatically to all those directly involved, and the flows could be adjusted to ensure fair shares for all parties. Some collective forms, such as sociocracy<sup>3</sup>, go further and effectively distribute management to all parties in an enterprise.

The main current form of collective ownership, corporations, is pathological, in that wealth can be managed to flow predominantly to managers and shareholders, at the expense of employees. Competitive markets also induce pathology by encouraging corporations to be exploitative and extractive: rather than generating new wealth it is often easier to extract existing wealth from people, societies and the environment, thus further unbalancing the flow of wealth.

If appropriate forms of ownership are not sufficient to ensure fair flows of wealth then retroactive actions, such as progressive income taxes, government services, welfare payments or a universal basic income, could also be implemented or continued. However retroactive actions are more cumbersome, less efficient and more likely to be resented, making them more prone to abuse.

Land, in the sense of an area of the Earth's surface, requires special consideration. There are two key aspects. One is that land is part of our common inheritance: it is just there, no-one makes it. There is thus no cost of production that might anchor the price of land. In a sense the 'price' is arbitrary, and this makes it especially prone to speculation. It would better reflect its nature if land was leased<sup>4</sup>. It could be managed, for example, by community land trusts, in effect acting on behalf of our collective inheritance.

The other important aspect of land is that part of its value arises from what is adjacent to it. A hectare of vacant land in a city is worth more, in terms of its potential benefit to an owner, than a hectare in a sparsely populated desert. This value should not belong to the owner, because it arises from the actions of the community around the land. Because this value emerges as the community develops, I have called it the emergent community value of the land, though it was a central but much-repressed insight of Henry George<sup>5</sup>. This component of wealth ought therefore to flow back to the community, which could be accomplished also through a community land trust.

Analogous considerations apply to natural resources. Non-living or mineral resources are part of our common inheritance, and wealth derived from them ought to flow widely to the society in whose territory they occur – or perhaps even to all of humanity. Non-renewable resources of course ought to be managed frugally, whereas at present they are extracted profligately. Living, renewable resources are part of the biosphere and their health and continuance ought to be an automatic part of the management of an economy, as already described.

The kind of economy briefly outlined here is developed more fully in *Economy, Society, Nature*<sup>6</sup>. It is radically different from the presently dominant regime, but it needs to be because the present system is so pathological it threatens to destroy our modern civilisation, along with much of the human and non-human population of the planet. Unrestrained growth of the GDP is but one source of its pathology.

A healthy economy will also involve many more details than are mentioned here, but this outline can indicate both its broad character and how it might be managed.

To address the pathological growth of modern industrial economies we must first of all carefully define what we mean, and what we want. Not all kinds of ‘growth’ are undesirable. We need then to identify the underlying driver of undesirable growth before we can attempt to change or stop it.

Much of the current debate about economic growth, de-growth or steady state fails to specify what it is that is growing<sup>7</sup>. Usually it is the Gross Domestic Product that is implied to be growing, or not. But GDP is not directly the culprit. The culprit is the ever-rising throughput of materials – the extraction, manufacture, use and dumping of ever-more stuff. It is that material throughput that causes resource depletion and the planet-wide harmful pollution that is degrading our living planet, our life support system.

GDP is in any case an inappropriate measure of the good health or ill health of an economy and its society, as its originator, Simon Kuznets, warned. GDP is in effect a tally of the net monetary worth of all those activities that involve money. No account is taken of whether an activity is useful, useless or harmful, or in the present context healthy or unhealthy. Many important activities that do not involve money are ignored. It happens that in the present regime GDP correlates with increasing material throughput, and harm to ourselves and the planet, but that correlation will shift if we focus where we need to – on whether our activities are healthy or harmful. In any case the magnitude of the GDP becomes irrelevant if we focus on the real culprit.

Another, and key, distinction to be made is between quantity and quality. It is commonly argued by the defenders of the present regime that it has lifted millions of people out of poverty, although that claim overlooks the many who have been allowed to remain in poverty or dropped back into poverty. The implication being made in this claim is that the quality of the lives of many people has been improved as material wealth has increased. Up to a point that is true, but gain this implication must be qualified, because excessive accumulation of ‘wealth’ can reduce quality of life, or fail to improve it. The point here is that it is really quality of life most people would hope to improve through sensible economic activity.

Turning to quantity, our present regime is extremely profligate with materials<sup>8</sup>. This profligacy can be reduced in three ways: by using materials more efficiently, by reducing our demand for stuff,

and by recycling materials so they do not become pollution and we do not need to draw more resources from the Earth. Food waste has become widely remarked, but there are many identified examples where use of materials can be made more efficient. The more wasteful is present usage, the easier it is to reduce waste. 'Demand' is greatly inflated within our consumer-capitalist system by marketing and advertising. These have become very sophisticated in inducing us to buy much more stuff than we need for a good quality of life. Finally the potential of recycling is to perennially recycle most materials, either through the organic world if they are organic, or through an extended industrial system if they are not. The living world recycles all materials, and we should seek to emulate it, so as to become part of it again. Products need to be redesigned so they are easily disassembled and so their materials can be easily recovered and remanufactured. This has been called cradle-to-cradle design – products are designed not just for cradle-to-grave use, but to be reborn again as new products<sup>9</sup>. Already in the 1990s Interface Carpet Inc. was able to greatly reduce its materials use through this approach while increasing profits<sup>10</sup>.

We can now define a goal to reduce quantity while increasing quality: to reduce the quantity of stuff we use at the same time as we increase the quality of our lives.

This gives us a clear objective while freeing us from pointless and confused semantic debates about whether 'growth', ill-defined, is good or necessary. Growth of quality is good. Reduction of quantity is good because it allows us to tread more lightly on the Earth, and also because it can allow us to focus our lives more on the things that bring us real satisfaction.

Incidentally 'happiness' is not necessarily a sensible goal. A good life involves joy and pain, inevitably. It is not healthy to try to be 'happy' all the time, we need to allow sadness and grief to run their course as well. What counts is how we navigate the ups and downs and whether we come out the other side of challenging experiences embittered or more robust and wiser. A better goal would be fulfilment.

We need also to distinguish healthy organic growth from unlimited or uncontrolled growth. Multicellular organisms long-since developed internal controls on their growth, so they do not use up all available resources and then starve, and so they do not grow beyond an optimum size and become ungainly and incapable. Traditional human cultures also managed themselves to avoid excessive growth, so their descendants could continue to live good lives indefinitely into the future. They lived by the ethic of leaving their world in a condition at least as good as it was passed to them by their ancestors. This must be our goal if our descendants are (eventually) able to establish lifestyles that can continue indefinitely into the future.

We come then to the question of why our present industrial civilisation so relentlessly increases its throughput of materials, why it always grows. More specifically, what is the mechanism that keeps growth going?

We are a materialist society, compared with many past and traditional societies, and the materialism has been raised to new heights by the deliberate cultivation of selfishness and greed. Selfishness is explicit in the neoliberal ideology, which has arisen from the neoclassical stream of economic theory. That theory is pseudo-science: it bears little resemblance to real modern economies and is highly misleading<sup>2,11</sup>.

The political emphasis on selfishness is also quite misguided because abundant experience and evidence shows we are a highly social and highly cooperative species<sup>12</sup> – why else would we have developed our sophisticated capacity for language? Human behaviour is a potent mixture of cooperation and competition, and the challenge and richness of our lives arises from our having to balance the two tendencies – the *yin* and *yang* of Taoist philosophy.

Greed is clearly a factor in driving material economic growth, yet there is more to it than just greed. The feudal lords were selfish and greedy too, and the lower orders suffered because of them, but feudal society did not grow inexorably, to consume itself and the world.

There have been many societies in which greed was constrained<sup>13</sup>, if it existed at all, so we need not resort to the dead-end explanation that greed is just part of human nature. Greed is cultivated in our societies, and consumerist marketing is a major mechanism.

In the neoliberal ideology a person's 'labor' is just another commodity, to be traded or discarded at will. As a result livelihoods have become very insecure, by design. In our insecurity we are prone to turning on each other. We have become fractious and divided. Those divisions in turn are exploited by the holders and seekers of power. The conflict consumes our 'social capital', the fund of trust required to keep our society functioning.

So selfishness and greed do great damage to the quality of our lives and our societies. Yet they still do not fully explain the perilous situation we are in. Something facilitates or magnifies the effects of greed so it turns our societies into malevolent systems.

A feature of our modern governance is to ensure there is never quite enough of something essential. A prime example at present is employment. For a time, postwar, employment in the developed nations was maintained close to a sufficient level, and our societies prospered. However for decades now employment has been deliberately kept insufficient, under the bogus guise of combating inflation. So we compete for livelihoods and accept less than we might deserve out of desperation. This keeps us on a treadmill that serves the greedy. The treadmill has been operating for centuries, probably since the land enclosures of late Mediaeval times. This practice of limiting the availability of something essential has been called artificial scarcity by Jason Hickel<sup>7</sup>.

Competitive financial markets ensure investment funds are also scarce. Managers of large corporations are required to maintain a high price for shares in the corporation, and high dividends to shareholders. The benchmarks must be met every calendar quarter, or shareholders might withdraw their funds and invest them elsewhere. In this competitive environment one of the best assurances is to be bigger than the competition, so there is a strong incentive to keep the company



growing, by any means available. If all enterprises are striving to grow in this way, then the whole economy will tend to grow. Thus the scarcity of investment funds drives growth.

Politicians are also incentivised to maintain overall growth of the economy. As economies are presently mis-managed, if growth slows unemployment is likely to rise. Rising unemployment is a politician's worst nightmare.

Our modern greed is thus fostered and implemented in a way that requires ever more 'economic growth', and that growth requires ever more of everything: materials, people, land, water, crops, poisons, products, devices and so on. We have built a machine with unlimited demands. There is ever less room for anything else on the planet. Nor is there time to stop and enjoy the sunset, to have surprise and poetry in our lives.

It is possible to manage an economy differently. In the decades after World War II unemployment in the OECD was maintained around 3% or less without excessive inflation<sup>11,14</sup>. This approach could be supplemented, for example, with a job guarantee and a buffer-stock of potential employees who could be drawn back into the larger economy as required<sup>15</sup>.

More broadly, we could stop and reverse the enclosure of the modern commons, as Hickel urges. More and more of our activities are enclosed and commodified. Even our entertainments must be 'streamed' from one of the giant global entertainment corporations.

Reclaiming the commons requires being able to step off the treadmill and live in our own way at our own pace. This requires that we have the means for a sufficient livelihood. A substantial rise in minimum wages, and all wages, would facilitate this and stimulate the economy<sup>16</sup>. Restoration of many government services that have been removed over the past four decades would help to support people living more independently. A universal basic income would directly create a modern equivalent of the commons. The developed economies are wealthy and can well afford such policies if the wealth is so directed.

Implementing such measures would require a major change in our political cultures, but they have in any case become constricting, corrupt and toxic. A significant shift towards a more democratic politics occurred in Australia in 2022, with the election of a cohort of independents. On the other hand the growing urgencies can lead to shifts towards fascism led by 'strong men', as has also happened in a number of countries.

Stopping and reversing growth in material throughput is an essential step towards an economy that is embedded in a healthy biosphere. Such a healthy economy would ensure growth is of the healthy kind, renewing and provisioning in a circular system with minimal extraction and waste of resources. Any political difficulty in realising such a system is simply a challenge to be met, because there is no other way we can offer our descendants healthy lives into the indefinite future.

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# Sharing planet Earth: Overcoming speciesism in economics

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## 1. Is economic growth just a manifestation of planetary growth?

Earth system scientists have proposed the concept of a 'hybrid planet' (Frank, Kleidon, and Alberti 2017). This term refers to the observation that physical and chemical processes unfolding in the human-made domain of the technosphere have achieved geological scales; this has also motivated the proposal to define a new geological epoch, the Anthropocene (J. A. Thomas 2022). However, this proposal has raised some conceptual concerns because, firstly, the domain of the technosphere is not co-extensive with the reach and capacities of human action (Haff 2014), such that the very notion of 'sphere' suggests that it obeys autonomous evolutionary regularities and even laws like the biosphere (Herrmann-Pillath 2018). Secondly, considering the comprehensive and radical requirements of winding down human impacts on the planet to avoid climate catastrophe affecting all life on Earth, wouldn't this imply that with the entry into the Anthropocene, humans must step out of the center, in a Copernican turn moving from anthropocentrism to biocentrism (or, geocentrism and other variants of this idea) (Herrmann-Pillath 2021).

One of the conceptual pillars of the notion of the hybrid planet is the unity of the laws of thermodynamics that Georgescu-Roegen classically invoked to argue for the limits of economic growth (Georgescu-Roegen 2013 (1971)). However, physicists have often criticized his arguments, as despite the growing size of thermodynamic flows driven by human action, they are still minuscule when considering the entire energy budget of the planet, that is, the incoming and outgoing radiation (Kåberger and Månsson 2001). The physicist Axel Kleidon points out that, therefore, the human economy, materializing in the growth of the technosphere, can even play a role in positively enhancing the planet's potential to realize productive work (Kleidon 2023). This follows from the fact that photovoltaics is a technology that directly utilizes the planet's radiation budget, in principle, like photosynthesis. The environmental dilemmas stem from structural distortions caused by particular technologies, mainly fossil-fueled, but not from humans harnessing planetary energy potential.

Kleidon shows in meticulous detail that photosynthesis is far less efficient than photovoltaics in transforming solar energy into useful physical work (sometimes called 'exergy'). Therefore, he envisages that humans can even support the biosphere by intervening technologically with Earth system processes. One of his examples is the water cycle, which relies on water cycling from the oceans to the land in the form of clouds along the temperature gradients that drive wind systems. Once the clouds arrive, they release the water by rain, which in turn supports life, part of which directly takes atmospheric regulatory functions, namely the plants, which are also involved in regulating the water cycle. The technological alternative is to directly desalinate ocean water and

send it to areas where it is needed. Kleidon calculates that this is much more efficient energetically than the atmospheric water cycle. He suggests that humans could use the technology to turn areas like the Sahara into flourishing biotopes.

Of course, this is well-informed science fiction with the pedagogical motivation to demonstrate a key point: Growth is not a phenomenon that is confined to the human economy but is a general natural process that roots in the thermodynamics of the Earth system (Smil 2019; Hall and McWhirter 2023). If we recognize this, could we envisage that economic growth becomes seamlessly integrated with the planet's growth in terms of energetic transformations and transformative potential?

## **2. What about the looming great extinction on Earth?**

The Kleidon argument overlooks one key challenge of our current crisis: The imminent collapse of biodiversity on Earth (Dasgupta 2021). The science fiction becomes a scientific illusion since it only argues on the highest level of aggregation of thermodynamic flows and only considers structural issues in considering the origins of global warming in fossil technologies. But the growth of the technosphere also means that there is a deep structural conflict between the growing size of the technosphere and the sustainability of the biosphere as a complex system of systems, that is of ecological systems (Elhacham et al. 2020; Jenkins et al. 2020). The growth of the technosphere crowds out life on Earth and would subject life on Earth to human technological design.

There are undoubtedly many questions about these ideas, such as whether we could imagine humans successfully transforming large Earth swathes via solar energy-fed interventions into planetary processes. For example, the Sahara is an important provider of phosphate to the Amazon rainforest via the wind system carrying the dust from here to there. Greening the Sahara may entail negative consequences for the rainforest, unless we fertilize it artificially, thus further boosting the technosphere. In other words, Kleidon's vision implies the internalization of the biosphere into the technosphere while assuming human capabilities to orchestrate evolutionary processes in both and between both.

Hence, the challenge is to strike a balance between the biosphere and technosphere, which boils down to the simple question of who claims the surface of the planet to maintain its ways of life. The focus on surface area is a simplification but is usual in many measures of the human appropriation of the earth, such as the ecological footprint or HANPP (Krausmann et al. 2013; Richardson et al. 2023). Accordingly, one idea to limit human impact on Earth system is to exclusively assign a substantial share of the planet to the biosphere (Wilson 2016). In the following, I want to present another option that directly engages economic theory, specifically the theory of institutions. The key idea is to free economics from speciesism.

Speciesism refers to the explicit claim that economics is and has to be anthropocentric, a position that is maintained even by economists who otherwise take ecology seriously (Llavador, Roemer, and Silvestre 2015; Dasgupta 2021), and it shapes ecologically informed policies via the anthropocentric notion of ecosystem services (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, IPBES 2022). In economics, it is only challenged by so-called 'deep ecology' proponents in ecological economics (Spash 2013). The latter is primarily value-driven, whereas I will present an approach that argues within the logic of economics.

Consider the classical Coasean reasoning about the internalization of externalities, which has been closely associated with the ‘tragedy of the commons.’ The basic idea is that externalities can be dealt with by assigning property rights to a resource so that owners would be motivated to take care of it and make the best economic use of it: externalities would be subject to negotiations between owners, along the lines of legal procedures on nuisances (Serkin 2016). In the standard example of a factory polluting the river, the question is how rights to pollute or rights to clean water are allocated between various users of the river resource. However, this argument only includes humans as potential holders of rights. That means, for example, the interests of the fish living in the river are only considered indirectly via the interests of the fisherpeople catching fish. This is a speciesist position, as the fish are also affected by pollution but are excluded from the negotiation process. This is taken for granted; hence, the current solution is that the government might step in and protect the fish via regulatory interventions. So, we get a hybrid institutional framework of dealing with externalities in which only humans can hold rights on natural resources as owners; the interests of non-humans are represented by the government, that is, other humans.

As we know, this arrangement has wholly failed to stop the looming collapse of biodiversity on Earth. Hence, I suggest another solution: Assigning property rights to all living beings to launch a more-than-human process of internalizing externalities of human impact on planet Earth. How can that work?

### **3. Debunking anthropocentrism of rights of property**

In recent years, the movement of giving rights to nature has gained speed, such as recognizing rivers as legal persons (Chapron, Epstein, and López-Bao 2019). Indeed, the construct of the legal person already creates a non-human holder of rights, such as the free-standing corporation. In principle, this can be directly applied to the rights of living beings. Further, the literature on animal rights has also unmasked the speciesism of the common assumption that non-humans cannot be holders of rights, such as human rights or ownership rights (Deckha 2021). Regarding human rights, the generalization is straightforward and has been classically argued by Peter Singer (Singer 2015). The key criterion is the capacity to suffer, that is, being sentient. To this, we can add the second key criterion: the capacity to act autonomously. Both requirements are not a matter of belief: Belief is only what denies those capacities to non-humans. Scientific evidence has extended the boundaries of sentience and autonomy far beyond what is considered ‘higher animals’ (Godfrey-Smith 2020). There is no scientific foundation for denying any ‘human’ rights to non-humans, based on the argument that those rights are coupled to distinct capacities exclusive to humans.

Apparently, the question of property rights is different; as Adam Smith famously quipped, we never saw two dogs bartering like humans. In economics, property rights are institutional devices to enact markets, and markets require distinct human means of communication and interaction. Even if we assign property rights to fish, they cannot negotiate with us. But does that justify denying their rights to ownership?

As Peter Singer argued fifty years ago, speciesism stands in line with racism and sexism. Denying ownership rights to other humans has been commonplace in all human societies, such as excluding women from holding land rights or treating colonized land as ‘terra nullius’, thus nullifying existing land use claims by native populations. The justification has always been that the respective

humans were of lower intellectual and moral capacities than the ruling groups, primarily white males. This argument is the same as applied to non-human animals today.

Let us consider a classical and influential theory on property, John Locke's. Locke conceives of the individual ownership of one's body as a natural right. Next, he argues that labor expended on an object creates ownership. Locke's theory provided legitimacy to the colonial expropriation of natives allegedly living as savages in the wilderness, literally like animals. Nobody owns the wilderness, and the tiller appropriates it with his labor. Of course, this application of Locke's theory is racist, but that points to the fact that it can be easily generalized: The natives also spent labor on the resources, even when they would gather nuts and herbs growing in the wild (Lucassen 2021). Apparently, the difference seems mainly technological, as a settler who tills the land is bound to it, whereas the nomad may follow herds of animals. Yet, this technological difference does not imply that the Lockean argument does not apply to the nomad. This was well recognized in the early history of colonialism, where colonial governments often moved to protect native rights against settler expropriation. They wanted to incorporate the natives as subjects in their realm (Greer 2017).

Now, and obviously, there is nothing that excludes non-humans from the original Lockean argument on ownership of the body since all living beings are defined by their capacity to distinguish themselves from their environment via enacting organismic boundaries and are autonomous in the sense of endogenously generating goals and actions (Thompson and Stapleton 2009). Denying the natural right to own themselves is speciesist. The philosopher Tilo Wesche has further generalized this reasoning in justifying the rights of nature (Wesche 2023). He introduces the distinction between natural resources and ecosystem services, approaching the latter as the processes that produce a natural resource, and that, therefore, can count as labor, understood in abstract form as 'adding value,' which is Lockean in spirit. This argument puts human property claims on the resource on par with claims of nature.

#### **4. The Commons as a basic form of more-than-human property rights**

The Lockean justification of property is universal and treats all living beings as potential property holders. To be more precise, this refers to their right of possession: In utilizing their environment as a resource, living beings possess the resource and accordingly establish rights to own it. This is a crucial step, as we must distinguish between possession as use and the derived right. This is well recognized in the economic theory of property rights, where the distinction between economic rights and legal rights is much-debated (Hodgson 2015; Barzel 2015). The former is a factual right to control and use; the latter is a right as defined by the law. This directly applies to the non-human extension: Possession is universal, and the question is how this translates into a legal right (Hadley 2015). Here we move into the exclusively human domain, as barring breakthroughs in communicating with animals, humans must independently take the step to formulating and assigning rights. How can this be done?

The solution has been adumbrated in Elinor Ostrom's celebrated work on the Commons (Ostrom 2015). Her original argument remains speciesist, as the members of the Commons are only humans who may negotiate over the fate of non-humans as a 'common pool' such as fisheries. This does not adequately reflect the complexity of ecosystems. Let us go back to Wesche's argument and consider an example of a natural resource, the soil, which is congenial to Locke's discussion of introducing property into the natural state.



Fertile soil may be produced by the farmer who tills the land, but many other living beings collaborate to create the soil. Consider the much-quoted earthworms: Their labor is essential for producing the soil. Hence we can differentiate between the soil as a resource and the ecosystem services that produce it. However, there are two difficulties. The first is that in an ecosystem, all constituents are resources for others. I refer to this as the principle of ecosystem holism. The other is that the sheer number of individual constituents is overwhelming. This results in what has been dubbed the 'tragedy of the anti-commons' (Heller 1998): It is impossible to create, assign, and manage all property rights theoretically corresponding to factual possessions, such as possession of earthworms.

