

SURPLUS ENERGY ECONOMICS

A YOUNG PERSON'S GUIDE TO THE ECONOMY

If we're to make sense of economic trends, we need to start by recognizing that there are *two economies*, not one. These are the “real economy” of material products and services, and the parallel “financial economy” of money, transactions and credit.

The “real” economy is an energy system, in which energy is used to convert raw materials into products. What matters here isn't just the amount of energy available to the system, but the material cost of putting energy to use.

The energy used to create, operate, maintain and replace the energy supply infrastructure is energy that can't be used for any other economic purpose. If this **Energy Cost of Energy** rises, less energy remains to power the economy. Material *prosperity* is a function of the *surplus* energy that remains after ECoE has been deducted from total supply.

The “financial” economy uses money for the exchange of the output of the “real” economy. Money thus has value *only* as a “claim” on what the energy economy produces. We can create money at will, but energy can't be lent into existence by the banking system, or conjured out of the ether by central bankers.

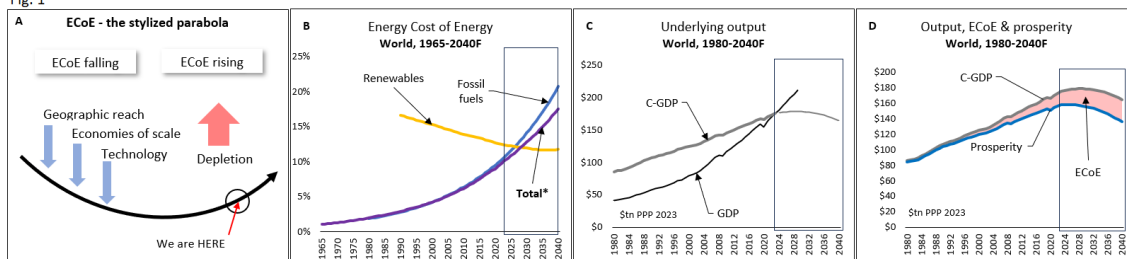
Properly understood, prices are *monetary* values attached to *material* products and services. The *general level* of pricing is determined by *the relationship between* the “two economies”. *Inflation or deflation* are functions of *changes in* this relationship.

The economy of today has been built on energy from oil, natural gas and coal. For much of the time since the Industrial Revolution, fossil fuel ECoEs trended downwards, as the industry reaped the benefits of economies of *scale*, improved its *technology* and extended its geographic *reach* in pursuit of lowest-cost resources.

Latterly, though, *depletion* – the effect of using lowest-cost resources first, and leaving costlier alternatives for later – has started driving ECoEs sharply back upwards. With fossil fuels continuing to account for four-fifths of global energy supply, this has pushed the overall ECoE of the economy up from 2% in 1980 to more than 10% today. We've already witnessed a five-fold increase in the material cost of energy, and ECoEs are going to carry on rising.

As ECoEs have risen, growth in the output of the global economy has decelerated. We've tried to counter this, first with “credit adventurism” and, since the GFC of 2008-09, with “*monetary* adventurism” operated through QE, ZIRP and NIRP.

Fig. 1



SEEDS looks behind this *credit effect* to see what has *really* been happening to global economic output. This increased by only 36% between 2003 and 2023, a period in which headline real GDP was supposed to have doubled. On this basis, the reported 60% increase in GDP per person between those years falls to just 8.1%. Each person’s average share of global debt increased by more than 150% through that period.

When we further deduct ECoE from this underlying or ‘clean’ C-GDP metric, we can see that growth in *prosperity* has steadily decelerated towards contraction, and that the prosperity of the world’s average person *has already stopped growing*.

At the same time, the real costs of essentials have been rising relentlessly, primarily because of the high energy intensity of so many necessities including food, water, housing, transport and distribution.

Because of the combined effects of falling prosperity *and* the rising costs of necessities, the critical metric PXE (prosperity excluding essentials) is *already* falling markedly at the per capita level, with the global aggregate *now starting* to head rapidly downwards.

This means that the affordability of *discretionary* (non-essential) products and services is heading into relentless contraction. Capital investment in new and replacement productive capacity will decline as attractive investment opportunities disappear.

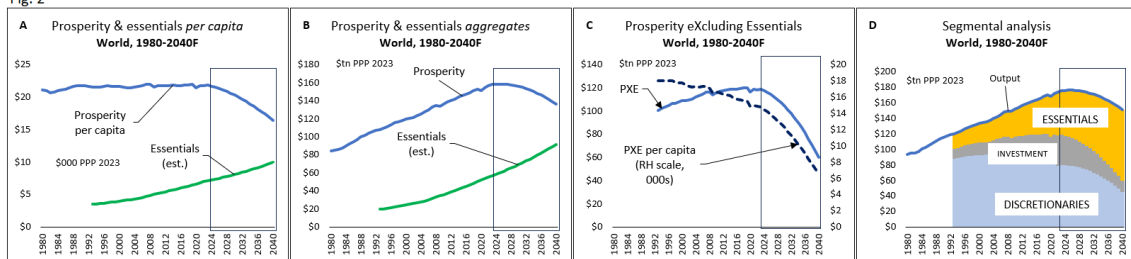
As well as shrinking the market for discretions (like travel, leisure, entertainment and non-essential gadgets), *affordability compression* is also going to undermine the ability of the household sector to ‘keep up the payments’ on its escalating commitments to the financial and corporate sectors.