So, on the one hand, we can recognize the complexity of mutual possessions in an ecosystem. Still, we cannot move to the simple Coasean solution of assigning individual property rights. The answer is the Commons, based on the distinction between property rights and ownership (Schlager and Ostrom 1992). In the original Ostrom model, the ultimate ownership right belongs to the community of the Commons. If we abrogate speciesism, we recognize this community as the ecosystem that relates to a critical resource, such as a lake or a particular area with topological boundaries reflected in ecosystem functionings (Herrmann-Pillath 2023). As in Ostrom's approach, this community can define and assign property rights to its members, which are specific rights of use but can never include alienation of the underlying key resource, such as selling land to non-members via the market.

In institutionalizing such a Commons, the concept of legal person applies in various forms. The first is that the Commons as the ecosystem is a legal person both with rights and responsibilities in its internal relation to members and in its external relations. The appropriate form is the trust, which is represented by trustees (Bradshaw 2020). For this, the current laws regulating trusts can be easily adapted. Internally, the Commons as trust needs to assign the status of right holders to various members. There is no universal solution to it; it is a design issue that seeks to create a workable, efficient, and inclusive regime of negotiating resource use in the Commons. As in the example of the soil, humans may obtain property rights by utilizing a parcel of land as personal holders of the right. However, earthworms may be represented as a group by a legal person who is in turn represented by a human steward. Hence, as far as the non-humans are concerned, the ecosystem Commons is a network of natural and legal persons which is institutionally designed by an internal process that reflects the ecosystem functionings. In principle, this distinguishes a constitutional level, in which the charter of the Commons would be crafted, and the post-constitutional level of continuously negotiating and adapting current institutions.

## **5. Transforming the technosphere: multi-species cohabitation in 'wild cities'**

I do not go into further details (Herrmann-Pillath 2023). My primary aim is to show that in principle, we can employ well-known approaches in economics to overcome its inherited speciesism. Contrary to the standard Coasean approach to dealing with externalities, which excludes other species from partaking in the process of internalization, the Ostromian institutional form of the Commons enables and empowers inclusive internalization, effectively sharing resources among all members of an ecosystem while creating a system of partial property rights in exploiting its resources, allowing the necessary degrees of freedom for human economic action. In concluding this contribution, I offer a glimpse at what that means in practice.



Such Commons are already emerging, in the shape of recognizing rights of possession to all species cohabitating at a particular place, even when it comes to the vital manifestation of technosphere evolution, the modern city. The World Economic Forum has released a report on 'BiodiverCities by 2030' (World Economic Forum 2022). This slogan is also invoked by an EU-sponsored network of 13 cities pursuing the aim of enhancing biodiversity in cities ([https://knowledge4policy.ec.europa.eu/projects-activities/biodivercities-project\\_en](https://knowledge4policy.ec.europa.eu/projects-activities/biodivercities-project_en)). The IUCN has launched an international benchmarking of multi-species urban environments (<https://www.iucnurbannatureindexes.org/en>). These initiatives respond to the recognition that cities are hotspots of biodiversity and evolutionary labs to future biodiversities that create ecosystem capacities to meet the challenge of climate change (Parris et al. 2018; C. D. Thomas 2020).

In practice, this means developing approaches to interspecies design in which the human-built environment is no longer only providing services to people but also to all other species (Roudavski 2021): hence we may speak of a reciprocal flow of ecosystem services for people and technosystem services for nature. Practically, this can be realized in the context of so-called 'nature-based solutions' (Herrmann-Pillath, Hiedanpää, and Soini 2022). For example, in the 'sponge city' design principles, urban wetlands and greeneries serve to cope with heavy rainfalls and regulate water flows in the city, which can also offer rich spaces for rewilding the city. This applies on all scales (Del Tredici 2014): For improving water drainage, the urban surface of roads and places must be porous, which allows herbaceous wild plants to flourish, if not suppressed, as usual, and this wild greenery also contributes to lowering temperatures. Examples abound.

Suppose we embed these approaches institutionally with the Commons as outlined here. In that case, this means that urban planning would recognize shared and partial property rights of non-humans in human-built structures, in principle, like rights of easement. Suppose the urban land is owned by all species cohabitating in a municipal Commons. In that case, human buildings must be designed as integral parts of the biosphere, allowing for uses by other species than humans. A simple example is birds (Hwang and Jain 2021). Modern buildings do not give many opportunities for birds to rest and nest. In comparison, a gothic-style building with many seemingly 'useless' ornaments, balconies, turrets, and so on is much more inviting. To this, green roofs and vertical greenery can be added. Such buildings open to rewilding are not fancy but are being constructed all over the world, yet remain exceptions. In the 'biophilic' city of the future, they would be the standard because this manifests the underlying property rights structure of the Commons.

Rewilding the city is the alternative to exclusively giving half of the Earth to non-human species. This is the better solution, as it does not separate the human domain from all others, akin to a giant technosphere condominium. Living together based on equal and inclusive ownership rights on the planet would create entirely new ways of living for the human species and would eventually allow for rich forms of symbiosis between technosphere and biosphere (Haraway 2016; Bridle 2022). A more-than-human science of economics will show the way for its institutional design.

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## **Part Two:**

# **Background Considerations**

# On capitalogenic climate crisis: unthinking Man, Nature and the anthropocene, and why it matters for planetary justice

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“Human society causes climate change.” This from the Intergovernmental Panel on Climate Change’s *Sixth Assessment* (2022: SPM-4). It is positively underwhelming in its simplicity – and quite possibly mistaken, in partial but crucial ways that undermine any politics of climate justice worthy of the name.

As the flat-earth climate denialism of previous decades wanes, a new form has gained hegemony: “climate change [is] unequivocally caused by human activities.” That’s Jim Skea (2023), the newly-elected IPCC chair, speaking on the eve of yet another useless global convergence, COP 28, held in, of all places, the United Arab Emirates.

How on Earth – one might reasonably ask – are such statements a form of denialism? My answer is simple. To deny the relations behind the climate crisis is scarcely less serious than denying the crisis itself. It’s no exaggeration to say that everything about our climate politics turns on one’s assessment of just who has done the deed. And to make sense of that, we’ll need a world history that takes seriously class and capitalism in the web of life.

## Anthropogenesis as Climate Denialism

On one thing, the would-be masters of the universe agree: it’s not our fault. From the IPCC to the World Economic Forum to Wall Street, the lords of Spaceship Earth have embraced the reality of climate crisis – and courageously accepted that everyone is to blame. We now live, or so we are told, in the Anthropocene – the “age of humans” (Crutzen and Stoermer, 2000). “We have met the enemy,” as Pogo announced on the first Earth Day in 1970, and “he is us” (Moore, 2023a).

Every denialism involves two elements. One is the reality that is being denied. The other pivots on those responsible. I’m not invoking ethical responsibility, but the rather concrete relations of competition and conflict inscribed in the long development of the climate crisis. I have spent the lion’s share of my adult years making clear that the origins of today’s planetary crisis are found in the rise of capitalism after 1492, a matter to which we’ll turn presently. For now, I want to underline the pervasive denial of the causal geohistorical relations behind the climate crisis. This occurs under the sign of *anthropogenic* climate change – a popular idea whose pretension to innocent description is every bit as pernicious as the denial of climate change itself. Half-truths, as Benjamin Franklin opined in 1758, easily become the “greatest lies.”

As I'll do my best to unpack in the following pages, the argument that history is determined by an Eternal Conflict between Man and Nature is an early modern invention. Bourgeois legitimacy always depended on some version of "natural law" thinking, from the earliest Civilizing Projects to Malthus to neoliberal economic dogma. That's no base-superstructure argument. The capitalist mode of production emerged, Marx and Engels emphasized, as more than an abstractly material assemblage of markets, machines, and classes; these cohered through the "means of mental production" specific to bourgeois rule (2010: 59). Scientific ideas and ideological claims coupled promiscuously – then as now.

Long associated with the Scientific Revolution, the latter was as much consequence as cause. *Bourgeois* naturalism necessarily preceded scientific naturalism (Furfey, 1942). The early modern organization of the means of mental production implicated the "software" of Cheap Nature: imperial power and its ambition to transform planetary life into profit-making opportunities (Patel and Moore, 2017; Moore, 2023f). Not coincidentally, capitalism as a mode of thought crystallized amidst climate crisis: the Little Ice Age (c. 1300-1850). The era's most harrowing passage was the "long, cold seventeenth century" (c. 1550-1700), defined by endless wars, political instability, and economic volatility (Ladurie and Daux, 2008; Parker, 2013). The unfavorable climate was, in part, *capitalogenic*, "made by capital," as coercive proletarianization led to the destruction of indigenous populations (Lewis and Maslin, 2015). Far from the happenstance of Man and Nature, this was a climate-class conjuncture. In contrast to the late medieval crisis, it was the first time a civilization was forced to respond to climate conditions partly of its own making. What followed was a far-flung "climate fix" that involved a new mode of thought alongside the dramatic reinvention of territorial, financial, and military power. The core principles of this Cartesian Revolution – above all its managerialism, instrumental reason, and love affair with dualism (and hatred of dialectics!) – were forged in the midst of climate crisis (Moore, 2018). It would be foolish indeed to believe that the mode of thought involved in the making of planetary crisis can deliver an emancipatory politics of climate justice.

The new climate consensus is a creature of this imperial naturalism. It recognizes geophysical reality while denying its geohistorical causes. This should not surprise us, for reasons that turn on contemporary history no less than the *longue durée*. Second-wave environmentalism, with Pogo and *The Population Bomb* (Ehrlich, 1968), was a reaction to the era's potentially dangerous radicalism (Robertson, 2012). Notwithstanding its apocalyptic rhetoric, this was an Environmentalism of the Rich (Dauvergne, 2016). As American workers learned in the 1970s, *their* environmental problems – in Louisiana's Cancer Alley, in the Central Valley's strawberry fields, in working-class suburbs like Love Canal – were irrelevant in the second-wave paradigm (Moore, 2022a). Environmentalism, let's be clear, had long been an elite affair. As boomer professionals flocked to the cause, its underlying politics of eco-managerialism combined individual virtue-signaling ("live simply so others may live") with a sober and modestly reformist technocratic politics inherited from first-generation conservationists (Moore, 2023b). Both shared a demographic basis in the professional-technical intelligentsia. *Plus ça change....*

This soft denialism keeps our thinking in the shallow end of the pool. Its underlying intellectual architecture is the binary of Man and Nature. I'm calling this the Eternal Conflict. The uppercase is deliberate. It is of course anything but eternal. As historians have long maintained, the geocultural sorting of planetary reality into Man and Nature emerged tentatively, then rapidly, in the two centuries after 1492 (Wynter 2003; Abulafia 2008; Moore, 2015, 2017a, 2017b 2018, 2021b). They became what Marx and Engels called ruling ideas, the Eternal Conflict its ruling binary (2010: 59).



In place of medieval, organic, holisms, after 1492 a new truth regime materialized around the fundamental separation of Man and Nature. This is the alienation of class formation expressed in thought – and *mediated through ideology* (Patel and Moore 2017). It was the work of soldiers as well as priests, planters no less than *philosophes*. At its heart was an essentially managerial outlook, dividing the world – as in Descartes' classic formulation – into “thinking things” and “extended things.” Thence was installed the Eternal Conflict between Man and Nature, variously theologized and secularized in modern form. That conflict would be managed by the Civilizers, in various combinations Christianizing, civilizing, and developmentalist. Invariably, the Civilizers claimed some incarnation of “natural law,” since World War II justified by Good Science (Moore 2021a; Selcer 2018). The Civilizing Project guided the rule of the Enlightened over Nature, a ruling conceit encompassing not only soils and streams, but the human majority. These latter were the “savage” and the “wild” and the “undeveloped” – in the language of the times, from Shakespeare to Truman. They were biological humans – but not, or *not yet*, civilized. Thus the practical utility of bourgeois naturalism in supplying ideological raw material for every ideology of domination, not least sexism, racism, and imperial nationalisms (Hage, 2017).

Without this line of critique, we are left with the fetish of abstract Man as historical actor, one whose anthropological essence encounters an external Nature. That external Nature must be tamed, civilized, developed. This was – and remains – the philosophy of imperialism and its “rational mastery of the world” (Weber 1951: 248). Not for nothing, the modern critique of human nature and capitalism's world-historical character *begins* with an assault on this view of abstract Man (Marx, 2010; Marx and Engels, 2010). For Marx and Engels, *humanity does not make history*. Empires make history. Corporations make history. Labor unions and revolutionary parties make history. Churches make history. For historical materialism, these all express and mediate the class struggle: the contradictions of specific modes of life and modes of production, of “real *historical* man” (Marx and Engels 2010: 39). Engels underlined the point: “labor created man” (1987: 452). From this standpoint, the climate crisis is not anthropogenic, but capitalogenic: the product of *historical man* as specific “ensembles” of labor-metabolic relations, with and within webs of life (Marx, 2010: 4; see Moore and Antonacci, 2023).

For Marx and Engels, then, the prime mover was class struggle, producer and product of metabolic and other “natural conditions” (2010). Man and Nature were materialist, but abstractly so. Keenly aware of Malthusianism's influence, they warned against a one-sided naturalism no less than idealism.

Here we encounter superficial, but also deeper ideological, problems with the Popular Anthropocene. The Popular Anthropocene is not the strictly geological project focused on “golden spikes” demarcating one geological epoch from another (Moore, 2017c). More ideological phenomenon than scholarly enterprise, the Popular Anthropocene is the latest incarnation of neo-Malthusian eco-catastrophism evolving since the end of World War II (Robertson, 2012). Critical scholars have picked the low-hanging fruit and denounced the Popular Anthropocene as distributing responsibility for climate change amongst all humans rather than focusing blame on the One Percent.

Eco-populism takes us only so far, however. The problem has deeper roots. Underneath the Anthropocene's blame dispersal is something worse. This turns on how the Anthropocene, in recuperating the terms of the Eternal Conflict, short-circuits a socialist critique of the climate crisis. Narrating the crisis as human-caused, the hegemonic climate consensus makes unthinkable the critique of capitalism and its class dynamics in the web of life as first order contradictions. The geocultural trinity of Man, Nature, and Civilization performs a crucial ideological function, blinding many “critical” intellectuals to capitalogenic climate forcing. The outcome has been a breathtaking flight from world history (Moore, 2022b). Both mainstream and critical tendencies within environmental studies have embraced the Eternal Conflict and surrendered to its ideological-linguistic doublespeak –

anthropogenesis, “human society,” overshoot, ecological footprints, and much more. Under no circumstances, these fetishes tell us, should we pay attention to the Man Behind the Curtain.

The construction of climate crisis as *human-caused* reads like the biospheric expression of Naomi Klein’s shock doctrine (2007): never let the threat of a crisis go to waste. Just take care to obscure its causes in the ideological pabulum of Man and Nature. The new climate consensus aims to sublimate any awareness of capitalogenic relations into popular into popular frames of anthropogenic climate change. To the degree this succeeds, it erases the dynamics of class, capital and empire; meanwhile, it naturalizes these into derivatives of the Eternal Conflict. Hence the insistence that a “climate emergency” must be addressed by emergency, authoritarian, *and above all scientific*, measures.

Here is a serious threat indeed. “Climate emergency” and “existential threat” discourses are species of political rhetoric long deployed by authoritarian rulers, from imperial anticommunism to the “war on terror” after 9/11 (Antonacci, forthcoming). Emergency politics historically favor anti-democratic “solutions.” Its core climate thread runs like this: *Humans* cause climate change; climate change represents an “existential threat” to humankind; emergency measures are necessary because “we are out of time”; those emergency measures will require the unprecedented centralization of power and an unprecedented submission to a biosecurity state if “we” are to “save the planet.” We haven’t time for democratization, much less social revolution. “Tree huggers” are fine, Europe’s leading climate scientist Johan Rockström told *The Guardian* in 2021. But the real solutions, Rockström highlights, will be found through the alliance of elite scientists and technocrats with “bankers and CEOs” (Watts, 2021). As Joseph Biden told voters on the road to the White House in 2020: “nothing will fundamentally change” (Prokop, 2019). Fukuyama’s “end of history” (1989) – this time as climate farce – has moved to the center of global politics.

### **Man, Nature & Capitalogenesis**

*Anthropogenic*. Let’s take a moment to consider its audacity. *Anthropogenic*: “Made by Man.” We know this to be untrue. Taking refuge in abstract generalities is nearly always a defense of the status quo. The research on the relational drivers of climate change is vast. While Marxists and centrist liberals tend to default to some measure of resource fetishism – “fossil capital” is one prominent instance (Malm, 2016) – the world-historical character of resource mobilization allows us to see how resources *become* (Zimmerman 1951). Coal is just a rock in the ground; it becomes a fossil fuel under specific geohistorical conditions (Moore 2015). The problem is not “stopping oil”; it’s stopping capital and socializing the capitalogenic means of material and mental production.

While one may quibble with precise formulations, the verdict is clear: 103 corporations dubbed “climate majors” are responsible for 70 percent of carbon emissions *since 1751*. The United States alone has been responsible for 20 percent of carbon emissions since 1850 – a figure that disregards carbon emissions financed or otherwise coerced by the American empire in the countries of the Global South over the past century (Heede, 2019). Anthropogenic? Made by Man? Let us consider the patently absurd notion that the genocides of the Americas after 1492 were anthropogenic. Or consider the Nazi destruction of European Jewry and the murder of 28 million Soviet peoples during World War II. Or the slave trade. *Were these anthropogenic phenomena?* No. All these movements were *capitalogenic*. Made by *capital*. Those responsible have names and addresses.

I hear the objections. Science abstracts from “human” relations to isolate human from natural causation. It’s crucial, for instance, to distinguish the climate influences of orbital variations or volcanic eruptions from smokestacks, feedlots, and cities. And that’s all true.

But the Anthropocene is not a narrowly scientific procedure. That’s why I call it the Popular Anthropocene. It’s a key ideological expression of capitalism’s scientific infrastructure, with proximate sources in postwar American hegemony and deeper roots in the rise of capitalism (Moore 2018; Selcer 2018). I’ll leave aside the obvious, that science is a social infrastructure shaped by definite social and ideological forces. It’s enough for now to underscore how the scientific advocates of the Anthropocene are shameless in their willingness to translate their expertise into neo-Malthusian narratives. Worse, countless critical, even socialist, intellectuals adopt this neo-Malthusian framing, with titles like *Marx in the Anthropocene*... as if Marx did not *begin* his outline of historical materialism with a searing indictment of “abstract man” (e.g., Saito, 2022)! Instead, across a broadly defined “critical” intellectual spectrum, there is widespread silence on the geohistory of capitalism and a *de facto* acceptance of Anthropocenic “trajectories” (Steffen, et al., 2015). These yield a sequence of banal empiricisms foregrounding the epochal significance of technology, markets, population, and other expressions of the so-called “human enterprise” – a delicious blend of sci-fi futurism and Spaceship Earth neoliberalism. In one landmark formulation, Nobel laureate Paul Crutzen (2002) proclaimed 1784 as Year Zero for the Anthropocene, identifying Watts’ rotary steam engine as the key machine of anthropogenic climate change, somehow joined to the prodigious demographic expansion that commenced a century or so later. That’s bad economic history, bad environmental history, and terrible politics (Moore, 2017b, 2023c).

### **The Capitalocene: Cheap Nature, Climate Fixes & The Geohistory of Climate Crisis**

Capitalogenesis orients us to a different history: not of Man and Nature, but of Marx’s dialectic of the “soil and the worker,” an internal relation of class struggle in the web of life (1977: 638).

We can start the clock on capitalism’s environment-making revolutions in 1492 (Patel and Moore, 2017). The capitalogenic remaking of the biosphere began immediately. The Columbian invasions were quickly followed by an ecohistorical revolution unprecedented in planetary history: the imperialist creation of a capitalist Pangea, as the new empires knitted together the geobiology of Eurasia and the Americas (Crosby, 1986; Moore, 2017a). From the beginning, capitalism was a biogeological force.

The *Capitalocene* is not the kind of wordplay fancied by “critical” intellectuals (Moore 2017a, 2018). It is a geopoetics – literally, earth poetry – that lays bare capitalism’s most potent “ruling ideas” and allows us to make sense of its history. From its origins in the conquest and commodification of the Americas after 1492, imperial-bourgeois ideology has forged not one but many Civilizing Projects (Moore 2023a). The new capitalist empires invented an epoch-making ideological system from Ireland to Brazil to Mexico. Simply (although history is never simple), this was a new cosmology. It reimagined history as a collision of Man against Nature, mediated by the Civilizers. It was the task of Empire – who deceived themselves and many others into thinking they were Civilizers – to assume the moral responsibility for the rational oversight and active management of Nature, including its “savage” inhabitants. From capitalism’s “rosy dawn” after 1492 (Marx, 1977), every great era of imperialism and accumulation has required – and reinvented – this ideological Holy Trinity: Civilization, Man, and Nature. That imaginary today dominates the Environmentalism of the Rich and its Anthropocene-Industrial Complex.

*Civilization. Man. Nature.* If our upercase is pedantic, it's for good reason. These words earned their modern place in the English language in the century after 1550. They quickly became the most dangerous words in the bourgeois lexicon, necessary to the era's intellectual revolutions and the conceptual apparatus of imperial policy. These keywords gained traction during capitalism's first great climate crisis and its subsequent climate fix. They were emergent principles of the Civilizing Projects that created the fetishes of "Europe" and its functional antonym: the "uncivilized" and "wild" Americas.

At the heart of this civilizational fetish – the historical precondition of the commodity fetish – was an entirely novel accumulation strategy: Cheap Nature (Moore, 2015). Its fundamental priorities were, and remain, twofold: violently reduce the cost of labor, food, energy and raw materials necessary to advance the rate of profit; violently devalue the ethical and cultural "worth" of human and extra-human work and workers. Nature became not only a "ruling idea" but a *ruling abstraction*, a guiding thread of imperialist praxis. From 1492, Nature became everything the imperial bourgeoisie did not wish to pay for: labor, life, resources, wombs, you name it (von Werlhof, 1988).

The Cheap Nature logic feeds bourgeois naturalism and its claims of natural law. Naturalism was seized upon and encouraged by bankers and kings, priests and planters, soldiers and merchants, becoming the geocultural premise for the invention of modern racism and sexism after the mid-sixteenth century. As Federici illustrates, female humans became *Women*, the "savages of Europe" (2004: 100). Consequently, female work became "women's work," and women's work was redefined as "non-work." They were caged through *Nature*: unworthy of remuneration. Nature, in other words, became an imperial-class project of superexploitation that prized the rate of profit above all else: extending the working day for females imprisoned in the ruling abstraction *Woman*, devaluing her socio-biological labor (Moore, 2023d). Only by accepting the Civilizing Project – and its logic of "taming" the "wild" woman (Shakespeare) – could women find redemption through unpaid work, above all through the Cheap Care regime that ensured the cheap birthing and care that makes capitalism possible (Tilly, 1984; Seccombe, 1992; Patel and Moore, 2017).

On this basis, the Capitalocene thesis argues for a history of capitalism that joins socially-necessary labor time with its dialectical negation: socially-necessary unpaid work in the web of life. Because this dialectic exceeds the cash nexus and market coercion, its covalent bond is capitalism's geoculture and its means of mental production, variously scientific, instrumental, and ideological. Thus the synchronicity of gendered proletarianization, proto-industrialization, and the Cartesian Revolution is hardly accidental (Federici, 2004). The latter's separation of "thinking" and "doing" is the world-historical crystallization of bourgeois managerialism (Moore 2021a). This Revolution accompanied the formation of the planetary proletariat, spanning the era's combined and uneven geography of the plantation, military, extractivist, and proto-industrial revolutions. Every great superpower that followed would reinvent both the Civilizing Project (the White Man's Burden, Manifest Destiny, Developmentalism, etc.) *and* its managerial trinity: seeking to govern work, war, and the biosphere. Today, this planetary managerialism, under the sign of a Davos-aligned Anthropocene, pursues a dystopian world surveillance state as a viable strategy for post-capitalist transition. Intellectually equipped by the Anthropocene, it promises to "fix" the climate crisis by generalizing the imperial-neoliberal degrowth policies imposed by Washington on Latin America, Africa, and across the Global South in the 1980s.

The Capitalocene thesis challenges the Anthropocene's erasure of world history and its falsification of "the" Industrial Revolution as Year Zero of planetary crisis. It's worth noting that this fetishization of the Industrial Revolution originates in Toynbee's high liberalism and his paeans to market liberalization 150 years ago. Toynbee's famous lectures (1884) were, among other things, a contribution to the

Progress and Improvement promised by liberal “competition” – and an anti-socialist polemic against the democratization of economic life. The transformation of British industry after 1800 was a turning point. But it cannot be reduced to an English story of magical substances and machines. Coal and steam power *are* significant. But their epochal significance derives from the radical extension of slavery and the plantation system in the American South during the 1790s and the West Indian plantation profits even earlier. No cotton, no industrialization, at least not as we knew it (Moore, 2023c). The *origins* of modern planetary crisis were found centuries earlier.

### **The Natures of Epochal Transitions: Climate, Class & Revolution**

Capitalism is not only the producer of today’s fateful climate-class conjuncture. It’s also the *product* of the climate-class nexus of two previous great eras of epochal transition. One was the crisis of feudalism, beginning at the dawn of the Little Ice Age in the late thirteenth century. In the wake of this climate shift, feudal agriculture’s socio-ecological antagonisms exploded immediately. Famine and pestilence appeared almost overnight. So did class revolt, and with increasing force. From Flanders to Florence, Catalonia to Scandinavia, workers and especially peasants refused to allow feudal restoration. What followed was a historic victory for western Europe’s direct producers and reproducers. In an era of economic contraction and an icy climate, peasants and workers enjoyed a golden age of living standards. Meanwhile, the ruling classes turned against each other in a Hobbesian war of all against all (Moore, 2003, 2007; Wallerstein, 1974).

At a time when it is often easier to think of the end of the world than the end of capitalism, the fourteenth century’s climate-class conjuncture yields an indispensable insight. Moments of unfavorable climate change in the Holocene are pregnant with political possibility. This is not because climate drives anything (climate does not “have agency”); it is because climate is *in* everything. Climate is a strand of civilizational DNA woven into the socio-ecological relations of power, production, belief, and, well... everything that makes a class society a *class society*. Feudalism’s two great subordinations of the peasantry – in the “long” eighth and eleventh centuries – occurred during the most favorable climates of the Middle Ages (Wickham, 2004). Great climate-class crises – *compromising ruling class capacities* – were prelude and prologue to these great subordinations. These climate-class conjunctures include the implosion of the Roman West in the Dark Ages Cold Period (Harper, 2018), and the historic defeat of feudalism’s One Percent in the Little Ice Age (Moore, 2003). The eras that followed were “dark ages” for the oligarchs. They were golden ages for the vast majority (Wickham, 2004).

The lesson for our times? Unfavorable climate changes across the Holocene have been bad for ruling classes.

We are accustomed to thinking that today’s crisis is the first capitalogenic climate event. It’s not – although ours *is* qualitatively distinct. The Columbian invasions in 1492 marked a geobiological watershed in two significant ways. One was the creation of a capitalist Pangea, 175 million years after the supercontinent broke apart. The conquests placed the potential work and energy of two continents at the disposal of imperial war machines – hungry to turn a profit to fight new wars, to pay their creditors, and to constitute colonial bourgeoisies (planters, merchants, mineowners, ranchers, etc.). The second watershed followed on the heels of the first. No profits could be realized in the Americas without Cheap Labor. The vortex of imperial conquest and colonial class formation demanded ceaseless human sacrifice. It helped that indigenous peoples were regarded as part of Nature, and subject to Cheapening in its most lethal forms. Microbes did not kill 95 percent of the New World’s population; slaving did (Cameron, Kelton, and Swedlund, 2015).



In the geological blink of an eye, the new empires detonated a new era. The Capitalocene does not substitute for geology; it incorporates geobiological change into an assessment of capitalism as a world-ecology of power, profit and life. The genocidal proletarianization of indigenous peoples led quickly to the formation of another murderous proletarianization: the African slave trade. It was quickly reinforced by a climate conjuncture amplified by the American genocides.

The conjuncture was recorded by contemporaries, who observed a series of unfavorable winters by the 1550s, a tumultuous decade of war, financial crisis, and the collapse of Bolivian silver production. The long, cold seventeenth century had begun. It was the worst stretch of “bad climate” in the Little Ice Age – the coldest climatic period of the last 8,000 years. Like earlier climatic episodes of political crisis in late Antiquity and late feudalism, it was an era of endless war, social revolt, and economic crisis. The New World genocides, by devastating indigenous populations, led to an unprecedented drawdown of atmospheric carbon dioxide – forests advanced, soils were left undisturbed by agriculture. The geographers Lewis and Maslin (2015) call this the Orbis Spike (1610). Amplifying contemporary shifts in the North Atlantic Oscillation, solar intensity, and volcanism, the Orbis Spike contributed to the era’s severe cold – and its unprecedented social volatility. Capitalism as we know it might have been stopped dead in its tracks.

This was not unthinkable. Indeed, it was the most likely outcome. Across the previous three millennia, climate shifts and civilizational crises were tightly bound. The crises of the Roman West in the long fifth century and feudal Europe in the long fourteenth-century point to the intimate dialectics of climate, class, and governance (Brooke, 2014). We might also include the Bronze Age Crisis in the twelfth century B.C.E., during which migrations, war and popular revolt unfolded amid drought and famine (Kaniewski, et al., 2010).

That capitalism survived climate conditions roughly comparable to those experienced in the crises of the Roman West and feudalism matters deeply to contemporary climate politics. Capitalism survived thanks to two great socio-ecological revolutions. These were fundamental to the first great climate fix. One was the Great Domestication. As Silvia Federici demonstrates (2004), the mid-sixteenth century marks an unprecedented rupture in the gendered-class structure of early capitalism. It’s no secret that the climate downturn and the upsurge in “witch hunts” were tightly connected. They were crucial moments in the defeat of the proletarian and peasant forces. A defeated and divided peasantry and semi-proletariat could not halt the redefinition of women’s work as “non-work” essential to the proto-industrial expansion that followed. In short, the Great Domestication made possible the Great Proletarianization, and these two made possible nineteenth-century industrializations (Patel and Moore, 2017). This was the rise of climate patriarchy, a class project of Cheap Nature upon which every imperial or industrialization project henceforth depended.

Meanwhile, empires, capital and science worked hand-in-glove to forge the most audacious productivist revolutions in the history of class society. We may call this the Plantation Revolution, although it included extractive, manufacturing, and stock-raising moments (Moore, 2003, 2007, 2010a, 2010b). Its world-historical pivot was the sugar plantation. In a rapid-fire sequence of frontier movements – beginning in Brazil during the 1560s – the riches of King Sugar greased the wheels of seventeenth-century accumulation. They provided the crucial increments of capital formation for the Industrial Revolution in the late eighteenth century. The Plantation Revolution’s crystallization of the climate class divide and climate apartheid would, in turn, provide the essential apparatus of power and profit for the Industrial Revolution’s decisive techno-resource combination (Moore, 2023c). That was *not*, as usually assumed, coal and the steam engine; it was cotton, the cotton gin, and a new

superexploited and racialized labor regime. Nor was it coincidence that King Cotton was crowned during the last great cold snap of the Little Ice Age (c. 1783-1820) – much as King Sugar had come to capital's rescue two centuries earlier. Taken as a whole, these early centuries after 1492 witnessed the birth of the capitalogenic trinity: the climate class divide, climate apartheid, and climate patriarchy.

### **Capitalogenic Trinities: Towards the Proletarocene?**

Today's world bourgeoisie is not exempt from this pattern of climate crisis and climate fix. The One Percent has dug itself out of crisis by moving soldiers, priests (of the Church, of Development), and financiers to the frontiers (Moore, 2000a, 2000b, 2017b). These frontiers – at least those vast enough to establish a new capitalist golden age – are gone. Enclosed. Exhausted. But the *strategy* persists – zombie-like. The drive towards frontiers continues even as these no longer exist on a scale sufficient to revive accumulation.

We have now come full circle. The Capitalocene depends on successive Civilizing Projects that seek to create new profit-making opportunities through Cheap Nature: a strategy of (economic) valorization and (geocultural) devaluation. From 1492, Civilizing Projects have turned on a Nature that includes most humans. *That* Nature is a ruling abstraction at the core of manifold Christianizing, Civilizing, and Developmentalist Projects. It expresses the bourgeois-imperial naturalism – often under the sign of natural law – that has informed counterinsurgency and counter-revolution since Thomas Malthus, and indeed even earlier (Moore 2021a). Nature is the conceptual raw material that makes the ideological hammers of racialized, gendered, and colonial superexploitation. That superexploitation is not a clash of civilizations – its form of appearance – but a class struggle. It's a strategy that seeks to increase the rate of exploitation (of surplus value) not only through socio-technical restructuring, but by increasing the mass of appropriation: *the extraction of the unpaid work* of “women, nature and colonies” (Mies, 1986: 77). In the same breath, those Civilizing Projects have been continually challenged, upended, and even temporarily reversed by unruly, messy, and contentious webs of life, including modernity's great liberation struggles, working-class movements, and socialist revolutions.

Just as we know who was responsible for the slave trade, and who profited from it – in some cases right down to the specific families and firms – so too do we know who is responsible for the climate crisis. And we know who has profited from that death drive towards the planetary inferno. In the words of the radical folksinger Utah Phillips, we know who is responsible, and they have names and addresses. This is the spirit of the radical challenge to the Environmentalism of the Rich and its super-concept, the Anthropocene. To them we say, *Another biosphere is possible!*



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## Unlimited limits and the challenges of living in reciprocity with nature

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I object to the question on which this volume focuses. It assumes that biophysical limits are real and knowable rather than a human construct associated with a particular understanding of how natural systems might behave. Limits have been an extremely useful construct for critiquing the even simpler construct that assumes science and technology can provide unlimited economic growth. Nature, however, has zillions of limits that are crossed all of the time, and not only by people (Giorgos Kallis 2019). Nature is continually changing and reconstructing itself in response to zillions of events. The idea that people can affect nature and have it resiliently return to an historic equilibrium unless we affect it too much is a myth. Yes, nature reconstructs, but never completely, always moving to a new state with every provocation, whether by a weather event, bacterial evolution that resets the balance of larger species, or numerous other changes including those initiated by people. And the idea of limits makes little sense for stock resources which come in ever lower qualities, i.e., ever more tightly bound in the complex natural order.

The idea of limits assumes nature, or discrete components of nature, operate in an equilibrium state to which it returns after being perturbed. If the perturbation is too great, however, pushing the system beyond its limit, well, all hell breaks loose, we really cannot say. In this constructed framing, illustrated by a ball rolling about in a bowl, people obviously need to avoid perturbing nature too much, i.e., pushing the ball out of the bowl. To some extent, we seem to observe such phenomena in ecosystems. We may think of nature as being in equilibrium, or in a disturbed state from which it will recover, or having been pushed beyond recovery, but that is because of how we think, perhaps because of something ingrained in our consciousness. The ball is rolling out of the bowl all of the time, changes occur, but all hell does not break loose.

Ecosystems too are a human construct that has nearly defined the discipline of ecology. Yet the boundaries of any ecosystem being implied by one ecologist overlap with or fit within the ecosystems of other ecologists. How the multiply conceived ecosystems work together across scales and through time is not well addressed by the discipline. Yes, there are clear examples of people overfishing and destroying a fishery, but many changes occurred in the process that would have prevented their return to their previous state. And the state of the fishery would have changed over time regardless of human intervention.

I came to this heretical position as a friend of Herman Daly. In the 1970s, I asked him at what level should an economy be when in a steady state. He replied that this would be determined by scientists who understood the limits of the natural system. I was studying the economics of agricultural pest management, chemical and biological, at the time. I was rapidly learning evolutionary ecology, a

perspective on an always changing world. I was becoming aware that of the many ways that biologists think, only a few include a ball rolling around in a bowl. But the problem runs deeper. Most scientists over the past century worked with smaller and smaller fragments of reality. The few scientists who have strived for a more systemic view are still rapidly learning. Our understanding of the climate system is an existential example. With the tremendous increase in our understanding of the climate system over the past half century, climate scientists were still surprised by how much heat the oceans were absorbing. They were further surprised by how ocean currents and atmospheric jet streams responded and unleashed whiplash weather around the globe. These climate system surprises meant the efforts of economists to determine optimal mitigation and adaptation pathways were mere sophistry (Norgaard forthcoming).

Again, with respect to the climate crisis at hand, note that 1.5C is a goal, we know the consequences will be worse at 2C, and extremely difficult at 4C. But there is no limit at which all hell breaks loose. The consequences just get exponentially worse, we think. In the most systemic area of human understanding of the world in which we live, there are a zillion limits we have been crossing and can continue to cross. Just as surely if greenhouse gas emissions are not mitigated, the heat will eventually kill all people and most other species too.

I think we can further work with the biophysical limits framing as critique, but it is a very troublesome framing for actually “operating” an economy. How should we respond to the mess we are in? Of course, we should rapidly switch to renewable energy, eat less meat, farm with nature, and produce less plastic and pesticides. I am a firm believer in rapid, deep degrowth, preferably planned to assure justice, so that we can slow the pace at which people affect natural and social system change (Kallis et al 2020). I have no way of knowing, but I also sense that the global economy will crash, and many lives will be lost. While I avoid contemplating the possible tragedy ahead, I am fascinated by how people might recover from such a tragedy and live more sustainably in the future. Indeed, if we could foresee tenets that might sustain people in the future and start following them rather than modern economic beliefs, we might temper the tragedy.

We are talking about new beliefs, not scientific breakthroughs. I do have hopes that human knowledge will become better synthesized and the processes of science more participatory and democratic. Knowledge needs to be much more widely shared to be effective, especially in tumultuous times. Even so, decisions, whether by individuals, corporations, or governments, are based on beliefs about reality and morality. Beliefs are necessary because human understanding of reality is fragmented with innumerable scientists knowing bits and pieces with no meta model to bring whole understanding. Moral philosophy is similarly inchoate. Christian beliefs guided what were publicly understood to be good decisions by Euromericans for centuries, but economic beliefs in individualism, property rights, materialism, markets with perfectly informed actors maximizing their own well-being, capitalism, and economic growth as human progress became dominant among Euromericans during the 20th century and were spread worldwide after WWII.

Economics has been predominantly a system of deductive logic built on assumptions politically supported by shared economic beliefs. I am not denying that thousands of economists have kept very busy deducing what happens when one of these beliefs is replaced by something closer to reality. Behavioral economics has gently, empirically documented how most economic assumptions are wrong. I am not denying that there are multiple patterns of thinking and a rich diversity of knowledge among economists. But when more than one assumption is made more realistic, market logic and economic logics generally break down into an inconclusive morass of “if this, then that” statements that are too complex for policy making and ignored. To the extent economics influences public policy, it is

through the publicly shared beliefs that support economists' basic deductive logic. This is what holds the mainstream of the profession together. These beliefs also conveniently support the economy and the powerful interests they have created.

The challenge now is to envision new beliefs, new tenets, new ideology to support human provisioning to tame the foreseeable tragedy and sustain surviving people and other species as the global climate continues to rapidly and chaotically manifest new conditions for the next century or two. An ideology portends a utopia (Mannheim 1936). The neoliberal free-market capitalist utopia was a perfectly functioning global economy with perfectly informed capitalists, laborers, and consumers equating gains and losses at all possible margins while optimally growing through capitalists efficiently investing in scientific research and the development of new technologies along with their implementation. An essential supporting belief of this utopia, given the focus of this series of papers, was that the evolving complex natural order could be divided into parts and owned as property. The rights to use property, the mechanism through which we have defined how we interact with nature, were very difficult to tie down, let alone change to fit new understandings of nature.

It is difficult to conceive of a utopia in the midst of the unfolding climate disaster. Such a utopia needs to be dynamic and resilient. My utopia is a pluriverse of cultures engaging in alternative experiments with how to observe, learn from, and live reciprocally within a rapidly changing nature (Norgaard 1994, Escobar 2018). Cultures could learn from the experiments of others. The argument is as basic as the adage "don't put all of your eggs in one basket", but we have to imagine learning, thinking, experimenting eggs. Diverse traditional cultures have long been resiliently adapting to modernity without fully succumbing. Moderns can turn off the pressure, support the global diversity we have, and learn with it. But my argument has slipped from utopia to its possible ideology.

To support a global pluriverse, we need broad tenets within which different cultures can coevolve with their environment and with each other. The first tenet would be to respect cultural diversity. Respecting diversity is always a good idea once we dampen mechanistic efficiency thinking from our consciousness and admit evolutionary and coevolutionary understanding with selection for resiliency. The second tenet would be to respect nature as a system we are living within and of which we are a part. Indeed, just as modern people have held markets and growth as sacred, so might people begin to treat the complex, changing natural order as sacred. Modern economics assumed that humanity was being liberated from the whims of nature and that better science and new technologies would soon offset any problems that might arise. This belief has proven disastrously false. Furthermore, the scientific challenges of keeping up with nature's whims will be even greater with whiplash weather over the coming century or two (Norgaard, Wiens, et al 2021).

And this leads to my suggestion for a third tenet. Observing, discovering nature's awe, interpreting, and understanding nature should be widely shared. Similarly, many should be in tune with, interpreting and understanding how society is faring and helping assure that it is functioning effectively. For three hundred millennia, more than a thousand times longer than modernity, people lived as hunter-gatherers. Everyone was expected to understand their natural world and to report novel observations to the tribe as a whole. But now in a rapidly changing natural order, a fourth tenet to sustain this pluriverse. Anticipating a changing world and adapting rapidly, resiliently, and tentatively will be necessary in continually changing times.

People would also be adapting to changes suggested or mandated from different levels of government. Having this understanding as a part of human consciousness will help the process. Lastly, my fifth



tenet is that people's novels, poetry, visual arts, and music need to support their hopes to live reciprocally, embedded within the changing complex natural order.

Within this possible utopia, I foresee property rights changing frequently. Just as importantly, property rights holders would be obligated to understand and be responsible for upholding the common ecological and social good in their day-to-day decisions on the use of property (Barnes 2021, Hermann-Pilath 2023). Modern social philosophers stressed liberty, freedom from authority which the individual had not approved, and since universal approval was hard to imagine, a right to freedom could always be claimed. Similarly, modern natural philosophers and later scientists promised freedom from the whims of nature. Modern economists argued that property and markets provided such freedom, and arguments that include responsibilities of any kind, except the responsibility to maximize profits, are rare among economists. It is hardly surprising that capitalism reigns, the most irresponsible are the richest, and natural and social systems are disintegrating. In a sustainable provisioning system, people will be living embedded in society and nature and living in reciprocity with each of them. Such a system would entail people being responsible to both systems, not striving for freedom from them.

People's identities, their sense of living meaningful lives, would dramatically shift toward finding value in participating in the new learning, deliberating, adapting cultural systems.

Morality and reality, especially as the realities in which people live change, need to be at the forefront of living meaningful lives. Caring and cooperating must give meaning. Rugged individualism must become totally passe. At the same time, people do need to pay attention to their own condition so as to be able to help others. Being a trusted, helpful participant in the new learning and adapting system is where personal meaning should lie.

Now the issues complexly interlinked rattle in my mind. Yes, somehow a pluriverse would also need to include some level of global support for the western science that informs and assures mitigating climate change as well as how to live embedded in and in reciprocity with nature. Yes, markets would still be an important social system component even as polycentric collective action would become much more important than it is now. I have strayed far beyond the question posed for this volume. I hope to stimulate thinking and discussion on what I think are more appropriate though even more difficult questions concerning how future generations might be able to live while being embedded in an evolving natural order that our generations have disturbed.

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# Positivism and the plight of the planet

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## Introduction

There are no words to describe the mega-catastrophes unfolding around us. One cannot be human without feeling deep sorrow for the tragic and meaningless deaths of humans, other living creatures, and the destruction of our common habitat – the seas, the continents, and the atmosphere. But, without accurate analysis and diagnosis, it is impossible to take effective countermeasures. In this essay, I would like to argue that the root cause of these crises is a defective theory of knowledge which was born in the European Enlightenment, and came to fruition in the early 20<sup>th</sup> Century in the form of Logical Positivism .

Positivism appears an unlikely candidate for the role of arch-villain. It was born in the Vienna Circle in the 1920's and spread like wildfire across Western academia. But, it died an equally spectacular death in the 1960's and many came forward to take the credit for killing logical positivism. For example, Suppe (2000) writes that:

“The Received View on Theories was the epistemic heart of Logical Positivism. Twelve hundred persons were in the audience the night it died. It was March 26, 1969-opening night of the Illinois Symposium on the Structure of Scientific Theories.”

How can an obscure philosophical theory, which died fifty years ago, be responsible for endless wars, breakdown of human society, and the ongoing climate crisis? To answer this, we sketch the historical forces which shaped developments in epistemology in Europe.