When the assets of the NBF (“shadow banking”) system are included, the aggregate liabilities of governments, households and private non-financial corporations have become enormous. Available data on broad liabilities is neither complete nor timely, but these can be estimated at somewhere in excess of \$900tn, compared with debt of \$420tn and GDP of \$176tn.

Even this number excludes huge gaps in pension provision, something which the WEF has called a “global pensions timebomb”.

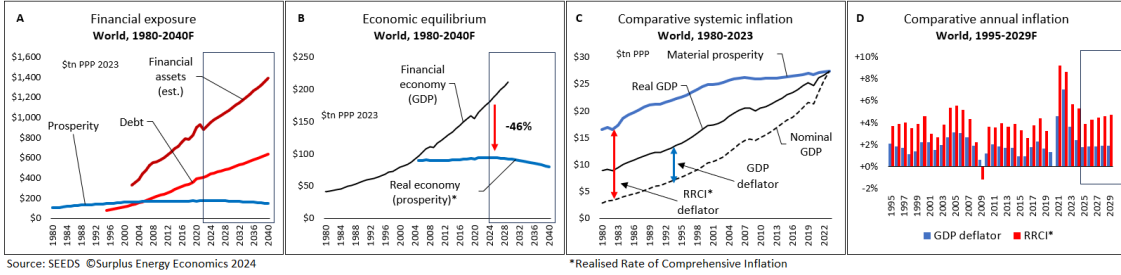
Since money has value *only* as a “claim” on the underlying “real” economy, it is self-evident that the relationship between the “two economies” *must* trend towards equilibrium. On a trailing twenty-year measure, the *disequilibrium* between the “financial” economy and its underlying “real” or material counterpart stands at -46%.

Fig. 2



Source: SEEDS © Surplus Energy Economics 2024

Fig. 3



The application of this *qualitative* calculation to the *quantitative* scale of financial exposure gives us some guidance on the scale of the next global financial crisis (“GFC II”).

Contrary to widespread misunderstanding, capital assets cannot be used to offset these enormous and increasingly at-risk liabilities. The supposed ‘valuations’ of assets are purely notional, being based *entirely* on the prices at which these assets change hands. We can’t, that’s to say, monetize assets by selling *all* of them at the same time, and any attempt to do so would simply crash the markets.

The “everything bubble” in asset prices, far from providing us with insurance against liability default, simply adds one more component to a looming correction which we cannot possibly avoid.

Though it’s likely that a wave of defaults will cascade through the system, the most probable outcome is the inflationary destruction of the value of the money in which liabilities are denominated.

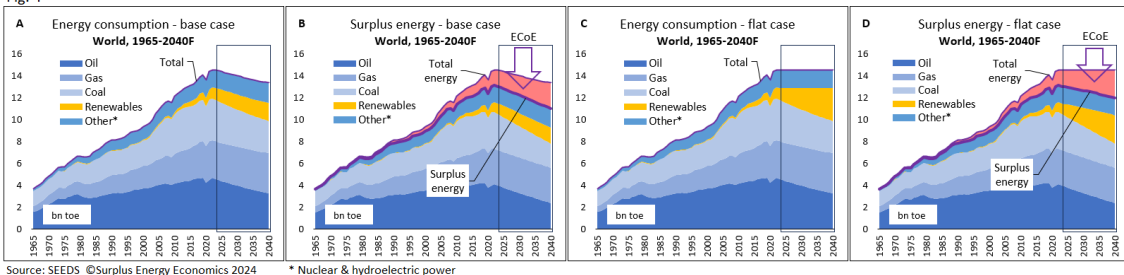
Inflation, understood as changes in the relationship between the monetary and the material economies, and measured here as RRCI, has long been higher than the GDP deflator used in the calculation of “real” growth in GDP.

Finally, the idea that renewables can replace the economic value hitherto sourced from fossil fuels is fallacious. The characteristics (especially the energy density) of wind and solar power are inferior to those of fossil fuels, meaning that renewables can never replicate the ultra-low ECoEs of fossil fuels in their heyday.

Best practice is already close to the efficiency limits set for wind power by Betz’ Law, and for solar by the Shockley-Queisser Limit, and we should be under no illusion that the human ingenuity embodied in technology can abolish the laws of physics to make “sustainable growth” a realistic possibility.

Even if we could maintain total energy supply by growing renewables output by enough to offset looming, cost-driven declines in fossil fuels, rising ECoEs would *still* push surplus energy, and hence prosperity, in a relentlessly downwards direction.

Fig. 4



SUPPLEMENTARY INFORMATION

A data sheet accompanying this document can be found [here](#).

Notes:

This text was first published as part of

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Unless otherwise stated, all financial data has been converted to dollars from other currencies at PPP (purchasing power parity) rates of exchange.

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