## Epistemology: The Long and Winding Road

Centuries of warfare between Christian factions devastated Europe and personally affected the lives of leading intellectuals. This historical experience seemed to provide ample proof that Christianity could not be used to build a peaceful society. The Biblical approach of the scholastics was rejected. Hobbes was the first to develop a political theory based purely on rational and secular foundations. Rejection of Christian epistemology, which takes the Bible as unquestionable truth, led to the search for new foundations for knowledge. The trauma of loss of faith in the certainties provided by religion is reflected in the passion of David Hume:

“If we take in our hand any volume; of divinity or school metaphysics, for instance; let us ask, Does it contain any abstract reasoning concerning quantity or number? No. Does it contain any experimental reasoning concerning matter of fact and

existence? No. Commit it then to the flames: for it can contain nothing but sophistry and illusion.”

The enormity of this statement is mind-boggling. All human wisdom, accumulated patiently by hundreds of thousands of thinkers, laboring over millennia, is reduced to nought. Only a tiny fraction of the millions of books extant would survive this purge. All the greatest literature of all cultural traditions would be lost in the flames. However, to the Enlightenment thinkers, this sacrifice appeared to be necessary, since the received wisdom had led to massive death, destruction, and unimaginable atrocities – the real-life version of *Game of Thrones*. Traditional wisdom seemed to be corrupt beyond possibility of repair, so it had to be discarded. New knowledge, starting from scratch, had to be built up on solid foundations of facts and logic, beyond the possibility of doubt.

Epistemological rejection of unobservables – God, Angels, Afterlife, Judgement Day – led to increased focus on the life of this world. The Biblical “Love of wealth is the root of all evil” was replaced by the Shavian “Lack of wealth is the root of all evil” in the Great Transformation of Europe from traditional to secular modern society. Increased focus on this world led to dramatic increases in knowledge about external reality – the natural sciences. At the same time, there was a parallel growth in the philosophy of science: the attempt to understand how these tremendous advances in human knowledge were generated. Surprisingly, this second effort has been a disastrous failure. As a popular textbook by Chalmers (2013) entitled “What is This Thing Called Science?” tells us, there is a wide variety of differing opinions, and no consensus has emerged.

Critical to this failure to understand science has been the effort to prove that science leads to certain knowledge. Loss of faith in the certainties of religion led to a vacuum which needed to be filled by the certainties of science. For centuries, it was axiomatic among European intellectuals that science produces TRUTH – facts about external reality about which we can be 100% certain. One of the goals of Kant’s philosophy was to prove that we could be certain that Newton’s Laws of Universal Gravitation were true. Just as philosophers of religion spent centuries creating arguments for the existence of God, so the philosophers of science have spent centuries trying to prove the certainty of scientific knowledge. Unfortunately, this goal has proven elusive. Even the simpler goal of “Demarcation” – how to differentiate between scientific knowledge and other kinds of human knowledge – has not been resolved satisfactorily.

For a fleeting moment, Logical Positivism seemed to provide conclusive evidence for a goal pursued by European philosophers over centuries. Statements involving unobservables were mere “sophistry and illusion”, validating Hume’s centuries-old sentiment. Although science itself grapples with unobservables, positivists contended that these were nonessential—replaceable by observable equivalents without compromising scientific truths. Intellectuals eagerly embraced positivism, and its influence quickly permeated academia. At first glance, obscure mistakes in narrowly specialized philosophy of science may appear inconsequential. Scientists, historically indifferent to philosophy of science, have continued their remarkable progress across natural sciences seemingly unaffected. However, the true impact of significant errors in the philosophy of science becomes apparent when one turns to the social sciences, where they had far-reaching consequences.

## Impact of Positivism on Social Science

Manicas (1987) presents a book length argument that modern social sciences took shape in the early 20<sup>th</sup> century. Further, these were based on a misconception about the nature of physical science. For the sake of clarity and focus, I will restrict the scope of my discussion to economics, even though similar arguments apply to all of the social sciences. To paraphrase Manicas, foundations of modern economics are based on a double mistake:

1. The first mistake is a misconception about the nature of science crystallized in the form of logical positivism.
2. The second mistake is the misconception that methods of science can or should be applied to the study of human societies.

We will now discuss both of these mistakes in greater detail.

The central claim of logical positivism (LP) is that “all knowledge comes from observations and logic”. This is self-contradictory: the claim itself is not based on observations and logic. There is a long list of flaws in LP which would take too long to present in this brief article. For our purposes, the most important mistake is ruling out the possibility of knowledge about unobservables. An example will clarify the issue. Consider an unobservable entity like a subatomic particle, or a gravitational force. Based on strong indirect experimental evidence, can we conclude that “electrons exist”? Positivists argue that theories about unobservables are convenient fictions. They are not to be judged as being true or false, but only in terms of their ability to explain the observables. If the best available theories hypothesize the existence of electrons and gravity, this does not provide us with warrant to believe in the existence of these unobservable entities. Tomorrow, we might find a theory which provides a better fit to the observations, and dispenses with the entities central to our current theories. Neutrality about existence of unobservables does not cause damage in the natural sciences. However, we cannot avoid discussion of unobservable human motivations in any serious approach to social science. Application of positivist methodology to the study of human societies creates blindness to essential aspects of human behavior, as we will discuss in greater detail later.

The second error lies in the application of scientific methodology to the study of societies. It might seem intuitively apparent that scientific methods are ill-suited for this endeavor due to the dynamic and ever-changing nature of human societies. The existence of universal mathematical laws capable of encapsulating these continuous changes appears impossible, especially given the extraordinary diversity of societies across time and space. Nevertheless, influenced by the increasing prestige of the physical sciences, some economists endeavored to employ a mathematical and quantitative approach in the late 19th century. This sparked vehement opposition from proponents of the traditional historical and qualitative approach, resulting in a fiercely contested battle known as the "*Methodenstreit*" or the battle of methodologies. As documented by Hodgson (2001) in his book titled "How Economists Forgot History," this methodological conflict did not yield a conclusive victor on either side.

However, World War 1 had a dramatic impact on this ongoing methodological battle. Just like religious wars had discredited scholasticism, the World War dealt a severe blow to the ideals of the Enlightenment. As hopes of achieving a harmonious society through the substitution of religion with reason were shattered, the prestige of the social sciences plummeted. While the notion of employing scientific methods for the study of society had been a minority perspective, the

aftermath of World War I saw a paradigmatic shift. The belief that scientific methodologies could catalyze remarkable progress and revitalize the fortunes of social science gained ascendancy. In the realm of Economics, the historical and qualitative tradition was almost completely obliterated, with profound consequences that will be examined in the next section.

### **Positivism: A Poor Foundation for Social Science**

Deficiencies of Positivism as a basis for social science were obvious to many participants in these debates in the early 20<sup>th</sup> century. In response to these attacks, positivists developed many variants, some of which were much more capable of handling these criticisms; for example, see O'Neill (2004). However, social scientists in general, and economists in particular, continue to believe in crude forms of positivism, abandoned by philosophers long ago. In particular, Friedman's defense of a positivist methodology for economics, discussed in detail by Maki (2009), is the only essay on methodology most economists ever read. The point we wish to make in the essay is very simple: it is impossible to understand the sources of human well-being on the basis of the positivist methodology, as it is understood by economists. Putnam (2002) has made essentially the same point with much greater attention to the complexities of the philosophical tradition.

In a nutshell, Logical Positivism asserts that science is the only valid source of knowledge. That is, we can only have knowledge about external reality, and it is impossible to have knowledge about our internal lives. This follows from the idea that knowledge must be based on observables. Internal states of other human beings are unobservable. I can guess, but I can never be certain, about the feelings inside your heart. But an epistemology which denies the validity of knowledge of internal states of others is untenable. Infants can recognize and differentiate between happiness, sadness, anger, and love in their mothers, and in others. This is also an inconsistent epistemology; there is nothing about which I can be more certain than my own internal states: I have direct access to my own experience. In fact, my life-experiences are the basis of all knowledge that I have. So, while I can deny the internal states of others as unobservable, I cannot do the same for my own. One of the foremost champions of logical positivism, A. J. Ayer (1964), eventually rejected the philosophy, saying that it was like "feigning anesthesia".

For natural sciences – physics, biology, chemistry, etc. – logical positivism creates no essential difficulties. Ignoring the subjectivity of the observer makes no practical difference to the external reality. But social science is the study of societies, composed of individuals and created by social interactions. Denying the possibility of knowledge of internal states of human beings makes it impossible to understand human behavior, human interactions, and hence human societies. Positivist methodology says that, since we can never have certain knowledge of internal motivations of human beings, we are free to make any assumption we like about them. To make an analogy, suppose we apply positivism to our daily lives. Then we would conclude that since emotions of others are not observable, our theories of behavior should make no reference to them. Thus, treating all others as psychopaths is methodologically acceptable. Even though it seems absurd, the influence of positivism was so strong that Skinner took precisely this approach in founding Behavioral Psychology. He reduced human beings to robots that can be programmed by stimulus and response. He argued that we need to move "Beyond Freedom and Dignity", since robots have neither.

To enable writing mathematical equations for human behavior, we must strip human beings of their identities based on their emotions, memories, histories, affiliations, and social relationships. This is precisely the “scientific” methodology of modern economics, as explained by Lucas:

“Unlike anthropologists, however, economists simply invent the primitive societies we study ... The point of studying wholly fictional, rather than actual societies, is that it is relatively inexpensive to subject them to external forces of various types and observe the way they react.” - quoted in De Vroey (2016, p 179)

Our objection is not to the creation of artificial societies; this is an essential ingredient of modelling. The problem is that economists study societies populated by psychopaths, and use these studies to try to understand human societies. It is no wonder that they fail miserably. There is overwhelming evidence for the failure of economists to provide solutions to economic problems we face. Worse than that, modern economic theories are actually the cause of many of the most serious problems currently facing humanity. These theories blind us to emerging problems, and they prevent us from finding solutions. A Congressional Committee was formed to investigate the failure of economists to predict the Global Financial Crisis, and to prevent the Great Recession which followed. Some quotes from the opening remarks of their report entitled “Building A Science of Economics for the Real World” are given below as evidence for our thesis:

The Subcommittee has previously looked at how the global financial meltdown of 2008 may have been caused ... by financial risk models, ... rooted in the same assumptions upon which today’s mainstream macroeconomic models are based. ... Economic analysis is used to inform virtually every aspect of domestic policy. If the generally accepted economic models inclined the Nation’s policy makers to dismiss the notion that a crisis was possible, ... it seems appropriate to ask why the economics profession cannot provide better policy guidance?

In our next section, we explore why the positivist methodology upon which modern economics is founded is inherently incapable of providing better policy guidance.

### **Positivism: Poisonous to Human Welfare**

Cooter and Rapaport (1984) document a critical transition in Economics in the early 20<sup>th</sup> Century. Pre-modern economists were concerned with “material welfare” – how we can use economic means to improve human welfare. Thus, they were clear that welfare created by listening to music is not on par with the welfare created by food on an empty stomach. They used the law of diminishing marginal utility to argue that transfers of money from the rich to the poor would increase welfare because the poor would derive far greater benefits in comparison with the loss of pleasure to the rich. However, these commonsense ideas were abandoned under the influence of positivism.

Lionel Robbin’s replaced welfare by scarcity as the foundation of economics because scarcity is observable, while welfare is not. Our central thesis is that positivist methodology led to the abandonment of the search for causes of human well-being. This makes it impossible for economists to make policies which serve to increase human welfare. Economics textbooks state clearly that the job of the economist is not to explore the psychological makeup of human beings. For example, Samuelson and Nordhaus (1989, p. 2) write that economists “must reckon with

consumer wants and needs whether they are genuine or contrived. Shakespeare's King Lear said, "Reason not the need" – and economists do not; rather they analyze how limited goods get rationed among whatever wants a society generates." Hausman and MacPherson (2006) describe the transition to these modern views as follows: "In modern economic theory as developed in the 1930s, economists put aside substantive conceptions of well-being ... (instead)... most economists took well-being to be the satisfaction of preferences."

It is worth pausing to clarify how positivism forces us to take satisfaction of preferences as well-being. Well-being is a deep unobservable – we ourselves are not always fully aware of the sources of our happiness and miseries. But we usually do have clear preferences among alternatives. But positivism requires us to eschew even these preferences (of our hearts) and replace them by the observable choices they lead to. An example can clarify the distinction between welfare, preference, and choice. My long run welfare may lie in not smoking. I may have a preference for cigars, but I may choose a reduced-nicotine cigarette over a cigar. However, the positivist strategy of replacing unobservables by observables forces economists to equate all three, and makes it impossible to think about the real sources of human welfare.

### **The Pursuit of Illusion**

Given this blindness to human welfare, the findings of Easterlin in the 1970's came as a great shock to the profession. Easterlin (1973) showed that tremendous increases in wealth over time had not led to corresponding increases in human welfare. Similarly, he showed the general levels of happiness in different contemporaneous societies had no correlation with their GNP per capita. The idea that wealth is the basis of welfare has been an unquestioned axiom of economic thought for over a century. The transition from the 16<sup>th</sup> Century Biblical maxim "Love of wealth is the root of all evil" to the 18<sup>th</sup> Century Shavian precept "Lack of wealth is the root of all evil" has been studied in detail by Tawney (1960). In the early 20<sup>th</sup> Century, Keynes (1931) was well-aware of the harms of pursuit of wealth, but thought that infecting the society with this disease would lead to accumulation of wealth, which would have long-run benefits:

The love of money as a possession — as distinguished from the love of money as a means to the enjoyments and realities of life — will be recognized for what it is, a somewhat disgusting morbidity ... But beware! The time for all this is not yet. For at least another hundred years we must pretend to ourselves and to everyone that fair is foul and foul is fair; for foul is useful and fair is not. Avarice and usury and precaution must be our gods for a little longer still. For only they can lead us out of the tunnel of economic necessity into daylight.

Easterlin (1973) proved that Keynes was wrong; accumulation of vast amounts of wealth has not led to corresponding increases in human well-being. After Easterlin's pathbreaking work, researchers began to explore the reasons for his findings. They found that human beings can become habituated to an enormously large range of living conditions, and learn to take that as normal. Increased wealth leads to a short-term boost in happiness, which disappears when the higher standard of living becomes the new normal. But now, maintaining the new normal higher standard requires more income, and more labor, causing loss of long-term welfare.



In fact, this rat race for ever increasing standards of living is essential to maintaining capitalism. This is because massive overproduction, far above and beyond what is required for a comfortable life, is a central characteristic of capitalism. As Galbraith (1998) noted:

If the individual's wants are to be urgent they must originate with himself. They cannot be urgent if they must be contrived for him. And above all they must not be contrived by the process of production by which they are satisfied. For this means that the whole case for the urgency of production, based on the urgency of wants, falls to the ground. One cannot defend production as satisfying wants if that production creates the wants.

This cycle of ever-increasing production, consumption, and labor, which generates artificial wealth and increasing misery, is now threatening to destroy the planet. The urgent but difficult task facing humanity is to stop this cycle.

### **Reversing the Great Transformation**

Polanyi (1944) describes the Great Transformation as the process by which society became embedded within markets, reversing the natural relationship in traditional societies. To articulate this more clearly, the institutional structures of a capitalist society became central to our identities, while our social relationships became peripheral. My professional career became more important than my role as a husband, parent, or friend. This led to breakdown of communities, families, and increasing loneliness. Lane (2000) has described the "Loss of Happiness in Market Democracies". Critical to this transformation was the commodification of human lives and land. Demands of the labor market lead to an educational system which produces human resources, not human beings. When human lives are for sale on the marketplace, it is natural for money to become the most prized possession, the goal of our lives. The market also destroys the symbiotic relationship between ourselves and our habitat, and reduces planetary resources to their monetary values. This is the root cause of the environmental crisis. Effective solutions cannot be found without arresting the inexorable mechanisms for growth built into the capitalist machine. And this cannot be done without dismantling capitalism. That is a tall order.

I have argued that the central problem stems from defective epistemology. Positivism teaches us that the central questions we face in our lives are meaningless. There is no point in searching for meaning, because meaning cannot be found by scientific methods. Reuben (1996) tells us that this is a recent development. In the early 20<sup>th</sup> Century, the purpose of a university education was to build character, and to teach civic and social responsibilities. But, when positivist epistemology ruled these areas to be outside the boundaries of knowledge, they were gradually excluded from the universities. Since the roots of the problem lie in a corrupt epistemology, solutions must begin by correcting our theories of knowledge. But this should not be surprising to those of us persuaded by Foucault's equation of power and knowledge. Details of how one might launch a knowledge revolution, especially when what is taught in the universities is strongly influenced by wealthy donors, cannot be considered here. However, I will discuss some guiding principles which may be helpful in this struggle.

The central question which faces us all is: how can I make the best use of this infinitely precious gift of a few moments of life? This question is rarely discussed explicitly in universities anymore,

even though it has occupied our deepest thinkers for millennia. Nonetheless, it is too important to be bypassed. A modern university education offers three main types of answers to students:

1. Capitalism: The purpose of life is to acquire wealth and pursue pleasure.
2. Positivism: The question itself is meaningless, since it cannot be answered by data and logic.
3. Existentialism: No meaning is available in advance; you must create your own.

We will not pause to discuss why the first two answers are absurd, even though they are widely believed. The third answer deserves deeper discussion. Aligned with Enlightenment principles, it suggests that we should discard the entire intellectual heritage of mankind, and start to search for meaning on our own. Imagine if this counsel was given to a student of engineering, medicine, or mathematics! Even the greatest genius would not be able to progress beyond kindergarten level of thought. Our best hope is to search among the established philosophical traditions which have accumulated knowledge for centuries. It is worth noting that because of the immense importance of this question to our lives, good answers can quickly spread, especially in this age of instant communication. There are many instances of powerful ideas overcoming all adversaries, and changing the course of history. So, we do not need to be discouraged by the immense amount of power in the hands of the opposition.

Finally, a major defect of positivism is a solipsist approach to knowledge. Knowledge is a set of propositions about the world which I know to be true. In fact, knowledge is a social construct, and also experiential. There is no proposition which can capture my knowledge of how to drive a car. Launching a knowledge revolution involves building communities, ways of living, and social relationships. Since the Great Transformation involves prioritizing our market relationships over our social relationships, we can choose to reverse these priorities on a personal level. The first step is to reduce our standards of living – our roles as consumers, laborers, and producers. This is the degrowth strategy, but from a bottom-up perspective. This will create time for us to invest in strengthening our social relationships, which are the real sources of long-term happiness. In view of the increasing threats created by climate change, we could try to build self-sufficient communities in rural areas. I have provided somewhat more discussion along these lines in Zaman (2023).

In conclusion, the pursuit of meaning in our lives holds intrinsic value, irrespective of our ability to spark a knowledge revolution. Far from being the only valid source of knowledge, science is completely unable to provide us with guidance regarding the conduct of our personal lives. In fact, scientific methodology is confined to extrapolation of patterns from our past, and blind to the uniqueness of every moment of our lives. This shift in perspective is akin to a Zen practice, urging us to recognize the precious and unique nature of every moment—unlike any before and never to be repeated. Embracing this mindfulness unveils extraordinary opportunities, necessarily overlooked by a scientific approach fixated on past patterns, and offers us new and uncharted paths for the future.

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# Economics needs to ditch most of what it does and adopt a realist global political economy and futures approach

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## 1. Introduction

Other papers in this collection will likely provide a tighter focus on the scope for ecological economics to replace mainstream economics. I take a broader approach to the context of the question about the biophysical limits to growth and look at the dynamics and growth of the world economy in terms of long-term historical structures, powers, and fields, stressing the political and the role of conflicts, including wars. I will argue towards a theme encapsulated in my title “Economics needs to ditch most of what it does and adopt a realist global political economy and futures approach”. The case is made in greater detail in my recent books *The Three Fields* and *World Statehood* and elsewhere (see Kotilainen and Patomäki 2022; Patomäki 2022; 2023).

My starting point is that prevailing ideas and theories have constitutive and causal effects through agency, practices, and regulatory-institutional implications, which in turn are co-responsible – with a number of geo-historically generated mechanisms and circumstances – for uneven growth and cyclical changes both within countries and in the global political economy as a whole. For the past century, the prevailing ideas have largely emerged from various strands of economics. The story of the development of economics is complex and can be told from multiple different perspectives, yet there is some degree of consensus about what kind of things characterise Western mainstream economics of the last half-century.

Classical political economy emerged much earlier and did so in the context of increasing monetisation and marketisation of European societies. These 18th-century developments were intertwined with colonial expansion and constant warfare among the European great powers and, especially in the 19<sup>th</sup> century, against the non-European others. States innovated to find new ways of financing their expenditure, and this resonated with monetising and profit-oriented innovations. Soon the new concepts, ideas, and doctrines of political economy started to shape forms of agency, practices, and institutions.

The world economy had already existed for centuries when the industrial (or more precisely mechanical) revolution gave rise to a truly planetary economy (Polanyi 2001, p. 93). In the two centuries since the 1820s, the world economy has grown by a factor of 70 or 80. This massive process, where both population and per capita production and consumption have increased exponentially, has had major physical and ecological consequences on a planetary scale. My focus here, however, is on the things which characterise Western mainstream economics, “market

globalism” and related issues that have both contributed to “climate emergency” and ecological breakdown and worked to impede appropriate responses.

## **2. Market globalism**

As a practical-political doctrine, contemporary economics has been associated with “market globalism”, which consists of a series of interrelated claims, including the primacy of economic growth; the importance of free trade to stimulate growth; the drastic reduction of some forms of government regulation; a set of policy prescriptions considered to constitute the basis of well-functioning free market economy; and advocacy of further marketisation of social relations and individual choice. (Steger 2002) It should be noted though that economics incorporates New Keynesianism; not all mainstream economists have professed all of these claims; and a few have even become vocal critics of some or many of them.

These complications notwithstanding, market globalism can be seen as a doctrine that frames and interprets social problems through theories of well-functioning price mechanisms in competitive markets and related ideals such as growth, efficiency, freedom, and justice. This doctrine, which has largely but by no means exclusively been based on mainstream economics, includes variations and changes over time, yet the general thrust has been that problems identified within this framework can be resolved by expanding the scope of competitive markets (Friedrich Hayek in his guise as political philosopher and many conservative politicians have also stressed the role of traditional morals, often focussing on the family).

Further ideas include that democracy must be limited to respect the liberal “free-market” boundaries of state intervention. The existence of a market requires the establishment of private ownership – private property is often taken as a sacrosanct cornerstone of society, whether justified in terms of arbitrary assumptions of normative theory (Nozick 1974) or general equilibrium theory (Arrow and Hahn 1971) – and commodification. While the generic orientation supports outsourcing, privatisation, and the idea that markets are self-regulating (unless externalities or exceptional circumstances dominate), the basic idea can be broadened through a wide range of analogical and metaphorical shifts of meaning. Within the framework of the same methodological principles, it is possible to go in diverse directions and generate recommendations that contradict each other (as Lawson 2016 has stressed).

Economics is usually, however, equated with modelling and statistical analysis (econometrics). At the core of economics is the “optimisation under constraints” approach. Economics has disciplinary effects functioning both internally and externally (Gueldry 2015), while the external effects are at the heart of economics imperialism (Mäki 2009). Market globalism is concomitant with the “episteme” of economics (see below) and from its standpoint – which functions among other things as a powerful system of control, reward, and punishment – it is difficult to see differences in social contexts or among purposes and identities of actors. At an abstract level, everything is always the same, though this claim needs some elaboration.

In mainstream economics people and individual-like collective actors have “preferences”, optimise under constraints, and respond uniformly to incentives no matter who or what they are or how they are positioned in practices. This is the standard scheme, but there are various modifications. Behavioural economics distinguishes between abstract optimisation-rationality and regular patterns of actual human behaviour. Recent popular empirical microeconomics relies on quasi-

experimental techniques, including natural and randomized controlled experiments, and claims to be largely theory-free as an approach, although it presupposes aspects of the atomism of closed systems and although its explanatory concepts are theory-laden and often derived from the corpus of mainstream economics.

The standard scheme continues to provide the basis for economics education and for how most economists think. A key problem is that this orientation and its underlying epistemology tend to constitute a closure of communication. By adopting particular epistemes or structures of meaning and knowledge circulated in some social practices, actors may become entangled in closures involving fixed identities and “hard will”.<sup>1</sup> In contemporary mainstream economics, different forms of agency are largely reduced to one basic scheme with minor (e.g. behavioural or quasi-social) variations and thus misrecognised. However, as a transformative political programme, this episteme has performative and constitutive effects. It shapes contexts and thereby actor categories and forms of subjectivity, including in terms of metaphorical extensions and modifications of the idea of optimising agents in competitive markets (e.g. New Public Management applied to public organisations).

Market globalism tends to have manifold causal consequences, many of them unintended. This episteme is capable of learning in terms of first-order aims (“preferences”) and means, but only to a rather limited degree beyond that, not least because it tends to be indifferent if not intolerant and hostile towards other epistemes. How prone to antagonism and authoritarianism is neoliberal thinking? Although Friedrich Hayek (2001, p. 143), for example, criticised demagoguery based on the category of the enemy, there is, for one thing, a tendency to construct “collectivists” as enemies of freedom. This can feed into populist imaginaries of antagonisms, as has happened in the 2010s and 2020s.

If we look at the wider purposes constituted within this episteme, we can see that these purposes include particular preferences for political order (Patomäki 2020a, pp. 119–123). The most preferred order is a combination of constitutionally limited democracy and “free markets” within a state, although some neoliberal philosophers such as Milton Friedman or Hayek have perceived authoritarianism in certain circumstances as indispensable, albeit only as a temporary step to prevent a slide to collectivism and to preserve freedom.

Nonetheless, while a significant part of mainstream economics (for example, general equilibrium theory, public choice theory) is in line with this kind of political theory, and while parts of economic theory have evident anti-democratic implications (for example, Arrow’s impossibility theorem has been widely used against democracy; Mackie 2009), most economists are likely not comfortable with a resort to temporary authoritarianism. What is nonetheless notable in terms of (explaining

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<sup>1</sup> A form of agency characterised by a hard will is typically based on the necessitarian assumption about the unchangeable essence of oneself (understood individually or collectively) and relevant others (including outsiders of a community). Karl Deutsch (1963, p. 111), from whom I have adopted the concept, connects it also to power and closure of communication: “Will is related to power. Hardening a decision – that is, closing the decision making system against any further messages by which that decision might possibly be modified – is the key to the formation of a will. To have [narrow] power means not to have to give in, and to force the environment or the other person to do so. Power in this narrow sense is the priority of output over intake, the ability to talk instead of listen. In a sense, it is the ability to afford not to learn.”



the lack of) self-transformative capacity<sup>2</sup> of the early twenty-first-century global context is the idea that institutional arrangements can be used to insulate private property and free markets from sovereign states and from potentially dangerous democratic demands (see Slobodian 2018). Concurrently, the goal has also been to safeguard state sovereignty to ensure exit options for individuals and capital and encourage governments to compete for capital by providing “business-friendly” policies (Harmes 2012). In other words, market globalism aims at locking in particular kinds of institutional arrangements. This is in line with, and can in some part explain, the gridlock of global governance in various functional areas (see Hale et.al. 2013; Hopewell 2016 on trade). Even the climate crisis has not led to significant institutional changes or innovations.

Market globalism can acknowledge neither identity-constituting differences nor the significance of socio-economic privileges, although many aspects of globalisation are possible only for the best-educated and wealthiest, whose globalising activities also generate massive amounts of greenhouse gases and other ecological effects. The wealthy and powerful may celebrate market globalism, but this becomes a source of resentment for many, especially if they experience increasingly uncertain living conditions and existential insecurity. Causal outcomes such as inequalities, increasingly insecure terms of employment, and economic crises generate concerns and anxieties in everyday life but unevenly, subject to various asymmetries.<sup>3</sup> The concerns and anxieties of everyday life can be mobilised for antagonistic politics, mostly in terms of frames, categories, metaphors, and myths that have been sedimented into the deep structures of the national and/or religious imaginary (Patomäki 2018, chs. 2–4; Patomäki 2020a; on the role of religion, Patomäki 2023, pp. 173-5).

Economics that professes growth and profit orientation may be appropriately associated with “market globalism”, but it is also, paradoxically committed to methodological nationalism<sup>4</sup> and is co-responsible – though mostly indirectly and through unintended consequences – for the rise of disintegrative tendencies in the global political economy. It thereby constitutes a multilevel hindrance to any adequate global responses to the consequences of the growth of the world economy and its by-products such as global heating, the extinction crisis, the emergence of

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<sup>2</sup> Contexts differ in their openness to change, and characteristically, the opening up of various contexts for peaceful changes – for increasing their self-transformative capacity – often amounts to democratisation. Self-transformative capacity can generate dependable expectations of peaceful changes by qualifying the sense of community and by fostering malleable, tolerant, and pluralist group identities – assuming sufficient socio-economic security, fair absence of privileges, and several other contextual features and background factors. Originally drawn from Robert Unger 1997, who calls this characteristic “plasticity” and “negative capability”, I develop and apply the concept of self-transformative capacity in Patomäki 2023.

<sup>3</sup> For example, in the early decades of the 2000s, the lower and middle classes of high-income countries have often been told that they must make sacrifices. Dominated groups who find that socio-economic conditions have changed making life more insecure, and who anticipate that globalisation requires them to make further sacrifices, turn against “elites” – including “modernised”, pro-globalisation social-democratic parties.

<sup>4</sup> The validity of methodological nationalism depends partially on to what extent social systems in general can be closed. Methodological nationalism is based on the belief that society or the economy is defined by the borders of the nation-state and that the nation-state is a container for all or most of the relevant processes. Thus, macroeconomic models start with the analysis and accounting system of a closed national economy and then expand this analysis to include imports and exports and, possibly, flows of capital. This approach assumes a double closure: an ontological closure necessary for mathematically expressible regularities and a partial national closure implying that the modern capitalist market economy has emerged spontaneously from within each separate state, rather than as part of the history and dynamics of global political economy.



weapons of mass destruction and other potentially destructive technologies (from nano- and biotechnologies to the technologies of space expansion and AI).

### **3. Turning point: from economics to realist global political economy**

The project of mainstream economics seems to have come to a turning point. It is increasingly recognised that the model of economics as a natural science was a misconception and that economics functions performatively toward the world, or tends to construct the world in its own image (even if involving unintended or even perverse consequences), rather than seeking to provide accurate descriptions of it (Davis 2017). What this project lacks is an adequate ontology for understanding the social and ecological effects of what it does and for grasping the role reflexivity and performativity play in the social world (on reflexive anticipations in economics and political economy, Patomäki 2019). Economics cannot predict the future, but social sciences can be future-oriented.

My point is that what is needed is a realism-based, pluralist and future-oriented approach to *global* political economy. There is no space to develop a systematic argument in favour of such an approach or outline it properly (again see Kotilainen and Patomäki 2022; Patomäki 2022; 2023); but what I can do here is to briefly summarise some of the basic ideas. First, an adequate orientating framework must combine ontological realism with an understanding of the context-bound and fallible nature of knowledge, coupled with some account of rational argumentation and judgement. Realism cannot be reduced to the mere realisticness of assumptions. Realism includes the analysis of the fundamental features and powers of reality. Without adequate realism, theories can have no common object of inquiry, and thus nothing on which to disagree. Realists argue that the world is differentiated, structured, layered, causal and open-systemic.

Moreover, in the realist conception, open-systemic causation should be understood in part also in terms of the subject matter in question. Because causal complexes at different layers of reality differ in nature, each science has its own, partially independent domain. Thus realism involves a social ontology and, I would argue further, a historicised social ontology that can explain the emergence of reflective consciousness, complex society and contemporary powers (that we all too often take for granted) in terms of a common, long and multiphased history of humanity that continues in the 21<sup>st</sup> century (Patomäki 2020b).

Secondly, all beliefs and knowledge claims are socially produced, contextual and fallible. Without concurring with some relativism, criticism and learning are difficult; and it would not be possible to account for the open-ended processes of science or the coexistence of different frameworks of interpretation in social sciences, including in economics and political economy. Pluralism and rational commitment are mutually compatible. Rationality has to do with openness to reasons, evidence and learning, yet rational people can and do disagree. The simple observation that no one is in a position to rule out an error, historical limitation or systematic bias on their own part goes far in motivating pluralism. Therefore, an adequate orientating framework combines ontological realism with an understanding of the context-bound and fallible nature of knowledge, coupled with some account of rational argumentation and judgement. Given all the existing rational differences and disagreements, there is room for pluralistic debate – including on all the metatheoretical issues involved.

All actions, including profit-oriented activities in a capitalist market society, as well as policies and institutional transformations, are future-oriented. What is the point of social sciences unless we can say something about the future? All social systems are open and closed to a degree, and these systems include reflective actors that have the capacity to act otherwise. It is not only that the net effect of many processes and mechanisms can often be known only afterwards; it is also that qualitative changes are possible through learning and structural and institutional changes. Social sciences are regularly involved in these qualitative changes, especially through reflexive self-regulation of social systems.

The openness of systems means that point predictions are not possible and that many predictions are in fact self-altering. The main aim of social sciences is not to predict accurately but to bring about desirable outcomes, explaining how to move from strategic actions and reflexive ideologies to emancipation. However, this also presupposes that it is possible, to some extent, to anticipate the future rationally. Any policy or institutional transformation has causal consequences and the choice between different alternatives must be based on some kind of knowledge of possible and probable consequences. Anticipation is all the more important in the 21<sup>st</sup> century because now humanity needs to find adequate global responses to the consequences of the growth of the world economy and its by-products.

The idea of a *global* political economy is sometimes justified by the fact that, as a result of relatively recent globalisation, the world has become interdependent. This is short-sighted. I started this concise paper by mentioning how the industrial revolution turned the already existing and expanding world economy into a truly planetary economy. By the 19<sup>th</sup> century, political economy and such theories as the comparative advantage of free trade – which was also used to legitimize imperial expansion – were widely debated across the world (Helleiner 2023). These debates have involved various, also radical, alternatives, and have been very much part of the dynamics of the global political economy.

#### **4. Final comments: unlearning and progress**

Arguably, past collective (un)learnings are embedded in current practices and institutions, breeding causal mechanisms and complexes generating real-world trends and oscillations, for example, in economic growth and distribution of incomes and wealth. What can be called the inner code of the evolving whole comprises the contents and structures of human learning that co-generate – in a context of power relations and previous layers – the causal processes through which the forms and parts of the whole are being determined.

The contested inner code is responsive to the real causal effects of the prevailing social practices and institutions, albeit often only indirectly and through complex processes that involve the possibility of unlearning and pathological learning (i.e. “learning” not to learn). These consequences include uneven yet ecologically unsustainable growth, distribution of surplus and concentration of wealth, and various crises, conflicts, and wars. Following the standard scheme of collective action, progressive responses to these dynamics in the 21<sup>st</sup> century must include collective actions and common institutions. We could even hypothesise that world history as a whole is directed towards planetary integration.

From this perspective, it emerges that the immediate rational response to the currently prevailing contradictions and disintegrative tendencies in the global political economy would be global

Keynesianism shorn of the “growthist” and technocratic connotations Keynes’s name sometimes conveys (Patomäki 2013, chp 8; 2018, chp. 5; 2022, chp. 6; 2023, chps. 7-8 and 11-13). Global Keynesianism promotes institutions and policies to produce sufficiently stable economic processes, enabling employment and the conditions of well-being and development for everyone everywhere simultaneously. A divided and conflicted world characterised by grievances cannot respond rationally to the consequences of 200 years of exponential economic growth and to the stark reality relating to the confines of the biophysical limits to growth.

For instance, it is possible to build a mechanism through which world trade surpluses and deficits are balanced through various mechanisms involving tax and transfer along the lines of the Keynes-Davidson International Clearing Union (ICU) plan and a global central bank that can issue reserve money (see Davidson 1992-93; Davidson 2004; Stiglitz 2006, pp. 245-68). Such institutions can be characterised as global Keynesian, as they frame questions of public economic policy and politics on the planetary scale. In particular, it has become increasingly evident that ecological problems and in particular global warming require new kinds of responses, such as a democratically organised, market-disturbing global greenhouse gas tax and world public investments, rather than a cap-and-trade system premised on the market (Morgan and Patomäki 2021; Morgan, Patomäki, and Wahlsten 2023). Causes and consequences of climate change could be tackled also through the means provided by an ICU-style global monetary reform (including expansion of SDRs or issuance of a new central bank currency, taxation of excess surpluses, climate change fund etc). Accumulation of relatively small changes in specific areas may lead to ruptures and sudden transformations in others, as issues and processes are often linked.

As different processes are connected and interwoven, the movement towards global Keynesianism and attempts at responding to environmental and several other planetary-scale problems can be linked in various ways. Breakthroughs in one area are likely to become a model for others, with the potential to cause a paradigm shift. After a critical point, directional change can become reinforcing, and this may also be deliberately purposed. In a best-case scenario, the current world-historical developmental path will be replaced by another, enabling long-term sustainability. A realist and future-oriented global political economy approach takes as its starting point that economic developments must be life-promoting rather than shortsightedly exploiting other life forms and the planetary biosphere.

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## Economics of abundance with degrowth

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In recent centuries, spectacular innovations in technology, policy, and business have enabled economies to expand in ways that degrade vulnerable people and places, and that disrupt the earth's atmosphere, biosphere, and hydrosphere. Although balance sheets have largely externalized these costs, they are coming back to bite us. It is time for more radical innovation: economics of scarcity designed to impel profits and growth must be replaced with economics of abundance oriented toward sustaining eco-social wellbeing with less material and energy. Readers who find advocacy of abundance counterintuitive, and its synergy with degrowth contradictory, are invited to read on.

Scientists around the world urge societies to curb exploitation of resources, and to prioritize governance and behaviours that support healthy societies and environments (Steffen et al. 2018, Ripple et al. 2021). In a high-profile example, the IPCC 2018 *Special Report: Global warming of 1.5°C*, developed by hundreds of contributing scientists citing 6,000 references, calls for “rapid, far-reaching and unprecedented changes in all aspects of society, including the way we manage our energy, industry, buildings, transport, and cities.”<sup>1</sup>

Key exceptions to this global scientific consensus are found among mainstream economists. Here I make the case that some of their resistance to systemic change is inadvertently constituted through basic concepts and commitments of economic sciences, including ideological narratives that portray key features of contemporary western economies (growthism, scarcity, selfish individualism) as universal realities determined by immutable laws of (human) nature.

This article offers analyses and proposals from degrowth and ecological economics to help forge future economic sciences—and real-world economies—that are more sustainable and equitable, and draws on anthropology and archaeology research to broaden imaginations trapped in scarcity-growth mode. Let's begin by highlighting three objectives shared by degrowth researchers and practitioners:

1. Decrease global quantities of material and energy use.
2. Curb cultural and personal obsessions with growth.
3. Reorient societies around equitable wellbeing and regeneration of humans and other nature.

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<sup>1</sup> Visit: <https://www.ipcc.ch/sr15/chapter/spm/>

Degrowth proposals to bring wealthier economies and select sectors into harmony with planetary systems aim to allow more resources for poorer populations and public services, in shifts that decrease economic and ecological inequalities. Degrowth is not recession—the unwelcome and uncontrolled shrinking of growth-dependent economies. Instead, degrowth works towards purposeful generation of different economies that thrive independently of growth. Such economies may build on long histories of human organization around abundance discussed below. As Jason Hickel (2019: 66) observes

“While austerity calls for scarcity in order to generate more growth, degrowth calls for abundance in order to render growth unnecessary . . . If we are to avert climate breakdown, environmentalism of the 21st century must articulate a new demand: a demand for radical abundance”.

### **Economics of scarcity**

The concept of scarcity is fundamental to economic theory, where scarcity of coveted resources, jobs, and products is understood to incentivize innovation and competition. Relative scarcity, a condition in which market demands for a good or service are greater than supply, thus raising its price, is distinguished from absolute scarcity, used to refer to limited quantities of existing resources. Adel Daoud (2010: 1206) points out that both economic concepts are used with a fateful tendency “to naturalize and universalize scarcity, and thus overlook abundance and sufficiency, which are important states in the social provisioning process”.

Mainstream economics can be strengthened by greater attention to historical processes through which concepts of scarcity, and their real-world expressions, have been constructed. Numerous works, for example, trace the emergence of capitalism through a series of moves to create specific forms of scarcity—starting in Europe, then its colonies—via enclosure of commonly managed forests, pastures, and waterways that allowed resource capture by elites, while forcing residents to procure food and shelter through markets (Polanyi 1944, Sevilla-Buitrago 2015). Ongoing expansions that breach earth systems boundaries are seen as extreme forms of enclosure making scarce the fundamental conditions of life (Moore 2017).

Asad Zaman (2012) argues that the centrality of scarcity in economics textbooks manifests unstated normative assumptions, starting with political commitment to private property and superficial measures of human welfare and satisfaction; he astutely applies to economics Michel Foucault’s revelation that modern sciences purporting to convey universal truths about human nature actually express positions and perspectives of particular societies. The power of contemporary economies to provoke sensations of insatiable desire and ever-escalating demand does not prove that we humans are intrinsically greedy and selfish, incapable of experiencing satiety or embracing self-limitation. Historical and cross-cultural evidence reveals plenty of healthy humans finding satisfaction in sufficient (not limitless) amounts of food, sex, rest, warmth, and other culturally-shaped goods. Giorgos Kallis’ (2019) exploration of sufficiency versus scarcity shows how diverse communities through history voluntarily institutionalize cultures of sharing and collective self-limitation.



## **Anthropology of abundance**

The tendency of economists to portray competition over scarce resources as the fundamental driver of human history is at odds with anthropological and archaeological research on diverse modes of human organization, many of which have endured and adapted over millennia. Field studies document examples of collective satisfaction with low resource use in contexts ranging from centuries of adaptive regeneration of Bushmen worlds in Southern Africa (Suzman 2017) to real-existing degrowth in island and Mediterranean contexts (Kallis et al. 2022). A special issue edited by Konstantinos Retsikas and Magnus Marsden (2018) explores modes of conceiving and achieving abundance and prosperity that do not fit the confines of neoliberal capitalism. During 30 years of intermittent field research in Andean and Amazonian communities, I have studied collective, ritualized stewardship of watersheds and forests; and learned in dialogue with others studying how diverse communities forge and sustain material and meaningful worlds oriented around inclusive wellbeing, not growth (Paulson 2017).

Contributors to the volume *Abundance: The Archaeology of Plenitude* (Smith 2017) re-examine archaeological evidence to interpret human development and social complexity as driven mainly by cooperation to regenerate abundance, not by competition over scarce resources. David Graeber and David Wengrow (2021) similarly contest determinist histories that naturalize (and thereby justify) hierarchy and expansion, as they rewrite the story of civilization protagonised by humans' creative agency to experiment with diverse social arrangements.

## **Practical economics to create abundant worlds with less resources and less damage**

To be clear, the point is not that all populations can or should emulate Bushmen or Amazonian cultures of abundance, but rather to recognize a richer realm of possibilities. Expanded horizons empower populations to explore their own answers to how economies motivated by one basic equation (maximize financial profit while minimizing financial investment and risk) might shift to another (maximize social wellbeing while minimizing environmental degradation). There is no single way this might be achieved. Relevant strategies include forms of voluntary simplicity supporting pleasurable frugal abundance (Alexander 2012, 2017), as well as investment in public goods and services supporting inclusive abundance in ways that are economically and ecologically efficient (Hickel 2019). Let's consider two areas of contention.

*What might transportation economics look like in a system designed to offer the most abundant travel options with the least resources and pollution?*

Production of electric cars to replace fossil-fuelled cars is likely to play out quite differently than development of smart cities that optimize walking, cycling, and public transport. Both contribute to decreased GHG and black carbon emissions. However, since private cars tend to sit idle 95% of the time, it makes sense in degrowth logic to opt for better choreographed circulation of fewer vehicles, which also decreases use of metals, rubber, and cement. Reducing the multitude of direct and indirect public subsidies that favour private vehicles can make driving lanes, parking lots, garages, and fossil fuels scarcer. Meanwhile, reorienting investments to information technologies and public services can make smart transportation more abundant. These systemic changes need not be mutually exclusive with electric or self-driving vehicles. However, following a century of investment in creating identities (including power, freedom,

virility) around car ownership, creative engagement of the advertising sector will be vital in nurturing new desires and paths toward pleasure.

*How could food economics be adapted to maximize provision of healthy nutrition while minimizing inputs of material and energy?*

The drive for profits has provoked innovations that have expanded quantities of food produced (e.g. agroindustry technologies and subsidies) and increased consumption (e.g. ultra-processed foods engineered to provoke insatiable desire). These same tools, together with computerized supply chains, chemistry and biology research, economies of scale, and more can certainly be mobilized in different dynamics that make wholesome food and environments more abundant. And that help to escape bizarre scenarios in which epidemic obesity coexists with malnourishment, and where growing corporate profits and GDPs rest on unconscionable waste and environmental degradation, including GHG emissions.

Abundant degrowth is not an oxymoron. In smart cities using less resources, fewer individuals may own private cars, but many more would enjoy comfortable and clean transportation. In resource-efficient global food systems, certain products may be scarcer, but healthy satisfying nourishment more accessible to all.

### **What is constraining such shifts?**

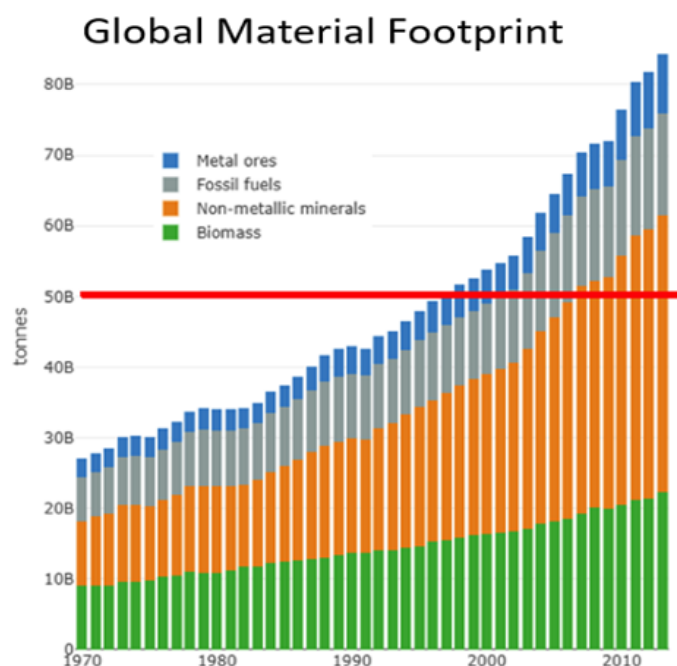
Our first constraint is a conviction that current patterns are unchangeable, inculcated by narratives that portray contemporary economic behaviour as determined by human biology: an innate *Homo economicus* who maximizes utility for individual gain, and a "selfish gene" that makes every human strive to take more than a fair share.

Second, is faith that innovations provoked by scarcity automatically work to preserve natural resources. In 1865, William Stanley Jevons observed that improvements in steam engine efficiency did not result in expected reductions in demand for coal, but instead led to increased coal use in a wider range of industries. A century later, oil crises and environmental outcries prompted innovations that increased miles per gallon in internal combustion engines. Rather than leading to reduced quantities of gasoline burned, however, these innovations contributed to increases in cars per capita, and in size and weight of personal vehicles. As the figure below illustrates, tremendous innovations in production and operational efficiency have coincided with a well-documented "great acceleration" in which global resource use has surpassed the rate of possible regeneration, marked by the red line.<sup>2</sup>

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<sup>2</sup> Image by Jason Hickel: <https://twitter.com/jasonhickel/status/1112285422091227137>.

Visit: <http://www.igbp.net/news/pressreleases/pressreleases/planetarydashboardshowsgreataccelerationinhumanactivitysince1950.5.950c2fa1495db7081eb42.html>



The good news is that different economic institutions and values can curb the rebound effect. In the short term, efficiency innovations can be matched with carbon fees, subsidy cuts, or green taxes that influence demand by increasing market prices. Longer term moves can nourish desires and arrangements that guide efficiency to support more leisure and pleasure, rather than exploit more labour and resources.

A third constraint is the fantasy that technological innovation will preclude the need to change socioeconomic systems. In 2022, *The Statistical Review of World Energy* reports the largest ever increase in renewable energy at a combined 266 gigawatts. It also reports that carbon equivalent emissions from energy increased by 5.7%.<sup>3</sup> While one region—Europe—is reducing CO2 emissions, the switch to renewables is partly facilitated by displacing costs and damages to the Global South, where demand for biofuel stock drives deforestation, and hunt for minerals for solar panels, windfarms, and batteries provokes desperate expansions of mining.

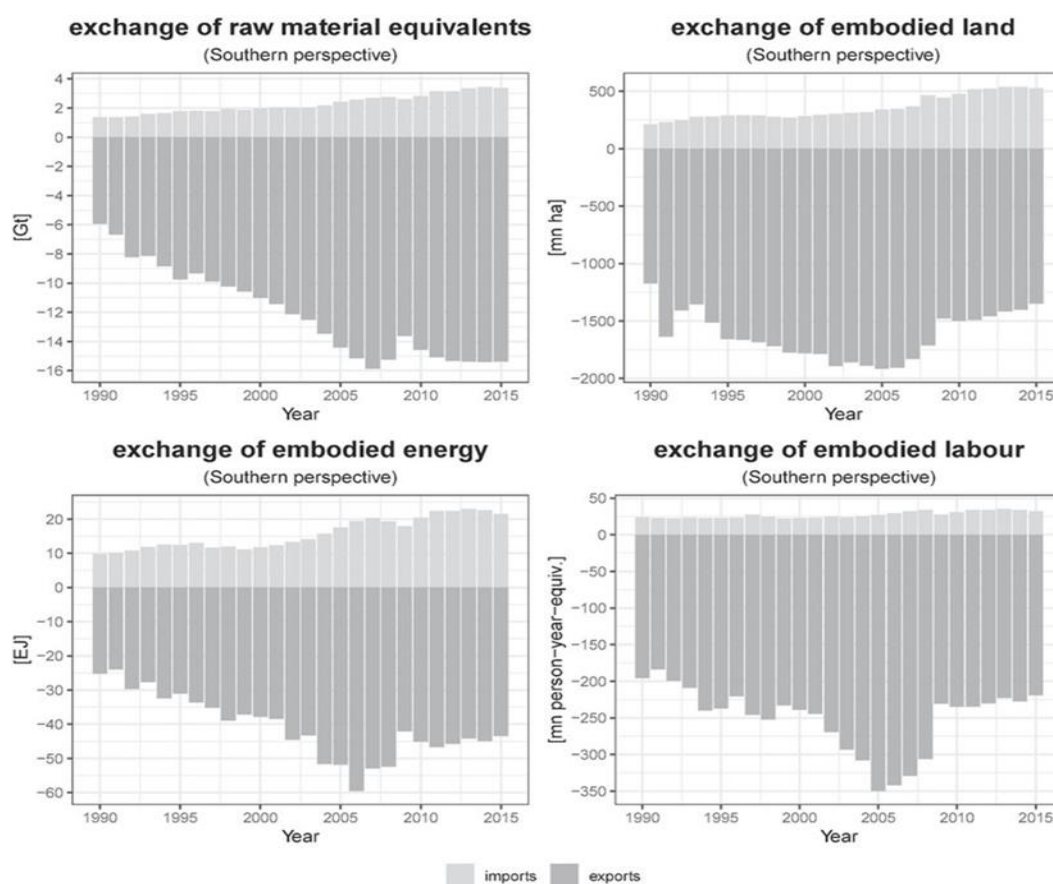
These economic myths interact to justify “green growth”, a path that prioritizes economic expansion to generate financial resources to invest in technological innovations that may shift societies toward sustainable wellbeing. As Hickel (2019, 58) asks: Why not work directly toward abundant wellbeing, rather than grow the whole dirty destructive economy hoping for a different outcome? What seems like an eminently rational proposal is constrained by one of our most fundamental myths: that growing production and profits are the (only) way to abundance. Economists and politicians continue to use GDP as a proxy for population wellbeing, despite evidence of weak correlations (above extremely low economic thresholds) between higher GDPs and other desired outcomes. I live in a country with one of the highest GDPs and largest material and energy budgets in the world, in absolute and per capita measures. Yet comparative data do not indicate that the United States enjoys more abundant wellbeing than many other nations, measured in terms of life expectancy (47<sup>th</sup>), gun deaths (2<sup>nd</sup>), incarceration

<sup>3</sup> Visit: <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2022-full-report.pdf>

rates (1<sup>st</sup>), happiness, mental health, literacy, social equity, child labor, murder, suicide, addictions, obesities, or maternal and infant mortality (54<sup>th</sup>).<sup>4</sup>

## Unequal exchange

As the figures below indicate, the question of whether economic growth produces abundant wellbeing for humanity is tangled up in unequal ecological and economic exchanges that are instrumental to accumulation and expansion.<sup>5</sup>



Experiences of abundance in some places have been contrived by applying transport and information technologies to displace workloads and environmental impacts onto subordinated people and distant places (Hornborg 2009, 2023). Even within countries, growing pies do not always mean more for everyone. After the brutally unequal Gilded Age, it is true that many countries experienced mid-20th century growth together with greater opportunity and

<sup>4</sup> Visit: <https://www.worldometers.info/demographics/life-expectancy/>;  
<https://www.cia.gov/the-world-factbook/field/infant-mortality-rate/country-comparison/>;  
<https://worldpopulationreview.com/country-rankings/incarceration-rates-by-country>;  
<https://worldpopulationreview.com/country-rankings/gun-deaths-by-country>

<sup>5</sup> These figures are drawn from Jason Hickel, Christian Dorninger, Hanspeter Wieland, Intan Suwandi, "Imperialist appropriation in the world economy: Drain from the global South through unequal exchange, 1990–2015". *Global Environmental Change*, 73: 102467.

intergenerational mobility, leading to more equitable education and incomes. Since 1980, however, tides have turned on all these fronts, so rising GDPs do not “lift all ships”. On the contrary, incomes of the richest 1% worldwide have grown 100 times more than those of the poorest 60%,<sup>6</sup> and The World Economic Forum reports: “Over the past four decades, there has been a broad trend of rising income inequality across . . . most advanced economies and major emerging economies.”<sup>7</sup>

### **Innovation toward abundant postgrowth worlds**

While it is not easy to balance radical social innovation with profit-making, new opportunities are arising. Financial costs and logistic challenges posed by new forms of scarcity, as well as concern with human and environmental degradation, are motivating searches for ways to thrive without destructive growth.<sup>8</sup> Longstanding prioritization of corporate growth and profits in all scales of governance is shifting rapidly under heated contestation (Paulson and Paulson-Smith 2021). Given the needed changes, countries, cities, organizations, and initiatives that anticipate shifts in resource and policy landscapes will be ahead of the curve.

In *The Economics of Abundance*, Wolfgang Hoeschele (2010) makes the case for dismantling mechanisms and institutions designed to create profit-enhancing scarcities (by limiting quantities of good or service, placing barriers to access, or creating new desires and demands), and replacing them with various forms of cooperatives, commons, and participatory decision-making designed to create and share abundance. Tobias Froese et al. (2023) review hundreds of business case studies to identify real-world shifts in which companies move beyond prevailing parameters of value creation to also contribute to degrowth, defined as voluntary transition to just, participatory, and ecologically sustainable societies. Actionable examples provided contribute to overcoming economic growth dynamics, engaging consumers in sufficiency-oriented presumption, open and decentral creativity, slowing and extending resource cycles, equalizing inequalities, and practicing democratic purpose-driven and transparent governance.

### **Conclusion**

Changes in ecosystems, planetary dynamics, and cultural and policy landscapes are generating needs—and opportunities—for radical innovations in economic science. In an era decreasingly hospitable for human survival, responding is not only an academic challenge but an ethical and political one that acknowledges the entanglement of economies with the real worlds that they help to build, and that give them meaning and purpose. Political and business leaders are beginning to question myths and costs of growth. To contribute to changing course, they need economic principles and tools that help move societies away from cultures of scarcity designed to provoke relentless striving to get ahead of others; and instead move toward

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<sup>6</sup> Visit: <https://wir2018.wid.world/download.html>

<sup>7</sup> Visit: <https://www.weforum.org/agenda/2021/12/global-income-inequality-gap-report-rich-poor/>

<sup>8</sup> Visit: <https://www.uu.nl/en/news/new-study-provides-strong-economic-case-for-climate-action-and-limiting-warming-to-below-2-degrees>

cultures of abundance that incentivize and reward actions oriented to increase equitable wellbeing, pleasure, community, conviviality, and regeneration of life.

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# Who gets what, how and why? The system of provision approach

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As the many essays in this collection illustrate, the problem of “biophysical limits” is acute and mainstream economics has little or nothing to offer. In this short article we introduce the “system of provision approach” (SoP) (see Bayliss and Fine 2021a). The SoP approach is a framework and, as such, is open to engage with different theoretical and methodological questions across academic disciplines depending on the context and purpose, although it specifically rejects the reductionism and individualism of mainstream economics. The approach is heavily engaged in both empirical and policy initiatives (and activism around them) and is tailored inductively to the issues and/or sector at hand: for example, energy (Bayliss and Pollen 2021); water (Bayliss 2014; 2017) housing (Robertson 2014; 2017), essential services (Bayliss, Mattioli and Steinberger 2021), car dependency (Mattioli et al. 2020), fast fashion (Brooks 2015) and the financialisation of car buying (Haines-Doran 2023).<sup>1</sup> The approach, however, was originally devised in relation to consumption studies.

## A brief comment on the failure of economics

One leading response to the crises of the environment has been to focus upon the imperatives to change our consumption patterns – for them to be far less, different and more equitable. From the perspective of mainstream economics, this involves an immediate and striking inconsistency within its core theory. On the one hand, it completely breaks with the approach to consumer behaviour, now well into its second century – based on utility functions, the optimising individual over given goods, with given meanings (aka physical properties), and in the context of given preferences and technologies and resources to deliver them. Otherwise, how could underlying preferences be (allowed to be) changed? On the other hand, there is a presumption that consumer sovereignty continues to reign supreme, as those irksomely shifted preferences exert their influence over what gets to be delivered. One way in which this has been addressed has been through behavioural economics, and nudge in particular.<sup>2</sup> This amounts to “we have ways of making you free to choose what is best for you” (or is it us?) – and this is a (contradiction of) neoliberal authoritarianism par excellence.

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<sup>1</sup> For a fuller account across many sectors see (Bayliss and Fine 2021a).

<sup>2</sup> Note, while there has been change, the “technical apparatus” around utility and production functions has remained remarkably resilient. It has evolved though through “economics imperialism”, ultimately leading to the incoherent and opportunistic addition to the mainstream’s core analytical framework of select fragments from other social sciences, including behavioural economics, see Fine (2024a and b) for a most recent account and retrospective

Environmental crises are unambiguously systemic and are deserving of systematic analyses at this level. We all know that shifting our consumption patterns may do little more than to allow the system more breathing space in which to continue along its headlong journeys to one disaster after another. This is what we have termed the “political economy of excess”, and it is notable not only in climate change. It can be found also in finance (and financialisation – why do we need three times as many assets as thirty years ago per unit of output?) and the diseases of affluence, with obesity to the fore – as the number of those malnourished through overconsumption on a global level begins to overtake the numbers who are undernourished (see Bayliss and Fine 2021b).

### **Consumption and the system of provision approach (SoP)**

Significantly, raising and addressing the issue of how changing preferences might filter back to what is produced, and how and for whom, has been the leading thrust of the SoP approach to consumption. SoP has been heralded across the social sciences, partly due to the dissemination of ideas on material culture, but like postmodernism has been ignored by mainstream economics, and also the vast majority of heterodoxy. Thus, for Leslie and Reimer (1999, p. 405) the SoP approach is seen as “perhaps the most comprehensive elaboration of production-consumption relations”.

It is increasingly clear to the world that the devastation of climate change is not simply the result of individual preferences but results from substantial vested interests for whom consumption reduction means a sharp fall in profits. The SoP approach offers a way to unpack the complex forces that underlie the consumption outcomes observed and, as such, offers more realistic responses. The approach has evolved over the past three decades and in part was informed by the observation that consumption does not occur randomly according to the vagaries of individual preferences (there are “fashions”, uniformities and diversities) but tends to happen in clusters and there are commonalities across groups of people which share similar features such as age, gender, location and heritage, and, over time, consumption patterns change in form, levels and qualities. Rather than exercising demand independently of each other, individuals conform to systematic patternings or social norms of consumption.

In contrast to the mainstream, the SoP approach treats consumption as inextricably attached to systems of provisioning, but it does more than just this (Bayliss and Fine 2021a). First, it offers a systemic analysis, one based upon the relations, structures, processes, agencies and material cultures through which provisioning occurs. Second, the SoP approach focuses upon norms of consumption by which is meant who gets what and how. Third, such norms are themselves associated with material cultures of consumption – how the meanings and significances of consumption are themselves produced and consumed (even though we are all supposedly “free” to produce and consume as we please). Fourth, considerable emphasis is placed upon the correspondingly variegated nature of SoPs. In a word, the food system differs from the housing system, and from the energy and transport systems across all of the aspects previously elaborated, although they may well be (differentially) underpinned by common underlying determinants such as globalisation, neoliberalisation and financialisation. Fifth, as the previously provided references indicate, a SoP approach has been taken as central in seeking to understand and address environmental issues. As such, the approach is not just

another set of concepts for economics that do not travel beyond the classroom, it encourages and facilitates practical applications and activism.

In contrast to the horizontal approaches of most of the social sciences to consumption, the SoP approach adopts a vertical perspective. Consumption is seen as a (typically end-) point in a wider system linked to provisioning. The SoP approach, derived from extensive analysis across the social sciences, is based on the premise that consumption is linked to production in (to reiterate) a vertically integrated process, rather than the result of the expression of individual preferences (as mainstream economics might suggest). The approach has evolved over the past thirty years into five core elements which overlap and intersect in shaping consumption outcomes:

## **1. Agents**

The SoP is determined by the participants in the provisioning system. Agents will include consumers and producers. And there may be subgroups within these. Consumers may be individuals or households or businesses or they may be public institutions. Producers might be further broken down into shareholders, managers, workers, financiers or they could also be public institutions or voluntary organisations.

There will then be other agents that shape the SoP. The state will have a key role. This might be as regulator, policy maker, or even provider or consumer. It could even be just in terms of the policing of property rights that underpin SoPs. And there may be others such as civil society organisations, or global bodies such as the World Bank or IMF. Notably for the SoP approach, the agents are considered to be likely (although not necessarily) to have conflicting objectives so that allocations within SoPs will be contested. A basic example might be contestation around pricing – the consumer would usually want it to be lower and the producer for it to be higher.

## **2. Relations**

Relations between agents in the SoP, are likely to be contested, and unpicking the underlying power dynamics is important for understanding outcomes. On one level, SoP analyses will be concerned with the relations between the agents within the system. For example, relations in production may be formally differentiated by the roles of capital and labour. Within production there may be relations between management and workers that shape the SoP. The relations will shape the way that contestations between sets of agents are resolved. Not all agents have equal power to shape SoPs, so that unpicking these power relations is important for understanding outcomes. The way SoPs operate will be contingent on who exercises power and how. SoPs also exist within wider relations such as class, gender and race which will have a bearing on consumption outcomes.

### **3. Structures**

Each SoP itself will have its own vertical structure which will intersect with horizontal social structures such as race, class and gender. These might be formal or informal. Structures will be specific to each SoP and will evolve over time (we lack the space to elaborate, see the various references provided).

### **4. Processes**

SoPs are shaped not just by who does what but also by how it is done as a structured sequence of activities. So, on one level, there is the organizational process of the SoPs themselves – how things are done between producing and consuming. But at a more abstract level there are deeper systemic processes such as privatization or commodification which change the structures and the agents involved in provisioning. As should be clear from what has been said so far, other processes include globalization and financialization which bring about transitions in and along SoPs according to how they themselves interact with and influence other factors.

### **5. Material Cultures**

Each SoP depends on the material features of the commodity in question. For example, there are features of housing that affect the way in which houses are produced and consumed which are different from, say, water. A house cannot be moved, it tends to account for a substantial part of income in consumption, it is not something that is changed often. Water tends to be homogenous aside from issues of quality and access, it is needed many times a day, and it is heavy to transport and so tends to be consumed near its source. Such material features affect the production and consumption of commodities. In addition, goods and services are imbued (often subtly or unnoticed) with cultural significance. Material cultures might be so deeply ingrained that they are considered to be a kind of unquestioned common sense. Issues that arise here around infrastructure might relate to the importance of efficiency and competition and a pricing structure that fully covers costs. These may be depicted as technical and neutral while they reflect certain underlying priorities and agendas.

The same item will have different cultures and associations depending on the context. Each of the agents in a SoP will have its own cultures associated with engagement in the system, and these may be in conflict. For example, one person's home if they are renting might be another's financial investment. One person's flexible workforce might be another's exploited labour, especially in the debates around zero hours contracts for example.

Consumption tends to happen in distinct, if differentiated, patterns or norms across groups in societies. A SoP approach and analysis of material culture can shed light on the nature of such norms of consumption as well as their origins. But material culture can also be helpful in understanding the underlying pressures behind structural societal changes such as our views on how basic needs should be met. Understanding the ways in which cultures emerge, and the associated narratives and discourses, can highlight the role of political and economic power in shaping cultural forms and norms and the way these become legitimised as well as how they might be changed.

Unpacking material cultures can be difficult partly because they are so much taken for granted that we are not even aware of their significance, though clearly there are now many working on climate emergency and ecological breakdown who are sensitised to this issue, such as degrowth. However, Fine (2013) has proposed a useful kind of checklist of things to consider in analysing MCs known as the “10Cs”. These are ten words beginning with c that have a bearing on material culture. Material cultures are: constructed, construed, commodified, conforming, contextual, contradictory, chaotic, closed, contested and collective. Not all of these will be relevant for each SoP but the list gives an indication of things to take into account when analysing material cultures (see Bayliss and Fine 2021a).

## Final comments

To reiterate in terms of these five framing parameters, the SoP is highly context-specific. What goes into shaping the SoP for cars will be different from the SoP for peanut butter which will be different across locations and different today from a century ago. While open to engagement, the SoP approach is neither methodologically, conceptually nor theoretically neutral, as it explicitly rejects some methodologies, conceptualizations and theories, especially if they are drawn from within particular disciplines and unduly generalized across differentiated consumption systems.<sup>3</sup> The approach draws attention to the extensive and complex channels which underpin specific social, environmental and economic outcomes. The workings of SoPs are often under the radar, and the underlying contestations, contradictions and conflicts are often obscured. The approach, moreover, shines a light on the largely unacknowledged configurations of economic, political and cultural powers that underpin social outcomes, and the ways these are normalised. It can, therefore, be helpful in identifying “leverage points” for interventions and pressure for change. In the UK, for example, SoP-based research has contributed to campaigns for reform of water and rail systems (Bayliss and Hall 2017 and Haines-Doran 2022, respectively).

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<sup>3</sup> Some might see parallels with the Global Value Chain approach, given its emphasis on provisioning systems. But the SoP approach differs in adopting a more open framework, as opposed to drawing from ideal types and more or less arbitrarily including or excluding determining factors accordingly (Bayliss and Fine 2021a).

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## Liveability within planetary limits

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Growth and emissions are relatively not absolutely decoupled. So, (under existing political and technical conditions) growth as we know it will simply make the nature and climate emergencies worse. It is then pertinent to ask, “how can we construct an economics consistent with the biological and physical limits to growth”. But that question is also incomplete because we face two interconnected crises which are both in different ways threats to the Senian freedom of citizens to “live the lives they have reason to value”. First, a crisis of outcomes in the Anthropocene where aggravated nature and climate emergency will devastate poor people in the global South who cannot easily adapt to extreme weather events, as on the Bangladeshi flood plain or in the desertification of sub-Saharan Africa. And second, a crisis of political process about the erosion of liberal democracy which we have taken for granted in the high-income countries under pressure of citizen discontents which the establishment political classes are unable to fix.

The two crises are interlinked. If we do not address citizen discontents, then Western democracies will, under the aegis of the radical right, default to “do nothing” or denial about climate change and building walls against migrants (see Trump in America or the eclipse and disintegration of centre right and centre left governing parties all across Europe because they are perceived to be not delivering). Matters are complicated by the current conjuncture of unexpected and unresolved crises. Israel’s assault on Gaza comes after the Ukraine War, the Covid pandemic and the Great Financial Crisis. Policy then becomes bipolar. Bursts of uncontrolled bail out of firms or households (as with the European response to the energy price spike) do not earn any gratitude. While the default back to austerity deepens discontent.

“Foundational economy” is a developing way of thinking about how we collectively address the double crisis of outcomes and process in the current conjuncture. Foundational economy is not an adjunct to mainstream economics or a reform movement within economics. Foundational economy is a practically concerned alternative. It holds open the space for a politics of improvement by proposing relevant measures which directly improve everyday life for households, build a stock of responsible capable firms and manage the cost of renewing reliance systems like sewerage systems or the electricity grid. In doing all this it challenges the assumptions and priorities of mainstream economists and politicians who believe that higher wages and a better funded welfare state are the key to managing discontent. The mainstream problem then is how to get back onto a trajectory of sustained, faster economic growth which will increase the tax yield for public services while higher productivity allows higher wages. Mainstream right and left then divide only over whether the policy fix should be tax cuts or productivist industrial strategy.



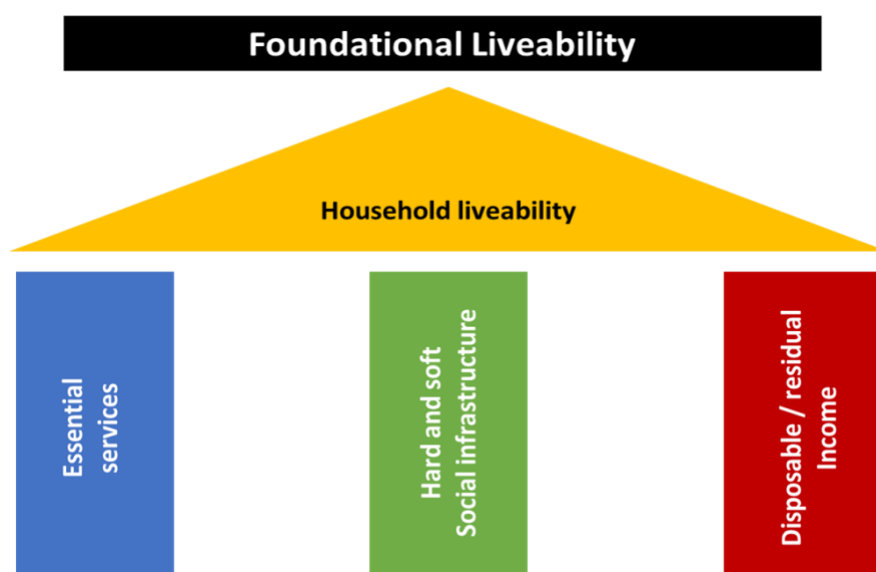
The evidence and argument below are drawn from our recent book on the UK but is relevant to all high income, liberal democracies. The question of what to do in the global South is a considerably more complicated wicked problem given often limited internal resources and neo-colonial external relations.

**1. Focus on direct benefits for households which improve liveability (not on indirect benefits for individuals from making the economy work to deliver higher wages)**

In recent opinion polls, more than half of respondents agreed that “nothing In Britain works anymore and three quarters believe that “things in Britain are worse now”. The foundational priority is to address these discontents by making direct and meaningful improvements in everyday life so that we hold open the political space in which nature and climate emergency can be recognized and addressed. It is important to head off the radical right argument that mitigation policies impose additional and unnecessary costs on households already overburdened by the cost of market essentials.

The foundational starting point is the household not the individual because most of us live in multi person households where income as well as expenditure sharing is increasingly important. We are no longer in the 1940s where the male breadwinner’s wages supported a family. In the EU, female work force participation is 65 % and rising while in the UK both partners work in three quarters of households where couples have children. Households with one earner, especially single parent households, disproportionately live in poverty. What matters for households is not top line wages but disposable income (after tax and benefits) and residual income (after paying for the four universal essentials: housing, utilities, food and transport). Residual income becomes crucial with the “cost of living” crisis. This is about a squeeze on residual income triggered by a near doubling of energy prices in the UK (despite price cap) and sustained by food price inflation and rising housing costs.

Figure1: The three pillars of foundational liveability



The household problems about squeezed residual income are compounded by failing public services and collapsing social infrastructure. In the UK. More than 7 million are on the English NHS waiting lists for non-urgent treatment and those in the bottom half of the income distribution cannot afford to queue jump by going private. Equally, social infrastructure of all kinds is crumbling because underfunded English local authorities' real expenditure on cultural and leisure activities has been cut by more than half since 2010. The consequence in the UK, and other high income countries, is a foundational crisis because all three supporting pillars of liveability- residual income, public services and infrastructure- are crumbling. No wonder electorates are in such a sour mood. Especially the working poor trapped in a dysfunctional tax and benefits system with an effective marginal tax rate of 70 % for those on Universal Credit.

The first constructive step is to ask what government and other social actors with agency can do directly to rebuild each one of the pillars of liveability in the short, medium and long term. The importance of the three pillar approach is that it broadens the range of interventions and actors in complex multi-level systems of government and governance. As we are beginning to understand in Wales, for example, it is not necessary to wait for Westminster central government or Cardiff Bay Welsh Government because local authorities, housing associations and regional health boards can make a difference (often within existing budgets).

In this context, mainstream economics preoccupations are irrelevant. The monetary issue is not higher individual gross wages through growth and productivity but the deductions for disposable and residual income which drive discontent, The economics approach is doubly irrelevant because, as hand wringing commentators recognize, there are no orthodox policies which in the short run will raise the secular growth rate, while any gains from productivity are likely to be captured by capital in profits, not by labour in the form of wages. And this is to say nothing about the material-ecological consequences of the problems of targeting continual economic growth.

## **2. Give due weight to social innovation especially in public service delivery (end the monomania about productivity increasing economic innovation)**

The foundational starting point is the balance of activities when 80% of the UK economy is services. The sectors of health and social care in the UK together now employ more than all of manufacturing whose largest sector in terms of employment is low tech and sheltered food processing. This is good news for those concerned with the environmental consequences of output growth. Personal services like education, health and care have a much lower carbon footprint than most manufacturing activities.

Even if we can have more services at low environmental cost, the problem remains that the key sectors of health and social care must meet the challenges of an ageing obesogenic society where demand threatens to outpace any feasible increase in supply. At the same time, underfunding and ill-judged policy pressure for productivity increases in the NHS (in the case of the UK) has resulted in cost cutting and increased throughput with no spare capacity. This makes the hospital system increasingly fragile and unable to cope with epidemics, surges in demand or "bed blocking", where discharging patients is difficult because care beds are not available. To deal with these challenges, sectors like health and care need social innovation which requires a new kind of imagination that operates within financial limits but without the financial incentive that drives economic innovation. Doing social care differently for the elderly

requires a focus on the whole person not just bio-medical needs after assessment. In health, the crux is a comprehensive reinvention of preventative public health to deal with avoidable health inequalities.

In this context, economics preoccupation with productivity is another irrelevance. In car assembly you can get more physical output for less labour input by adding capital or changing layout. But in hospitality or care services, labour is both input and output so that reducing the labour input often results in worse service (think budget hotel or low-cost mobile contract where labour has been taken out of the product). Again, here the preoccupation with productivity is doubly irrelevant because mainstream economics has no policies which will deliver its desired outcomes. The standard fix is to subsidize R&D and early-stage innovation in the hope that shiny new technologies - in digital, aerospace, life sciences and such like - will deliver higher productivity and competitive success. That is unlikely in a small country like the UK which accounts for 2% of world manufacturing output and R & D and this would not be socially transformative because hi-tech everywhere employs a small part of the workforce.

With productivity growth stalled, the UK has doubled down on workfare to compel participation in the workforce which delivers growth of output (if not per capita output). But low quality, low paid jobs require state subsidy of wages and rents as with housing benefit which is an economic subsidy to private landlords masquerading as social policy for tenants. Such policies block innovative thinking about what low wage households need. As much as income from work, the low paid need the gift of time in the form of predictable flexible hours which fit round family tasks they cannot afford to outsource. Failures here are also problematic sources of social and economic problems in a time of climate emergency.

### **3. Focus instead on building a stock of responsible and capable firms (end the preoccupation with upgrading the individual to fit the needs of the economy)**

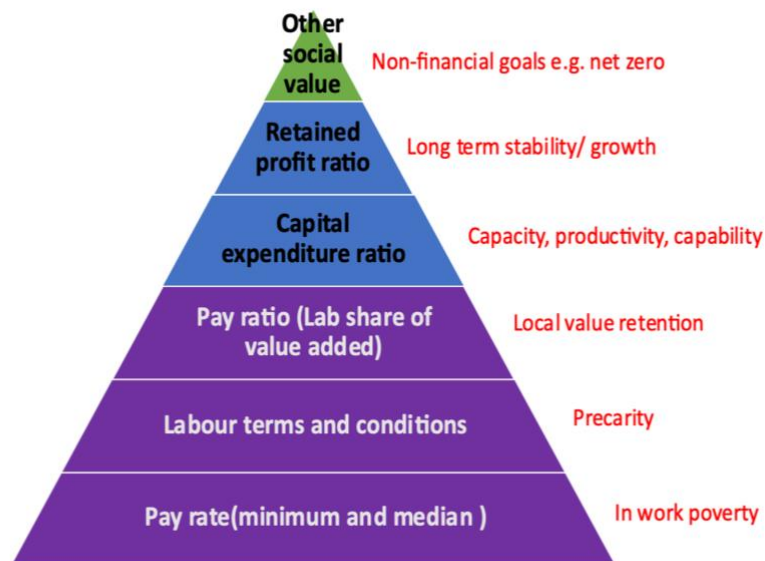
A stock of technically capable, socially responsible and financially solid firms is essential if there is to be any greening of the economy. It is only on this solid basis that we can expect sustained delivery on ecological obligations which will impose costs on firms. Irresponsible and fragile firms will not have the motivation or capacity to contribute to the cost of renewing infrastructural reliance systems or to pass up the opportunity to earn profit from polluting activities or to stop greenwashing behaviour.

The pressure for higher returns in a financialised system and public sector austerity have separately worked to dramatically increase the number of irresponsible private firms and public organisations. Thus, we have managers behaving badly. In many large firms like supermarkets, managers use their power against suppliers to capture margins; or, as in construction, subcontractors caught in a least cost system have no option but shoddy workmanship and no training. Ownership models which undermine stability are another aspect of the problem. Private equity owners strip out assets and/or load firms with debt, as in the residential care sector. In the UK public sector, underfunding reduces capital expenditure in schools and hospitals at the same time as it erodes pay and conditions so that staff recruitment and retention problems become endemic.

Here again, foundational economy thinking is practical and direct in focusing on the broad range of what matters. The responsibility and capability of firms is judged using the McGrady triangle

which inputs standard accounting information that all firms have on capital expenditure, retained profits and labour pay. This triangle is being used experimentally in purchasing to assess suppliers, screen out substandard suppliers and set improvement targets. But it is also a 360-degree tool, if suppliers are generally not offering decent pay and conditions or investing in the future, the problem is usually created by the private purchaser or public funder.

Figure 2: The McGrady triangle<sup>1</sup>



While foundational economy focuses on the demand for labour by firms and organizations, mainstream economics and politics diverts onto upgrading the labour supply. The political request is always for more skills training, with the employers who benefit usually lobbying not to pay for the training. The intellectual elaboration is human capital theory where humans are assets in production to be developed so they yield more. The underlying mainstream assumption is that individual and social benefits are aligned as the upskilled will earn more and enable innovation and productivity increases. But supply does not create its own demand so that, for example, an increasing number of university graduates are in ill paid non-graduate jobs. The provision of training and the return from training is limited by the stock of firms. If firms offer no jobs or low pay and poor conditions, then trainees will divert into other occupations and employees will churn.

<sup>1</sup> The triangle device was developed by Ian McGrady, CEO of the Edsential community interest company as part of an action research PhD project.

#### **4. Focus on how households will pay for the massive cost of renewing foundational reliance systems (bracket the productivist rhetoric about the opportunity of the green industrial revolution)**

The green transition means costs and inconvenience. The renewal of foundational reliance systems – like water and sewerage or the electricity grid – will be hugely expensive. Inconvenience is inevitable given anarchic provision of new reliance systems like charging points for battery electric vehicles. Some (maybe many) car owning households will not have an affordable, accessible charge point. The key issue for the political management of green transition is managing all this so that inconvenience is minimized, and costs are equitably distributed. Any kind of transition strategy will be stalled if it imposes a large burden on low-income households.

The naive response is that the problem can be solved by bringing in private capital which is of course readily available. The problem is that private capital adds a claimant because equity or bonds have to be serviced with interest or dividend payments out of a limited revenue fund dependent on bill paying firms and households. There can then be problems of revenue deficiency. In the UK the classic example is privatized water. Up to 2023, bills were kept low for households, so that the revenue barely covered cost of operations and investment was low. The only way the water companies could find funds for distribution to shareholders and bond holders was through taking out more debt. Now, after public outcry about sewerage discharge into rivers and onto beaches, capital expenditure has to rise in the next regulatory period and (with or without borrowing) household bills will have to rise.

The problem with higher bills is then the regressive and arbitrary basis for utility charging and the narrow base of the tax system. 60% of English and Welsh households have metered water bills which are not related to income and the rest have unmetered bills which are not related to consumption. Energy bills are powerfully influenced by the energy efficiency of the house which a low-income tenant cannot change. Hence the need for tax reform, shifting away from a 1940s style system based on individual income and sales taxes. We need to collect data on household income (not individual income) so low-income households can have lower utility bills and households in the higher income deciles pay more because they can afford to do so. More generally, the tax base needs to be broadened to at least include taxes on wealth inheritance. This makes sense when the UK stock of wealth is now 7 times as large as national income and twice as unequally distributed, partly because so much inherited wealth comes from unearned gains on property.

In the context of this discussion of who pays and how, the economic and political rhetoric about the opportunity of green industrial revolution is profoundly unhelpful. The green industrial revolution will be led by private firms eager to claim public grants and tax concessions to do (more profitably) much of what they would do anyway. Just transition demands for good jobs to replace those that are lost will be frustrated if employers get the chance to recompose skills, with workers on insecure contracts. Here, as more generally in the service economy, what we need is political support which creates pro-union frameworks for organization by muscular trade unionism prepared to strike to claim improved pay and conditions.

## Conclusion

In conclusion, foundational economy provides a different answer to the question “how can we construct an economics consistent with the biological and physical limits to growth”. It should now be clear that foundational economy is not an adjunct to mainstream economics or a reform movement within economics. Foundational economy is an alternative concerned practically with improved household liveability on the demand side and increasing the stock of responsible firms on the supply side. Only on this basis can we create a space for collectively getting on with all the things that rightly matter at different scales from managing nature and climate emergency to attending choir practice next Tuesday night. From this foundational perspective, the idea of “the economy” understood by a discourse called “economics” is in the 2020s as much part of the problem as part of the solution.

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# Demographics, the economy and the environment: An MMT approach

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## 1. Introduction

The pace of climate change is blowing past even pessimistic projections, threatening human survival. At the same time, concern is rising over rapidly changing demographics. Falling birthrates are overtaking lower mortality rates so the global population is rapidly aging and already declining in some nations. That would have been celebrated a few decades ago when Paul and Anne Ehrlich warned about a population “bomb,” predicting that:

“[t]he battle to feed all of humanity is over. In the 1970's the world will undergo famines – hundreds of millions of people are going to starve to death in spite of any crash programs embarked upon now. At this late date nothing can prevent a substantial increase in the world death rate...” (Ehrlich and Ehrlich 1969, 5)

They suggested:

“We must rapidly bring the world population under control, reducing the growth rate to zero or making it go negative. Conscious regulation of human numbers must be achieved. Simultaneously we must, at least temporarily, greatly increase our food production. (188)

Similarly, in a 2017 survey of Nobel Laureates a third of respondents ranked population growth and environmental degradation as the “biggest threat to humankind”.

But rather than seen as a boon, these demographics are feared because of impacts on economic growth and the burden of supporting the aged. Some have stressed the impact of China’s declining workforce (where the population fell last year) and potentially elsewhere in the developing world because cheap labor has been a major factor fueling economic growth while suppressing prices (and wages) in developed countries. But the more immediate concern has been the supposed unsustainability of pensions as most countries face an avalanche of retirees with fewer people paying taxes into retirement systems.

We will use the Modern Money Theory (MMT) framework to address these concerns. While it is true that governments will likely collect less revenue while paying out more in pensions, we



argue this is not a cause for concern since there is nothing to prevent governments with sovereign currencies from paying the elderly promised pensions. What is less certain is whether there will be enough real output those incomes can buy in a non-inflationary and environmentally sustainable manner. The real issue, then, is production and distribution of real resources, not lack of finance.

Another fundamental presumption underlies this contribution: achieving environmental sustainability must consider economic and social sustainability, including provision of old age security. At the same time, rethinking aging and population decline from a real resource perspective leads to solutions more in line with our biophysical limits since the focus is on doing more with less (raising productivity) and the distribution of resources (improving equity). Since the environment is better off with a smaller global population, policy should focus not on changing the demographic trends, but on taking measures to ensure adequate provisioning for all, while respecting the biophysical boundaries. This includes taking measures today to fight the catastrophic effects of climate change which threaten collapse of production.

## **2. The Demographic “Time Bomb”**

The news that China’s population actually fell in 2022 for the first time in 60 years led many pundits to warn of a “demographic crisis,” with “consequences not just for China and its economy but for the world” (Stevenson and Wang 2023). Bret Stephens warned that “[i]f you think the world has too many people already, then this might sound like good news. It’s not. China is increasingly likely to grow old before it gets rich, consigning millions of Chinese to a penurious and often lonely old age” (Stephens 2023).

China is not alone -- Europe, Japan, South Korea, and Russia have declining and aging populations. But China provides a warning of what to expect in other developing nations. Over this century, the most populous nations will see fertility rates fall below replacement. India--with the largest population in the world--has a total fertility rate (TFR) already below replacement (2.01), and that is expected to continue to fall to 1.78 in 2050 and 1.69 in 2100, when India’s population will also begin to fall (Stevenson and Wang 2023). Among the most populous countries, Nigeria and Pakistan have the highest TFRs at 5.14 and 3.41 respectively, but even these are expected to drop below replacement by 2100 (Stevenson and Wang 2023).

For now, the global population continues to increase. But on current projections that reverses sometime this century, peaking at 9 or 10 billion.<sup>1</sup> By 2100 the projected population is within a wide range, between 9 billion and just over 12 billion, however the median projection calls for the population to begin to decrease before the end of this century.<sup>2</sup> Barring catastrophe, we are not likely headed for either “population bomb” extreme: zero or infinite population. Eventually, the mortality and birthrates will probably align so that the global population will fluctuate within some narrow range.

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<sup>1</sup> See UN data for a projected peak at about 10.4 billion in the 2080s: <https://data.worldbank.org/products/#eatlas>.

<sup>2</sup> The projected range varies between a low of 6 billion and a high of 15 billion simply by changing the assumed fertility rate by just half of a child (UN DESA 2022).

### 3. Aging and Government Finances

Conventional wisdom holds that an aging population places an unsustainable burden on government finances, with relatively fewer workers paying taxes into public pensions. A report from Standard and Poor's (S&P) cautions that "[i]n the absence of policy action to cut age-related spending, the median net general government debt will rise to 102 percent of GDP in advanced economies and 155 percent of GDP in emerging economies by 2060" eventually resulting in ratings downgrades (Tilleray and Mrsnik 2023, 1). Reporting on the latest projections of U.S. Social Security's finances, Jeff Stein of the *Washington Post* warns:

[r]egardless of the politics, the aging of the baby boomer generation poses a real challenge for federal lawmakers. Congress has until 2032 to avert major cuts to Social Security and until 2033 to avert major cuts to Medicare, according to the latest projections by the nonpartisan Congressional Budget Office. (Stein 2023)

Radical changes have been proposed to make the US Social Security system more sustainable -- those on the *right* suggest benefits cuts, raising the retirement age or investing Social Security funds in the stock market to get better returns.<sup>3</sup> Americans on the *left* favor eliminating the income cap on the payroll tax, increasing the tax base to make Social Security solvent. Jean-Luc Mélenchon and the unions in France argued for raising taxes on the rich and employers. *The New York Times* summarized the pessimistic view on demographics: "How do you adapt to an older world and pay for the inevitable pension time bomb ticking in the background as this super-ager cohort approaches retirement age?" (Warner 2023).

The *Times* is correct that policy is needed to adjust to a different demographic composition—fewer children and more elderly. Unfortunately, most solutions proposed for solving the "pension time bomb" are misguided. The adjustments we need to make should not be aimed at how to "pay for" pensions. The real question is this: with relatively fewer workers, can we care for a growing army of retired seniors living longer lives? We face a potential resource problem, not a finance problem.

When we think of retirement at the individual level, it's certainly a financial issue: *will I have enough money saved for my old age?* But from the perspective of society, sustainability depends on its real resources and worker productivity. Workers support those who are not working: retirees, the unemployed, children, people with qualifying disabilities, and unpaid care providers.<sup>4</sup> This is the real burden of retirement—having enough real goods and services for everyone. Even if we could *financially* afford to pay retirees what they were promised, a retirement system would not be sustainable if a nation couldn't produce (and import) enough goods and services.

The solution proposed by the left serves to illustrate this point. Suppose we broaden the tax base for Social Security by eliminating the cap—so all pay is taxed. But, at the same time, suppose we don't have enough workers with productivity sufficient to produce all the goods and

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<sup>3</sup> Some even propose a sovereign wealth fund to issue debt and invest proceeds in the stock market! <https://www.semafor.com/newsletter/01/20/2023/pences-big-anti-abortion-play>

<sup>4</sup> Although it must be recognized that much of the support of elderly, young, and people with disabilities is done by those unpaid care workers.

services needed. Our retirement system will be solvent in financial terms, but it will not be sustainable. We can continue sending checks to seniors, but they will compete for a limited amount of goods and services, leading to inflation and eroding the purchasing power of those checks. Taxing higher-income individuals might alter the distribution of consumption, but it will not create more output.

One could still argue for higher taxes on the wealthy for a variety of good reasons: the payroll tax cap is clearly regressive and has become even more so due to rising wage inequality. The rich contribute inordinately to greenhouse gas emissions because of the composition of their consumption basket: private jets, yachts, and mansions. Taxes can be used to alter their consumption patterns and to reduce inequality that threatens democratic governance. We emphasize, however, that success of such taxes should not be measured by revenue generated but rather by reduction of emissions and power to influence elections. Very high tax rates on the rich and a tax surcharge on the middle class may be required to release sufficient resources to distribute to seniors—again, success is measured by reduction of resources consumed by extravagant lifestyles, not by revenues raised.

Whether we can take care of tomorrow’s seniors will depend on the resources available to support them in the future—including most importantly the labor force—and on growth of productivity. On current projections for the USA, the overall dependency ratio (number of young and old dependents per worker) will rise, but only to the levels already reached at the height of the baby boom. With even modest growth of labor productivity, it is difficult to imagine that this would lead to a catastrophic burden. And if we can believe that advances in Artificial Intelligence live up to expectations, we may face a cornucopia of productivity advances.

Do we really face a “demographic time bomb”? It is difficult to reconcile the fear that robots are coming for our jobs while believing that we will not be able to adequately provision seniors. A report from Goldman Sachs projects that two thirds of the jobs in the US could be subject to replacement or degrading if generative AI lives up to its hype. Extrapolating to the world, they conclude that as many as 300 million jobs globally could be affected.<sup>5</sup>

Imagine an extreme scenario in which robots produce everything. There is plenty of output for humans, and the robots never need wages, pay taxes, or retire. However, since robots won’t pay taxes, this will “bankrupt” Social Security even as the supply of resources needed for the young and elderly would be plentiful. But we only need to give the retirees (and others who can’t work) their fair share of income to distribute output. This demonstrates that if we remove the real resource constraint, it is easy to come up with the finance to distribute output to old, young, and everyone in-between. Although there could be political fights about the distribution, there would be no question about sustainability or affordability. Hence “affordability” concerns production and distribution of output and income—not finance.

To drive the point home, consider a dystopian future in which climate catastrophe is not avoided. Production collapses so that we are unable to provision tomorrow’s youth, workers, and elderly. No matter how *financially* “sound” the retirement system is, it will not be able to support the population.

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<sup>5</sup> [https://www.key4biz.it/wp-content/uploads/2023/03/Global-Economics-Analyst\\_-The-Potentially-Large-Effects-of-Artificial-Intelligence-on-Economic-Growth-Briggs\\_Kodnani.pdf](https://www.key4biz.it/wp-content/uploads/2023/03/Global-Economics-Analyst_-The-Potentially-Large-Effects-of-Artificial-Intelligence-on-Economic-Growth-Briggs_Kodnani.pdf).

#### 4. An Alternative Framing of the Issue

Surprisingly, the correct framing for financing retirement systems is found not in the Bernie Sanders plan of raising the payroll tax cap or in Biden's plan of "taxing the rich". Instead, it comes from the ultra-conservative former Fed Chairman, Alan Greenspan. In an exchange with Paul Ryan who was prodding Greenspan to agree with him that privatizing Social Security "can help us achieve solvency for the system," Greenspan responded:

Well, I wouldn't say that the pay-as-you-go benefits are insecure, in the sense that there's nothing to prevent the federal government from creating as much money as it wants and paying it to somebody. The question is, how do you set up a system which assures that the real assets are created which those benefits are employed to purchase.<sup>6</sup>

Greenspan recognized that government can finance retirement since it cannot run out of its own currency. The real issue is whether there will be enough real output for that finance to buy.

It should be obvious that, from a real-resource perspective, simply focusing on the aging population in the context of low birthrates and population decline is missing half the story: there are fewer children to support. The child dependency ratio fell as the aged dependency ratio rose. Certainly the burden of support per child has grown: with a smaller families, parents focus more attention on children and support them for more years. A few decades ago, children in the developed world began working at age 16, or at least by age 18. Today, they are often supported by their parents for 25 years. At the other end of life, seniors are supported in retirement. Going forward, a typical global worker might live as a dependent for 50 years (25 as a youngster and 25 as a senior), with a working life of 40 years.

In terms real output, the burden of aged dependency is not much different from the burden of dependent young (although the composition of consumption is different). But the method of distribution is very different. Parents bear most of the burden of caring for the young, while, at least in the West, society bears much of the burden of supporting the elderly. For the young, distribution is largely within the family (although indirect support of youth by government plays a big role) while direct income support by government of the elderly is huge. It is the transparency of government elderly support—cash, with an attached payroll tax in the USA—that raises concerns about sustainability. We expect, and to some extent overlook, much of the burden of parental support for children. If today, instead of an aging population, we were dealing with a baby boom, we wouldn't worry about its financial sustainability. Instead, we would worry about the real issue – the environmental sustainability of a growing population. Yet, in terms of the "burden" on society, the macroeconomic impact would be similar to what we face with the aging "crisis."

Attempts to cut old age security would do for elder care what we already do with the care of the young—push more of the burden onto families and away from the public sector. Cutting back on retirement security does not reduce society's burden of caring for the elderly—unless we choose elder neglect. It simply transfers financing from the social sphere to the household. More seniors today and tomorrow would become impoverished and forced to rely directly on

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<sup>6</sup> <https://www.youtube.com/watch?v=DNCZHAQnfGU>

their children. Workers would have to support, within their own households, both seniors and children. This is the system we had before there were national old-aged security programs.

Thus, while reforming national social retirement systems is portrayed as achieving “intergenerational justice” by raising taxes and cutting benefits now—supposedly to avoid burdening our grandkids—in reality, such “reform” simply burdens workers of today and tomorrow. In real terms, workers are always—inescapably--supporting both the young and the old. Social Security puts the financial responsibility at least partially in the public sphere. There are several benefits to this, including greater horizontal equity: one’s standard of living depends less on the extended family’s income as government can provide income directly. Luck plays a smaller role as retirement does not depend on number of children, their earning capacity, or their health (and vice versa, the children do not bear all the costs of bad luck in “choice” of long-lived parents and absence of siblings to share the burden). There is less incentive to have lots of children. And government can partially offset differences of lifetime earnings that generate big private retirement funds for some and miniscule funds for others by providing a base income for all. That base should grow with overall productivity and capacity to provide higher living standards for all.

More public support for the young, and fewer of them, are desirable outcomes--at the levels of the family and society--ensuring that average worker productivity *can* rise more quickly due to greater investment in the young, while we curb and reverse population growth to save the planet. While this is not foreordained, policy can make it a more certain outcome. Rational public policy should play a bigger role providing a social safety net for both dependent groups (young and old), especially in the USA where child poverty is high and retirement benefits for the lowest paid workers are inadequate. The question is whether—and how—we can prepare to support individuals for something over half of their lives.

## **5. Conclusion: Policy Solutions**

Why is it important to bring aging into a discussion of environmental sustainability? Most proposals for dealing with aging would increase precarity among not just seniors, but for all ages of the population. Families that must care individually for their elderly members cannot devote as much care to their young. Those of working age must struggle to set aside funds for their own retirement. They must continue to work long hours and seek more monetary remuneration. Local and national governments promote economic growth to create more jobs, better paying jobs, more wealth accumulation and more taxes to support social security programs. Insecurity, inequality, and precarity create division, invidious distinction, and winners and losers. Those who fall through the cracks generate social and economic costs. In poorer countries, environmental damage can be a direct result as people desperately exploit nature to survive. In the rich world, damage is indirect, through environmentally unsustainable growth promoted by socially unsustainable policy.

Centering on real resources also leads us to question the disastrous austerity policies of previous decades that have negatively affected productivity growth and our potential. Austerity programs have largely sought to raise revenue and reduce benefits to enhance financial sustainability. This misguided logic kept large portions of the population in developed and developing nations idle even as many of community’s needs go unmet. In the aftermath of the Great Recession we left workers unemployed for many years instead of employing them to

accelerate the transition to renewable energy and a more sustainable economy. Even today many Southern European nations are reeling from double digit unemployment rates while greening initiatives remain on the shelves.

Adequate social provisioning for seniors can reduce precarity and promote transition to a more socially and environmentally sustainable model. Instead of remaining in single family homes, we can reduce environmental footprints by constructing compact, multi-use communities for seniors with healthcare and recreational facilities within easy reach by senior-friendly transport. Instead of a patchwork system of public Medicare and privatized Medicare Advantage (that is bankrupting American families with private equity maximizing returns) public health facilities would be freely available to all. Instead of a “three-legged stool”<sup>7</sup> old-aged security would be guaranteed by adequate public funding. It would be best to provide all essential benefits on an equal basis to all elderly people. The main component of Medicare works so that, at age 65, all Americans qualify on an equal basis. Access to medical care is essential for elders, but so is access to adequate food, appropriate transportation, shelter, and entertainment.

If this sounds like a call for government to play a bigger role in provisioning for a sustainable demographic transition, it is! We are convinced that just as moving to an environmentally sustainable economy will require greater government involvement, social and political sustainability will also require more oversight. The neoliberal push for less government and more reliance on “the market” has been exposed as not only wrong, but as an existential threat to human survival. We would add that achieving environmental sustainability requires policy to reduce social precarity so the population of all ages can support the transition.

We should also recognize the benefits of low birthrates and an aging population. Instead of increasing the age of retirement, we should incentivize participation of elderly people in caregiving for both the young and the old. Women over age 65 already provide much of the care to their elderly parents, but more men should also participate in care activities—in the home, in the school, and in the community. Social policy could support seniors who want to provide youth care—perhaps with income but also with transportation and other support. This sort of investment in child rearing can help to produce a healthier, happier, and more productive labor force for the future.

In conclusion, a nation’s pension system (public and private) determines the distribution of production to retirees. The fight over pensions is a fight over the distribution of the nation’s output and income to workers, retirees and other dependents. The supposed unsustainability of government finances serves as a useful pretext for altering the distribution of resources away from seniors that rely on Social Security and for pushing the burden of care from the public sector onto households. The policies to “shore up” public pensions are not likely to increase output but would reduce the share going to the elderly. The old-aged security crisis is not real, but manufactured. Giving credence to the idea that there is an actual crisis serves to legitimize potentially disastrous “reforms.” To get to appropriate solutions, we first need to change the framing of the issue—away from finance and toward real resources.

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<sup>7</sup> In the USA seniors are supposed to rely on a combination of Social Security, personal savings, and a private pension. However, most seniors have accumulated very little personal savings, and pensions have largely been converted to defined contribution plans that are nearly universally inadequate. See Teresa Ghilarducci *When I'm Sixty-Four: The Plot against Pensions and the Plan to Save Them*, Princeton University Press 2017.



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## On ecology and economics

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### Immiserizing growth

There was a time when it was thought that the main task of economics was to assure economic growth. For example, John M. Keynes predicted that “the day is not far off when the Economic Problem will take the back seat where it belongs” (Keynes 1931: 6). Then, once scarcity has been overcome, mankind would devote most of its efforts to real problems, the problems of life and human relations (ibid.).

The impact of economic growth on the Earth environment was not an issue. This is no longer so. The ecological impact of economic activities can no longer be ignored. Ecological sustainability is an imperative if we want to preserve the planet for future generations. Ecological economics is a new subfield which addresses the challenge of introducing the ecological restrictions into economic analysis, trying to provide an integral response to the pressing environmental problems, many of them caused by economic activities.

This collides with the traditional economic point of view of a continuing and unlimited economic growth. Ecological economics introduced an opposing line of thought assuming that technology will not be able to circumvent fundamental energy and resource constraints; this, together with the collateral damage caused by economic activities, will impose that eventually economic growth would stop. Therefore, resource constraints as well as ecological damage have to be taken into consideration in any economic analysis.

The idea of immiserizing growth—an increase in aggregate national output that results in a net decline in national welfare—was first developed in the context of the theory of international trade (Bhagwati et al. 1998: 369). It can be extended to the situation where an increase in aggregate output results in environmental degradation. Given the fact that social costs differ from private costs the main issue in ecological economics is to design the restrictions which allow to internalize the environmental externalities

A key difficulty that ecological economics faces has to do with the fact that many environmental problems are characterized by a considerable degree of uncertainty about the severity of the problem and the effectiveness of possible solutions. For example, Weitzman (2011: 284) argued that “the economics of climate change consists of a very long chain of tenuous inferences fraught with big uncertainties in every link.” He remarked that in this case, cost-

benefit analysis “can be fragile to the specifications of extreme tail events” (ibid.: 289). To make things worse, climate change has to do with physical and biological processes that are slow to respond to attempts at reversal (ibid.).

Anyway, if we are unsure about the existence of future limits to growth the prudent course is to assume they exist.

Robert Costanza, one of the pioneers in ecological economics, formalizes in a game theoretic format the main dilemma environmental policy design faces. He shows that this simplified game has a fairly simple ‘optimal’ strategy:

“if we really do not know the state of the world then we should choose the policy that is the maximum of the minimum outcomes (i.e. the Maxi Min strategy in game theory jargon)” (Costanza 1989: 4).

This means that we analyze each policy in turn, look at what would happen in each of the possible states of the world if we pursue that policy, and pick the policy with the best outcome in the worst scenario.

It is usual to distinguish between positive and normative economics. Positive economics is supposed to study “what is,” “what was,” or “what will be,” while normative economics has to do with “what ought to be,” according to the original Hume’s distinction.

For example, the discussion on the impact of some industry on the environment is an issue within the positive economics orbit. On the contrary, the discussion on what level of pollutant emission is tolerable is a normative issue; it has to do with value judgments.

For different reasons<sup>1</sup>, fighting climate change is preeminently a normative issue involving issues of justice and equity.

Moreover, sustainable development is a multidimensional concept and very difficult to reduce to one-dimensional monetary terms. As Söderbaum (2020: 208) warns,

“the present sustainability challenge is rather about the non-monetary aspects of development. Monetary impacts are still important but reducing analysis to its alleged monetary equivalent, so called ‘monetary reductionism’, is questioned.”

For all these reasons, normative analysis plays a decisive role in environmental decision-making. The main contribution of positive economics is to quantify the costs of the different ecology-preserving initiatives. But the final decision will inevitably be deeply influenced by normative considerations.

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<sup>1</sup> Detailed in chapter 4 of Beker (2023).

## **The trade-off between sustainability and economic growth**

While continued economic growth may be ecologically unsustainable, low or negative rates of economic growth may be accompanied by adverse social impacts such as large-scale unemployment. The field of ecological macroeconomics aims to address this issue with the help of new macroeconomic models.

As Hardt and O'Neill (2017) point out, the challenge is to build macroeconomic frameworks and modeling tools to test how proposed post-growth policies could produce a stable transition and viable alternative to economic growth. In fact, most of the literature in ecological macroeconomics has as a departure point the need to manage an economy without growth.

Those who are not willing to resign to economic growth argue that using renewable energy, recycling waste, and shifting consumption from goods to services can make economic growth more environmentally friendly, what has been called "green growth." However, ecological economists are deeply skeptical about the possibility of divorcing economic growth from associated environmental impacts as promoters of "green growth" claim. In fact, no sufficient data are available for a meaningful statistical analysis that could prove or disprove the green growth hypothesis that perpetual economic growth and environmental sustainability can be reconciled.

After exhaustively reviewing the vast range of climate–economy models populating the literature, Scriciu et al. (2013: 254) conclude:

“Although there has been substantial analysis over the last decades on the environmental constraints to economic growth using integrated assessment modeling, economics so far has yet had little to offer in the way of model based analysis for studying the interrelationships and tradeoffs spurred by the double objective of respecting biophysical/climate thresholds and meeting ever-aspiring growth prospects. This remains an important blind spot and requires more attention from the economics profession.”

Some years later, this conclusion is, unfortunately, still valid. Therefore, the above mentioned maxi-min criterion seems advisable to avoid making irreversible mistakes in this sensitive area.

In this respect, some critics have pointed to the negative results of some policies implemented to prevent some of the gloomy scenarios forecasted. For example, fears of overpopulation framed very doubtful policies, such as China's one-child policy and forced sterilization in India. Banning synthetic fertilizer and pesticide imports forced Sri Lanka's millions of farmers to go organic practically overnight with disastrous consequences that culminated in the 2022 dramatic popular uprising. These examples underline the importance of being very careful in the speed of reforms and to take always into consideration the economic and socio-political context in which they are executed as well as the possible side and unwanted effects of them.

## **The challenge of climate change**

In the last 50 years, there has been an increasing awareness of the fact that the industrial economy has been systematically changing the ecosystems within which it is embedded ignoring most of its negative consequences.

Lately, concerns have been especially growing about the urgent need to avoid dangerous anthropogenic climate change by stabilizing the atmospheric concentration of greenhouse gases, the objective so defined by The United Nation Framework Convention on Climate Change that entered into force in 1994. The human additions to the stock of greenhouse gases in the climate system are warming the planet. Some of the consequences are that polar ice shields are melting and the sea is rising. In some regions, extreme weather events and rainfall are becoming more common while others are experiencing extreme droughts, floods, and storms increasing pest attacks and fueling wildfires.

Falling yields, rising crop failures, and famine are some other effects of adverse climate change. In 2018, the UN Intergovernmental Panel on Climate Change (IPCC) published a special report that concluded that global emissions must be halved by 2030 and reach net zero by the middle of the century. However, there is at present no agreed plan for accomplishing this. Moreover, the Glasgow Climate Pact signed in 2021 only agreed on phasing down but not phasing out coal as was included in previous negotiation drafts.

Grubler et al. (2018) present a scenario for reducing emissions in line with the Paris Agreement known as Low Energy Demand (LED), which reduces global energy consumption by 40% by 2050 and makes it much more feasible to achieve a transition to 100% clean energy. But this requires a planned reduction of the material and energy throughput of the global economy by close to 20%.

Scenarios that assume emission reduction and continuous economic growth mainly depend on the use of “negative emission” technologies such as Bio-Energy with Carbon Capture and Storage, an approach which has been associated with substantial risks and uncertainties.

For this reason, Spangenberg and Polotzek (2019: 206) recommend, to avoid a climate overshoot, that affluent countries start with a phase of de-growth and turn into a steady-state economy once the necessary reductions of resource consumption have been achieved.

Besides that, they conclude that economics has to change: “In short, economics has to be reinvented if it is to become a force for leading us away from catastrophe – rather than toward it. Taking the science of complexity on board would be a first step in this direction” (ibid.: 206).

## **On climate change and economics**

It is well known Sir Nicholas Stern's remark that "climate change is a result of the greatest market failure the world has seen" (Goodwin 2019: 36).

Although mainstream economists admit that externalities—and negative externalities in particular—cause market failure, they assess the performance of an economy through a single metric, the Gross Domestic Product (GDP) which ignores most of the costs of environmental damage. For this reason, Stiglitz et al. (2009: 7) remark that "choices between promoting GDP and protecting the environment may be false choices, once environmental degradation is appropriately included in our measurement of economic performance." For the time being, this recommendation, however, is far from being implemented.

Economics recipe to deal with negative externalities is to internalize them. The most common way to do this is by imposing a tax. This is the preferred economics approach. For example, in a statement issued on January 17, 2019, 3,623 US economists—including 28 Nobel Laureates—asserted that the "most cost-effective lever to reduce carbon emissions" is an escalating carbon tax (Climate Leadership Council 2019). This quite unusual demonstration of discipline unity—signers include from Robert Lucas to George Akerlof—shows that it is almost a religious belief in the profession that any issue can be solved simply through the use of price signals.

However, the issue is what the proper amount of the tax is, which is not easy to estimate. In the case of the carbon tax, the signers propose that the "carbon tax should increase every year until emissions reductions goals are met."

Denmark approved a corporate carbon tax in order to reach the ambitious target of cutting greenhouse gas emissions by 70% from 1990 levels by 2030. But, in general, carbon taxes are difficult to implement because they are often regarded as being regressive as they may penalize poorer members of society.

In fact, carbon tax should be applied to those goods responsible for the majority of greenhouse gas emissions: transport fuel, electricity, heating, and food, items with an important weight in low-income family budgets. An alternative may be to consider a policy design that offsets the regressive effects by returning the revenue back to low-income households. Anyway, carbon tax has proved to be difficult to implement. In France, the Yellow Vests movement was the response to the increase in carbon tax.

For this reason, other kinds of regulation are preferred such as setting limits to the emission of air pollutants. The issue here is whether these limits are enough to prevent environmental damage. For the time being, it seems they are not, given the growing environmental degradation.

Externalities—in this case positive externalities—pose another sort of difficulty. It is the case where investment opportunities that can contribute to ecological restoration include positive externalities, such that the investor cannot capture all of the benefits; or where the return will occur over a relatively long time. In both cases, investors will be deterred by one or the other of these characteristics. For this reason, instruments like taxes, subsidies, and permits are useful to promote that sort of investment. In the same vein, Goodwin (2019) mentions Payment

for Ecosystem Services (PES) programs such as the US\$1.5 billion investment made by New York City, when it paid upstate landowners and other stakeholders to engage in watershed conservation. She adds that PES programs may be used to solicit private investments in restoration; for example, those who increase the storage of carbon (or prevent its release), as compared to a benchmark, receive carbon credits that have a monetary value.

## Conclusion

Social change is a serious matter. This is not the first time we are told that drastic changes in society are needed—which is beyond any doubt. But given the experience of failure that an experience of drastic social change as communist economies meant, it is advisable to take cautiously de-growth or post-growth recommendations, in particular because of the high degree of uncertainty about the real magnitude of the ecological problems and the effectiveness of possible solutions. In this respect, it is worthwhile remembering Deng Xiaoping's advice that the best way to cross a river—when you do not know the depth of the water—is by feeling the stones.

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